Offshore Wind Energy in the North Sea Region

The state of affairs of offshore wind energy projects, national policies and economic, environmental and technological conditions in Denmark, Germany, The Netherlands, Belgium and the United Kingdom.

Faculty of Spatial Sciences
University of Groningen

A quick scan by the partners of work package 1 of the POWER project.

Edited by Sjoerd Zeelenberg, Faculty of Spatial Sciences, University of Groningen.

Last update: September 2005. Expected new update: December 2005.

POWER and University of Groningen, September 2005.

Preface

POWER - Pushing Offshore Wind Energy Regions - is a transnational project, funded by the European Regional Development Funding (ERDF) through the Interreg IIIB North Sea Programme, and runs from 1 July 2004 for three years. The POWER project unites North Sea regions with an interest in supporting and realising the economic and technological potentials of offshore wind energy[1]. In its four work streams, the project discusses and assesses environmental issues of offshore wind farms, planning practises, the development of a reliable regional supply chain for the offshore wind sector and skills development issues. 37 Organisations take part, with representatives from Denmark, Germany, The Netherlands, Belgium and the United Kingdom. Transnational co-operation between these regions establishes a high profile North Sea competence network for offshore wind energy.

This study was created within the framework of the Planning and participation work stream of the project (the project's work package 1). Work package 1 focuses on the integration of the different planning systems of the Member States bordering the North Sea. Its aim is to give insight in possible improvements in the decision-making process for the location of offshore wind farms, and to harmonise planning and information strategies for offshore wind farms in compliance with government legislation. These improvements can be realised in a variety of ways, i.e. the development of transnational strategies, the creation of a credible and accessible knowledge base or by redefining and redistributing tasks and powers.

Besides the planning guidance, an information tool and a pilot Decision Support System (DSS) will be created during the course of work package 1 (WP1). *Offshore Wind Energy in the North Sea Region* is a quick scan, and forms a base line analysis for future project activities. It comprises an inventory of all offshore wind farm projects in the North Sea, as well as a general description of decision-making processes within the North Sea Member states, including a list and analysis of stakeholders. Ultimately, it provides an overview on the offshore wind farm planning processes in Denmark, Germany, The Netherlands, Belgium and the United Kingdom.

The study was compiled by the following partners and contractors of WP1:

- Institute for Chemistry and Biology of the Marine Environment (ICBM, Germany),
- University of Groningen (UoG, The Netherlands),
- The Senator for Construction, Environment and Transport, State of Bremen, (SBUV, Germany)

[1] See also http://www.offshore-power.net.

- Suffolk County Council (SCC, United Kingdom),
- Institute for Environment, Infrastructure and Innovation (IMI, sub contractor, Belgium),
- Port of Oostende (PoO, Belgium).

Although this quick scan is executed as part of the work package 1 research plan, its added value increases by the use of it by other POWER partners. As mentioned at the 2nd Transnational Meeting in Oostende (11th -12th April 2005), it will be available for the other partners. It will be accessible at the power website[2] and will be distributed at the 3rd Transnational Meeting in The Netherlands, 1st and 2nd of September 2005. For questions regarding the compilation of the document, the reader may turn to the University of Groningen[3]. For questions on the specific national situations, contact the author of the concerned chapter. ICBM in Oldenburg[4] is work package responsible partner and is able to answer the reader's questions on the upcoming steps and developments of the work package.

Within the scope of POWER, other products have been realised that might be in the readers' interest. Work package 2 (Economic support & Supply chain) focuses on wind energy supply chains and has recently finished detailed descriptions of the offshore wind farms in Denmark and England. The qualification requirements study, executed within work package 3 (Education & Advanced professional training) will contribute to the development of standards and certificates for offshore wind energy courses or modules and to the support of training providers in the North Sea Region. Both studies will soon be available at www.offshore-power.net[5].

This document is compiled and edited by Sjoerd Zeelenberg (University of Groningen). The state of affairs of the 5 countries in the upcoming chapters is derived from quick scans made by members of the work package. These persons are mentioned in the concerned chapter. Besides an overview on the work done so far, this document serves as input for both the upcoming stakeholder analysis in order to develop a DSS and the identification of best practices in offshore wind farm development, according to the research proposal. During the research activities, this document will be updated frequently.

[2] http://power.balport.com, only available for partners.
[3] s.zeelenberg@rug.nl.
[4] Susanne Adam (adam@icbm.de) or Dietmar Kraft (dkraft@icbm.de).
[5] If not, feel free to contact Michael Moll (michael.moll@et.suffolkcc.gov.uk) for work package 2 activities, or Marc van Straten (marc.van.straten@apics.nl) for work package 3 activities.

