

# POWER Offshore Wind Supply Chain Study for Denmark - Supply Chain in a Globalized World -

## Executive Summary

A report conducted in collaboration between Offshore Center Danmark and AC Consult.  
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Offshore Center Danmark

### AC Consult

Rådgivende Ingeniører, FRI  
Ingeniørrådgivning, Projektledelse, Planlægning.



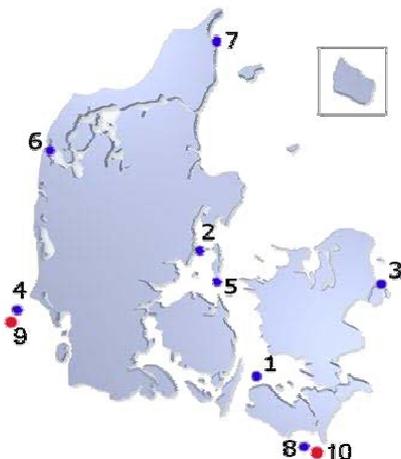
## EXECUTIVE SUMMARY & CONCLUSIONS

Denmark has been erecting wind turbines offshore since the early 1990's. Today the country is leading in the field with 423 MW offshore wind turbines in operation. On a global level, Danish wind industry employees 35,000 people. 45 % of all installed wind capacity in 2004 was done by the Danish.

The traditional oil/gas offshore industry has provided the Danish offshore industry with more than 30 years of experience working in the North Sea. The Danish offshore capital, Esbjerg, is home to 200 offshore oil/gas companies. In total more than 3,500 people are employed by the industry in the region.

### Operating and planned offshore wind farms in Denmark

Today, a total of 214 offshore turbines\* distributed over 8 locations are connected to the Danish electricity grid. Together with approximately 5,200 onshore turbines these generate about 20 % of the total Danish electricity consumption.



The map above show the 8 operating Danish offshore wind farms as well as 2 planned offshore wind farms. Details are summarized in the table on the next page.

\* The definition of offshore turbine used in this study includes all wind turbines located in water, regardless of water depth and foundation type.



| <b>Operating Offshore Wind Farms</b> |                             |                        |                            |                            |
|--------------------------------------|-----------------------------|------------------------|----------------------------|----------------------------|
| <b>Location</b>                      | <b>Year of construction</b> | <b>No. of turbines</b> | <b>Turbine rating [kW]</b> | <b>Total Capacity [kW]</b> |
| Vindeby (1)                          | 1991                        | 11                     | 450                        | 4,950                      |
| Tunø Knob (2)                        | 1995                        | 10                     | 500                        | 5,000                      |
| Middelgrunden (3)                    | 2000                        | 20                     | 2,000                      | 40,000                     |
| Horns Rev (4)                        | 2002                        | 80                     | 2,000                      | 160,000                    |
| Samsø (5)                            | 2003                        | 10                     | 2,300                      | 23,000                     |
| Rønland (6)                          | 2003                        | 8                      | 2,150                      | 17,200                     |
| Frederikshavn (7)                    | 2003                        | 3                      | 1 x 3,000<br>2 x 2,300     | 7,600                      |
| Rødsand (8)                          | 2003                        | 72                     | 2,300                      | 165,600                    |
| <b>Total</b>                         |                             | <b>214</b>             |                            | <b>423,350</b>             |

| <b>Planned Offshore Wind Farms</b> |                             |                        |                            |                            |
|------------------------------------|-----------------------------|------------------------|----------------------------|----------------------------|
| <b>Location</b>                    | <b>Year of construction</b> | <b>No. of turbines</b> | <b>Turbine rating [kW]</b> | <b>Total Capacity [kW]</b> |
| Horns Rev II (9)                   | 2008                        | n/a                    | n/a                        | 200                        |
| Rødsand II (10)                    | 2009                        | n/a                    | n/a                        | 200                        |
| <b>Total</b>                       |                             |                        |                            | <b>400,000</b>             |

## Supply Chain Study

In order to identify potential gaps in the Danish supply chain for the continued development of offshore wind turbines, a number of interviews with leading businesses from the different parts of the supply chain were carried out. Based on a desktop study of the industry, the knowledge already possessed by Offshore Center Danmark and the interviews, an analysis were conducted.

Initially, the approach was to consider only the Esbjerg region. However, based on the facts that Danish offshore wind businesses are scattered all over the country and that future offshore wind project in the region inevitably will feature involvement from companies from outside the region, the geographically scope were expanded to include the entire nation.

## Study conclusions

The study of the Danish supply chain for offshore wind turbines showed a remarkable impact from the effects of development in IT technology and cheap deep sea transportation - the borders that define regions are dissolving (when looking from a supply side). Globalization plays a bigger role in the supply chain than ever before. 3 main areas were identified as playing an especially important role in shaping the marked through globalization:

- Import of industry hardware and services
- Export of the manufactured offshore wind turbines
- Outsourcing manufacturing to other countries

The Danish wind industry has taken the challenges and is working in the world wide economics on buying, selling, outsourcing and manufacturing. This is reckoned by the Danish wind industries and is one important key to its success.

Other important finding in the study included:

- No supply gaps on material deliveries. The majority of deliveries needed for offshore wind projects are already available in the region (Denmark). Special deliveries not widely available in the region can be obtained quite easily due to the effects of globalization.
- Politics is seen as a major bottleneck for the continued development of the offshore wind sector. It's necessary to deal with local and foreign politics (on subsidies, laws, infrastructure etc.) in order to open up for this.
- Flexible trade unions make the wind industry capable on matching the ever going and fast changes in the supply and demand of employees.
- No lack of middle- and high educated people.
- Important with a solid and trustworthy network between industries inside and outside Denmark.
- Important with solid wind turbine interest organizations to deal with the local and foreign politics.
- Interaction between oil/gas offshore industry and traditional wind industry important. There are many experiences to draw from by using the competences build up over the past 30+ years in the Danish oil/gas offshore industry.
- Handling of electricity (overrun, frequency, storing) from wind turbines is difficult and need to be addressed. Today 20 % of the electricity in the Danish grid is produced by wind turbines. As this ratio will increase so will the problems with handling the fluctuations of wind based electricity.
- Outsourcing of manufacturing and services to other countries demands the necessary resources and knowledge from start.

## **POWER project information**

**The full report is available for download on the POWER website at  
[www.offshore-power.net](http://www.offshore-power.net)**

Contact for POWER in Denmark:  
Morten Madsen, Offshore Center Danmark  
Niels Bohrs Vej 6, 6700 Esbjerg, Denmark  
[mm@offshorecenter.dk](mailto:mm@offshorecenter.dk) / +45 3697 6372

### **POWER – Pushing Offshore Wind Energy Regions**

The POWER project establishes a high profile North Sea competence network for offshore wind energy, with partners in Germany, the UK, Denmark, the Netherlands and Belgium. The project looks at environmental issues of offshore wind farms, the development of a reliable regional supply chain for the sector, and skills development issues. Denmark is represented in the project by EU Vest and Offshore Center Danmark. POWER is co-financed by European Regional Development Funding through the Interreg IIIB North Sea Programme.