Table of contents

Chapter 1

Introduction

In Europe as well as in the individual member states, the use of renewable energy resources has gained major importance. The Kyoto protocol, the Lisbon agenda and several EU Directives emphasise the shared conviction that a change in energy consumption and production is desirable, and in the end unavoidable. Without discussing these trends in detail, it is fair to state that current attention for wind energy (in society, government policies and private organisations) is a consequence of this.

Two major drawbacks of the use of fossil energy can be distinguished: resources are finite, and the emissions produced by their combustion have a negative effect on our climate. Therefore, developing the renewable energy sector does not only make ecological sense, but it is also beneficial for the economy as a whole. A recent EU policy workshop concluded that, despite the little experience yet, the deployment of offshore wind energy is of great importance and can contribute to national and EU energy policies, such as the Lisbon agenda, sustainable growth, environmental protection and regional development (Ministry of Economic Affairs and COD 2004).

1.1 Offshore wind energy

Compared to onshore wind energy, offshore farms have numerous advantages. Located at sufficient distance, noise and visual disturbance are minor issues. Wind patterns at sea are more uniform and wind speeds are higher. These circumstances favour the use of larger wind turbines, producing more efficiently. These advantages are one of the reasons to explore and deploy offshore potentials. The North Sea has a considerable potential for offshore wind energy, as it is characterised by large areas of shallow waters and a large wind resources. Therefore, several developments in the North Sea have occurred and are bound to take place, varying from country to country.

The deployment of offshore wind farms poses several challenges. Experiences in Denmark and the United Kingdom have provided many answers and useful insights. The capacity and efficiency of offshore wind turbines have increased considerably. The reliability of offshore wind energy and the predictability of their production are improving. Given this technical progress, offshore wind energy can become a competitive and reliable energy source. Substantial investments by concerns like Siemens, Vestas, Shell or General Electic, confirm the economic potential of the offshore wind energy sector. As a consequence, targets and objectives are revised. Recently, the European Wind

Energy Association has adjusted its targets for offshore wind energy to 10 GW for 2010 and 70 GW for 2020 (EWEA 2003). Table 1.1 shows present and planned offshore projects[1]; ambitions are set high, and considerable efforts need to be done. The planned capacity in the second column is to be understood not so much as long-term policy goals, but rather as projects that are likely to be realised within the upcoming three years.

Table 1.1. Overview of offshore capacities in the North Sea. Commissioning of the wind farms is foreseen for the period 200-2008[2].

	Installed	**Planned or under construction**
Denmark	423 MW	400 MW
Germany		2,2 GW
The Netherlands		220 MW
Belgium		216-300 MW
United Kingdom	80 MW	650 MW (round 1), 6 GW (round 2)

1.2 Offshore experiences

Given the current pace of developments, knowledge and experience on offshore activities are rapidly growing. The planning, construction and deployment as well as the operation of offshore wind farms pose new questions and challenges to both government and industries. Challenges that have to be met.

Regarding the various attempts and institutions aiming at sharing and generating information on this topic, the international context of offshore wind energy is crucial. European Directives and guidelines increasingly influence national decision making and interregional or national projects stipulate adjustments and additions of existing policy frameworks. (Spatial) policy plans, Strategic Environmental Assessments (SEAs), Environmental Impact Assessments (EIAs), electricity policies, grid connections; each country deals with them in country-specific or comparable manners. Within the scope of the POWER WP1, it is expected that lessons can be learned from experiences in the different countries of the North Sea Region. The state of affairs differs considerably per country, which increases the need, and value, of comparative analysis.

Elaborating on this, the upcoming chapters provide an overview of the state of affairs concerning offshore wind farm planning in five North Sea Region countries i.e. Denmark, Germany, The Netherlands, Belgium and the United Kingdom. The current and planned offshore wind farms will be discussed, and planning procedures will be enlightened. Furthermore, the role of authorities and stakeholder groups are discussed. Attention is paid to environmental problems and challenges, as well as to the financial and economic conditions for successful deployment of offshore wind energy potentials. The final chapter provides an analysis of the chapters; analogies are sought for, as well as contradictions, bottlenecks and impediments of the development processes are to be addressed.

1.3 References

Beurkens, L. and M. De Noord (2003), *Offshore wind power developments, an overview of planned projects*, ECN, Unit Policy Studies, nr. 7.7449, Petten

EWEA (2003) *Special Newsletter*, European Wind Energy Conference (EWEC), Madrid 18th June 2003

Ministry of Economic Affairs and COD (2004) *Development of offshore wind energy in Europe*, policy workshop background document, 30th September and 1st October 2004, Egmond aan Zee

[1] The table is limited to the countries participating in the POWER project.
[2] The data have been derived from Beurkens and De Noord (2003) and the next chapters.

Chapter 2

Offshore Wind Farm Planning in Denmark[1]

2.1 Background

The present policies for wind power in Denmark are a mixture of the previous government's policy of redirecting wind power investments to offshore, re-powering of projects and the current government's policy of reducing investments in wind power in general. It is the governmental policy to follow EU, which seems to include the EU electricity directive target of 29% renewable electricity in Denmark by 2010. Since the current share of renewable energy sources is about 25%, additional installation of wind power and other renewable energy sources is required. Wind energy accounts for approximately 20%. The share of renewables is expected to rise to 36% in 2025 (DEA 2005a). Most of the offshore wind farms are owned by private companies, and it is still a political priority whether to encourage the formation of cooperatively owned offshore wind farms (Olesen 2002).

2.2 Danish wind energy policy

According to the Danish Government's action plan for energy *Energy 21* (published in 1997) 4000 MW of offshore wind power should be installed by 2030. The target for onshore wind energy is 1500 MW. This scheme would enable Denmark to cover more than 50 per cent of the total electricity consumption by wind energy. In 2005, the installation of wind power in Denmark amounted to approximately 2700 MW onshore and approximately 423 MW offshore.

Generally spoken, Danish energy policy has been an area of consensus in the Parliament throughout the past 25 years; there has been a broad consistency in the energy policy. During the two oil supply crises (1972-1979), energy policy was obviously directed towards security of supply. Strong fiscal incentives were put in place to encourage domestic oil and gas exploration in the North Sea. The power generation system was changed from being largely oil fired to being coal-fired.

[1] The original chapter was compiled by Hasse Petersen (IMI), 7th December 2004. It is revised by Sjoerd Zeelenberg (UoG) and Morten Madsen (Offshore Center Denmark), 9th August 2005.

The conversion to coal-firing meant that Denmark had relatively large greenhouse gas emissions per capita in the 1980's when environmental concerns became prevalent. As a result of that the policy on greenhouse gas abatement became rather ambitious, thus after the oil crises the energy policy became to some extent synonymous with the environmental policy (Krohn 2002b). Table 2.1 gives an overview of current policy goals.

Table 2.1. Wind power targets (Olesen 2002).

	Target	**Onshore/ Offshore**	**Planning document**	**Status of target**
2005	1500 MW	Mainly onshore	Energy 2000[2], confirmed in Energy 21[3]	Approved by Parliament (achieved in 1999)
2003	20% RE electricity in electricity supply	Not specified	Political agreement 1999	Agreed among most Danish parties in 1999
2010	29% RE + waste in electricity supply (requires approx. 2300 MW wind power with Danish RE-mix)	Not specified	EU Directive for Renewable Energy in Internal Electricity Market (COM2000-116)	Indicative EU target
2008-2012 (av.)	21% reduction in CO_2 emission from1990 to 2008-2012 (not directly transferable to wind power capacity)	Not specified	EU burden-sharing of Kyoto Protocol	Ratified by Danish Parliament[4]
2030	50% wind power in electricity mix	Mainly offshore		Indicative national target[5]

Development of offshore wind energy in the territorial sea as well as in the EEZ is the responsibility of the Danish Energy Authority (DEA), which belongs to the Ministry of Economic and Business Affairs (Krohn 2002a). The decisions of the Energy Authority can be brought to the Energy Board for Appeal, which is an independent appeal board under the Ministry for Economic and Business affairs. The decision-making of offshore wind energy is top-down.

Legally, the Danish territorial sea is a special zone and in general it is not covered by the onshore regulation. However, the onshore regulation is to a certain extent applicable to the coastal zone. National authorities administrate the sovereignty. With respect to the production of electricity from wind energy installations situated in the territorial sea, the DEA administrates the sovereignty and, furthermore, decides whether a specific project requires an EIA. A number of other authorities administer regulation concerning the sea territory. However, according to the existing framework they are all linked through the DEA, which illustrates the Danish regulation is aiming at 'one-stop shopping' (Shaw et al. 2002).

2.3 Current projects

Up to now, 8 offshore wind farms have been built in Denmark. Three of them, Vindeby, Tunø Knob and Middelgrunden, are rather small-scale pilot projects. The wind farms Horns Rev and Nysted are to provide a capacity of approximately 160 MW each. The Samsø the wind farm is a special demonstration project of another 23 MW. Finally, the wind farms Rønland and Frederikshavn have a capacity of respectively 17 MW and 7,6 MW. Table 2.2 and map 2.1 provide an overview. The numbers on the map and in the table correspond. The projects are described in the upcoming sections.

[2] Energy 2000, Danish Energy Action Plan, approved by Parliament in 2000.
[3] Energy 21, Danish Energy Action Plan, approved by Parliament in 1996.
[4] The EU – burden-sharing of the Kyoto Protocol target was in principle agreed among the EU countries in 1997 and was confirmed in March 2002.
[5] This indicative target was set by the former government. The current government, that came into power in November 2001, has not confirmed it, but have on the other hand not made publicly cancelled it, though it is not included in the new government's plan for sustainable development (April 2002).

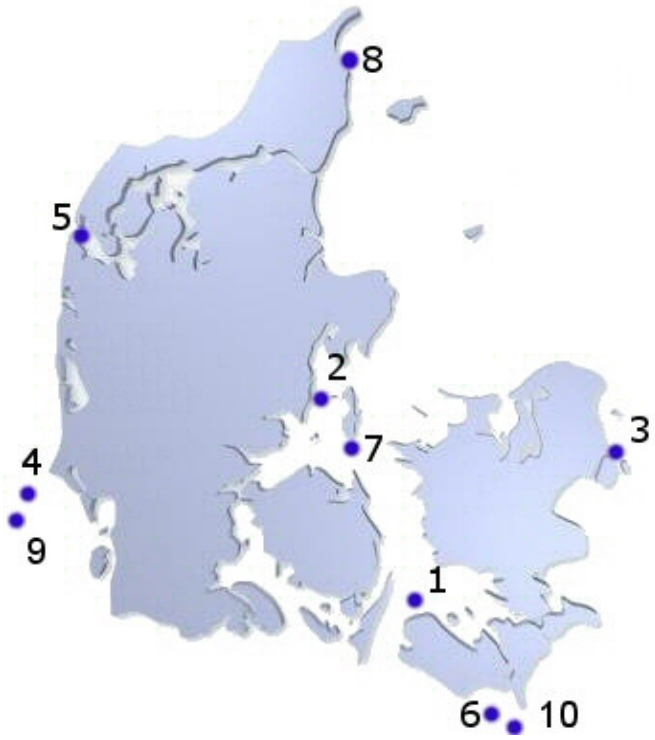


Table 2.2. Overview of offshore wind farms in Denmark (Offshore Center Denmark 2005).

	Name of farm	Year of construction	Number of turbines	Capacity per turbine (MW)	Total capacity (MW)	Owner
1	Vindeby	1991	11	0,45	4,95	SEAS
2	Tunø Knob	1995	10	0,50	5,00	Elsam (previously Midtkraft)
3	Middelgrunden	2000	20	2,00	40,00	Joint venture[6]
4	Horns Rev	2002	80	2,00	160,00	Elsam
5	Rønland	2003	8	2,15	17,20	Several[7]
6	Rødsand/Nysted	2003	72	2,30	165,60	Joint venture[8]
7	Samsø	2003	10	2,30	23,00	Joint venture[9]
8	Frederikshavn	2003	3	1*3,00 and 2*2,30	7,60	
	Total		**214**		**423,35**	

Table 2.3. Overview of planned offshore wind farms in Denmark (Offshore Center Denmark 2005).

	Name of farm	Year of construction	Number of turbines	Capacity per turbine (MW)	Total capacity (MW)	Owner
9	Horns Rev II	2007	unknown	unknown	200	See below
10	Rødsand II	2008	64	3,10	200	See below
	Total				**400**	

[6] The Middelgrund Wind Turbine Co-operative holds 50% and local power company Københavns Energi holds 50%.
[7] Vindenergi ApS, Harboøre Møllelaug I/S and Thyborøn-Harboøre Vindmøllelaug I/S.
[8] Energy E2 holds 50%, Dong holds 30%, and Swedish Sydkraft holds 20%.
[9] Joint venture; Samsø municipality holds 50%, private investors hold 40% and Difko holds 10%.

Table 2.3 shows the planned offshore wind farms. Horns Rev II will be developed and owned by Energi E2. For Rødsand II, 4 organizations are competing for the tender: Ballast Nedam Infra B.V. and Evelop BV, Elsam Kraft A/S, Rødsand II A/S (a consortium which also bid on Horns Rev II) and a consortium consisting of DONG Vind A/S, Sydkraft AB og Energi E2 A/S.

2.3.1 Pilot projects: Vindeby, Tunø Knob and Middelgrunden

In 1991, Elkraft established a 5 MW test plant at Vindeby, and in 1995 Elsam established a 5 MW wind power plant at sea at Tunø Knob. In connection with Vindeby and Tunø Knob, the adverse impacts of the offshore wind turbines on the marine environment have been studied. These studies indicated that small-scale offshore wind farms do not have considerable adverse impacts on the marine environment.

Middelgrunden Offshore Wind Farm dates back to 1997. It was commissioned in 2001 and consists of 20 2 MW wind turbines. The wind farm is sited in Oresund at a distance of three kilometres to the Copenhagen harbour. Copenhagen Environment and Energy Office (CEEO) took the initiative to organise the project, in co-operation with a group of local citizens: the Middelgrunden Wind Turbine Co-operative. The offshore wind farm is a 50% co-operative with 8.600 shareholders. The legal owners are the Middelgrund Wind Turbine Cooperative and the local power company Københavns Energi. The shares of the co-operative were mainly sold in small numbers to a broad section of the Copenhagen public (DEA 2004a).

Middelgrunden Offshore Wind Farm was subject to a long and intensive hearing phase, and today it is an example of how extensive dialogues can generate a widespread understanding and social acceptance of an offshore wind farm. A comprehensive information work was carried out (leaflets, public meetings, articles, TV etc.), both in relation to relevant authorities, NGO's and the future shareholders in the co-operative. In order to mitigate worries about noise, local inhabitants were invited for a demonstration tour to a modern wind turbine that creates significantly less noise impact compared to older wind turbines. At the final hearing, a large number of local groups and committees, including the several thousand shareholders, recommended and supported the project. Only a relatively small group of yachtsmen, fishermen, individuals and politicians remained in opposition. The reason for this minor opposition is believed to be the strong public involvement in the planning phase as well as the financial involvement of the public (Petersen and Neumann 2003).

2.3.2 A demonstration programme for offshore wind energy

In 1996, a committee was appointed in order to assess the technical and economical feasibility for development of large-scale offshore wind farms. Following the committee's advise, the government indicated via the action plan for energy, *Energi 21* (as discussed in 2.2), that the target for offshore wind energy was 4000 MW prior to 2030. Thus 4000 MW became the basis for developing the Offshore Wind turbine Action Plan for Danish Waters Havmølle-handlingsplanen (Utilities and Energy Agency 1997).

This Offshore Wind turbine Action Plan for Danish Waters (see also section 2.4) resulted in 1997 in a set of planning regulations to establish a framework for the development of offshore wind energy. The aim of building the five pilot offshore wind farms was to obtain a solid experience prior to further decisions in view of prospective offshore wind farms within the designated areas were to be made (DEA 2004b). The document designated 15 possible areas (4 prime and 11 supplemental sites), suitable for offshore wind farms. In 1998, the Government ordered the utilities to erect 5 large-scale demonstration projects of a total of 750 MW on the basis of these recommendations. Thus, the Danish Energy Authority granted permission for respectively Elsam, Eltra, Energi E2 and SEAS-Transmission to commence preliminary studies (EIAs) for possible wind farms located at Horns Rev in the North Sea, in the Kattegat south of Læsø, at Omø Stålgrunde, north of Lolland and at Rødsand and Gedser Rev, both south of Lolland-Falster.

As will be described in section 2.4.1, the government abandoned this plan and chose to use open tenders for establishment of new offshore wind farms. The reason for moving from the 5-project plan to public tenders was that the government thought it to be better to open up for a competition on the market through open tenders. So in the end, only Horns Rev (4), Rødsand/Nysted (5) and Middelgrunden (3) have been constructed, according to the *Havmølle-handlingsplanen*.

2.3.3 Horns Rev

As mentioned in section 2.3.2, the Danish power company Elsam was ordered by the Minister to erect an offshore wind farm. This offshore wind farm was to be established as a large-scale demonstration facility at Horns Rev. Due to the special status of the demonstration programme, a comprehensive environmental measurement and monitoring programme was initiated to investigate the effects on the environment before, throughout and after the completion of the offshore wind farm.

In June 1999, Elsam obtained the permit for the preliminary surveys and in March 2001 the building permit was received - after public hearings and public authority acceptance of the EIA report and project proposal. In December 2002, the last wind turbine was put into operation (Petersen and Neumann 2003). Based on the preliminary investigations, a 2-3 years monitoring programme was settled. Horns Rev is owned by Elsam (40%) and Vattenfall (60%).

2.3.4 Rødsand/Nysted

In 2001 the Danish Energy Authority approved the power company Energi E2's application to establish an offshore wind farm at Rødsand. The project was the second offshore wind farm of the five pilot projects. In June 1999, SEAS Distribution was granted permission to commence preliminary studies (EIAs) for the offshore wind farm, on behalf of I/S Sjællandske Kraftværker, Københavns Belysningsvæsen and A/S Østkraft. In July 2003, the last wind turbine was erected, and the first 10 of the 72 wind turbines were producing electricity.

2.3.5 Samsø

In 1998, the island of Samsø was selected by the Danish Government as a demonstration case for a community to be supplied with 100% renewable energy within the next decade. This status was obtained via a competition that was organised by the Ministry of Energy. The overall objective is to supply Samsø with 100% renewable energy by 2008.

The implementation of an offshore wind farm, establishment of co-operatives in view of private ownership and management of the wind installations as well as involvement of local inhabitants in the wind project, are all cornerstones in the demonstration project. The wind turbines were erected and put into operation in the period of December 2002 – February 2003.

2.4 Designating offshore wind energy areas

As described earlier, the Offshore Wind Turbine Committee of the former Ministry of Environment and Energy conducted a mapping project in order to identify possible locations for offshore wind farms. Furthermore, an assessment of the impact of offshore wind farms on coastal landscapes recommended that offshore wind farms should be concentrated in relatively few areas, placed at a given distance from the coast.

The mapping project tended to take into account all known interests in Danish waters, such as nature preservation areas, shipping routes and military interests etc. The condition of the power grid was also considered an important factor. The capacity for the exciting grids were described and for the different areas it was estimated whether or not this would be sufficient to meet the demands of the offshore wind farms.

Furthermore, the planning process took into consideration the need for limited water depths, relevant for the technology available at that time. The plan also aimed to concentrate offshore wind energy in a few areas, while maximising the use of existing infrastructure and reducing as far as possible the impact on the coastal landscape. Based on an evaluation of the interests attached to the different areas in the waters, five main areas for offshore wind farms were selected (Shaw et al. 2002).

When issuing tenders nowadays, the government most likely leans towards the action plan and uses the designated areas as tender areas. A tool to regulate location choice is a law that states that[10] for areas within the designated areas in the action plan or for areas put out in tenders, cost

[10] *Bekendtgørelse nr. 151 af 10/03/2003 om nettilslutning af vindmøller og pristillæg for vindmølleproduceret elektricitet m.m.*

for grid connection from the wind turbine electricity collection point to the local transmission grid must be paid by local grid operator. For all other areas these cost must be paid by the turbine owner themselves. This law has proven to be an effective instrument.

2.4.1 New offshore wind farm concessions and tendering procedures

The framework for the procedures for offshore wind development has been changed recently in order to create a more competitive system, based on tendering. As part of these considerations the Government has decided to exempt the utilities from the order to establish the last 3 demonstrational offshore wind farms. Instead, the preparations for the procedure to be used to invite tenders for establishment of the plants on market conditions were commenced.

According to the recent energy policy agreement, two new offshore wind farms, each of 200 MW, have been planned. The procedures of the first offshore wind farm concession were carried out during the summer 2004, in view of a new offshore wind farm at Horns Rev II (9) in the North Sea. The tender round for subcontractors will be issued in 2007. The second tender procedure is currently taking place with regards to a new offshore wind farm at Rødsand (10), south of Lolland in the Baltic Sea (DEA 2004c).

2.4.2 Pre-exploitation phase

The establishment of offshore wind farms requires a permit as well as a license for the operation phase. The twofold approval process includes permission for preliminary surveys and later a final approval of projects – a building permit. Both of these permissions depend upon a process of public hearing in order to take account of the different interests. In relation to the latter, the applicant must carry out an EIA (Shaw et al. 2002).

2.4.3 The exploitation and decommissioning phase

During the exploitation, regulatory and procedural requirements consist mainly in providing information to the authority supervising the project (the supervision authorities are pointed out in the approval from the DEA) regarding the fulfilment of requirements related to the conditions under which the original permission for the offshore development was agreed. In this respect, developers are typically required to conduct monitoring activities and provide regular reports concerning offshore and onshore construction, and environmental impact.

As is the case with the exploitation phase, the procedural requirements related to decommissioning concern primarily the fulfilment of agreed conditions under the granting of the original consents, such as demolition and removal procedures, environmental impact and rehabilitation, safety etc. A summary of the legislative aspects of relevance in offshore wind farms development, and the relevant competent authorities, is provided in appendix 2.1.

2.5 Economic conditions for offshore wind exploitation

The costs of grid connection are split between the grid operator and the wind turbine owner. As regards offshore wind turbines located on sites that are specified in the former government's scheme *Havmoelle-handlingsplan for Danske farvande* the costs for an offshore grid junction point are paid by the grid operator. The internal grid of the wind farm is paid by the owner of the turbines. There are two grid operators in Denmark (Eltra and Elkraft): both private companies. In a few months the two companies will be combined into one state-owned company - Energinet.dk. However, smaller grids (under 150 kV) will still be operated by private organizations.

In 1999, a majority in the Danish Parliament decided to convert the state subsidy schemes for electricity production by renewable energy to a market based system for tradable green certificates with an obligation starting in 2001. A lot of discussion and confusion has appeared in relation to the Danish green certificate system (WWG 2004)[11].

The subsidies for offshore wind turbines are rather complicated. Subsidies depend on when the turbine is connected to the grid and its age. The Transmission System Operator (TSO) is

[11] The state of affairs of this discussion is unknown for now.

responsible for the sale of the electricity production on the spot market for wind turbines connected to the grid prior to 2003. For turbines connected to the grid in 2003 and onwards, the plant owner is responsible for the sale. Several fixed premiums and tariffs apply, depending on the moment a specific farm was brought into use (DEA 2005b).

2.6 Public debate

The national authorities have played a crucial role throughout the development of wind power with the initiation of spatial planning and setting other framework conditions. The government has also played a key role throughout the development of new concepts, such as offshore installations (Olesen 2002). For further information on the government see section 2.2.

2.6.1 Interest groups

The main organisations involved in support of wind power are:

- *Danmarks Windmoelleforening* (Danish Wind turbine Associations) that is organizing owners of wind turbines.
- *Organisation for Vedvarende Energi* (Danish Organisation for Renewable Energy) that is a membership organization for people interested in the promotion of renewable energy and other green solutions
- Danish Wind Power Industries, organising wind turbine manufacturers.
- Offshore Center Denmark supports the development of offshore wind power by benefiting from the experiences of the offshore oil and gas industry.

In addition, the environmental organisations generally support development of wind power, since it is an effective mean of reducing greenhouse gas emissions. Most supportive are WWF, Greenpeace and Danish ECO-Council, but also the *Danmarks Naturfredningsforenings* (Danish Association for Nature Protection) is generally in favour of wind power, though, some of its local groups have been opposing individual projects (Olesen 2002).

2.6.2 Organisations in opposition towards wind power

The Danish Association of wind turbine neighbours is opposing wind power development throughout the country, and even though most of its protests are unsuccessful, it has gained momentum the last few years.

Previously power companies lobbied against wind power, but the opposition has decreased significantly and they are now increasingly lobbying for their own involvement in the wind projects. *Dansk Industri* (The Danish industry association) is lobbying against wind power because of the costs involved for electricity consumers, and is advocating reduced development rather than a change from consumer payments to electricity tax reductions.

Finally the Danish Ornithological Society is critical towards parts of the offshore wind farms because it finds that there is substantial scientific uncertainty about the adverse impacts on birdlife, in particular migrating birds (Olesen 2002).

2.7 Considerations

With the action plan *Energi 21* from 1997, the government has emphasised the importance of wind energy compared to the importance of conventional energies and furthermore, the government did come up with substantial indicative targets for offshore wind energy. Between 1992 and 1995 a mapping project (SEA) was carried out in order to identify possible locations for offshore wind farms. This was followed by the appointment of the committee in 1996 with the aim to assess the technical and economical feasibility for development of large-scale offshore wind farms.

An assessment by the committee of the impact of offshore wind farms on coastal landscapes recommended that offshore wind farms should be concentrated in relatively few areas, placed at a

given distance from the coast. Though, the prospective offshore wind farms should be situated within the Territorial Sea in order to limit technical costs. A number of different authorities administer regulation concerning the sea territory, however, according to the existing framework they are all linked through the Danish Energy Authority. This illustrates the Danish regulation is aiming at 'one-stop shopping' – the developers must only request permits for offshore wind energy exploitation at the Danish Energy Authority.

Several offshore wind farms are already in operation, including two large-scale offshore wind farms. Particular Middelgrunden Offshore Wind Farm at Copenhagen became subject to a long and intensive hearing phase after it faced preliminary opposition from local various stakeholders. As such, it is today considered as a Danish example of how extensive dialogues can generate widespread understanding for- and social acceptance of the development of an offshore wind farm. Mostly, concerns by local stakeholders in relation to the development of the offshore wind farms considered visual impacts, noise and adverse impacts on areas designated in accordance to the Birds and Habitats Directives.

2.8 References

DEA (2005a) *Energistrategi 2025* (Energy Strategy 2025), Danish Energy Authority

DEA (2005b) *Energistyrelsen (Description of subsidies for wind turbines)*, http://www.energistyrelsen.dk/sw23781.asp, last visited 12th August 2005

DEA (2004a) *The Danish Energy Authority*, http://www.ens.dk/sw1108.asp, last visited 7th December 2004

DEA (2004b) *The Danish Energy Authority*, http://www.ens.dk/sw1107.asp, last visited 7th December 2004

DEA (2004c) *The Danish Energy Authority*, http://www.ens.dk/sw10858.asp, last visited 7th December 2004

Energy 2000 (2000) *Danish Energy Action Plan*, approved by Parliament in 2000

Energy 21 (1996) *Danish Energy Action Plan*, approved by Parliament in 1996

Krohn, S. (2002a) *Wind Energy Policy in Denmark Status 2002*, Danish Wind Industry Association

Krohn, S. (2002b) *Wind Energy Policy in Denmark: '25 years of Success – What Now?*, Danish Wind Industry Association

Offshore Center Denmark (2005) *Offshore vindmølleparker*, http://www.offshorecenter.dk/ddunderside.asp?h_id=11&u_id=41, last visited 12th June 2005

Olesen, G. (2002) *Guidelines for spatial planning of wind turbines*, Danish Organisation for Renewable Energy, Predac Project

Petersen, H. en F. Neumann (2003) *National planning procedures for offshore wind energy in the EU*, workshop report, 5th June 2003, IMI, Brussel

Shaw, S. M. Cremers and G. Palmers (2002) *Enabling offshore wind developments*, 3E and EWEA, Brussels

Utilities and Energy Agency (1997) *Havmølle-handlingsplan for de Danske farvande - the Offshore Wind turbine Action Plan for Danish Waters*, Elselskabernes og Energistyrelsens Arbejdsgruppe for Havmøller - Committee for offshore wind turbines by the utilities and the Energy Agency, June 1997

WWG (2004) *World Wide Green*, http://www.worldwidegreen.com/europe.htm, last visited 9th December 2004

Appendix 2.1 Legislation for Danish offshore wind farms

The Danish planning regime for offshore wind turbines includes a number of laws and statuary orders. The most important legislation currently in force is noted in table 2.4.

Table 2.4. Legislative aspects relating to offshore wind development in Denmark (Shaw et al. 2002).

	Identification of the regulatory act (in Danish)	**Translation of the subject**	**Authority**
1a	Lov om afgrænsning af søterritoriet Lov 1999:2000 (7th April)	Act on the delimitation of the territorial sea	Ministry of Foreign Affairs. With respect to electricity production plants, the authority is delegated to the Energy Authority
1b	Bekendtgørelse om afgrænsning af Danmarks søterritorium BEK 1999:242 (21st of April)	Government order on the delimitation of the Danish Territorial Sea (co-ordinates)	Ministry of Foreign Affairs
2a	Lov om eksklusive økonomiske zoner Lov 1999:411 (22nd of May)	Act on exclusive economic zones	Ministry of Foreign Affairs. With respect to electricity production plants, the authority is delegated to the Energy Authority
2b	Bekendtgørelse om Danmarks om eksklusive økonomiske zone BEK 1996:584 (24th of June)	Government order on the delimitation of the Danish Exclusive Economic Zone (co-ordinates)	Ministry of Foreign Affairs
3	Lov om kontinentalsoklen Lov 1979:182 (1st of May)	Act on the continental shelf	Ministry of Environment/Ministry of Economic and Business Affairs
4	Lov om beskyttelse af havmiljøet Lov 1993:476 (30th of June)	Act on protection of the maritime environment	Ministry of Environment Danish Forest and Nature Agency
5	Lov om naturbeskyttelse Lov 2002:85 (4th of February)	Act on Protection of Nature	Ministry of Environment Danish Forest and Nature Agency
6	Lov om råstoffer Lov 1997:569 (30th of June)	Act on Raw Materials	Ministry of Environment Danish Forest and Nature Agency
7	Lov om miljøbeskyttelse Lov 2001:753 (25th of August)	Act on Environmental Protection	Ministry of Environment Danish Environmental Protection Agency
8	Lov om elforsyning Lov 2001:767 (28th of August)	Act on Electricity supply	Ministry of Economic and Business Affairs Danish Energy Authority
9	Bekendtgørelse om vurdering af virkninger paa miljøet (VVM) af el-produktionsanlæg på havet BEK 2000:815 (28th of August)	Government order on the Assessment of Environmental Impact from electricity production plants on the Sea	Ministry of Economic and Business Affairs Danish Energy Authority

10	Bekendtgørelse om støj fra vindmøller BEK nr. 1999:304 (14th of May)	Government order on noise from wind turbines (relevant in coastal areas)	Ministry of Environment Danish Environmental Protection Agency
11	Lov om fiskeri Lov 1999:281 (12th of May)	Act on fishery	Ministry of Food, Agriculture and Fisheries
12	Vejledning om udlægning af telekabler og visse rørledninger på søterritoriet Vejledning 2001:163 (17th of September)	Guidelines on cable laying on the Sea Territory	Ministry of Economic and Business Affairs Danish Energy Authority (cables for electricity Production Plants)
13	Bekendtgørelse om afgrænsning og administration af internationale naturbeskyttelsesområder BEK 1998:782 (1st of January)	Government order on the delimitation and administration of international nature preservation areas	Ministry of Environment Danish Forest and Nature Agency
14	Lov om sikkerhed til søs Lov 2000: 554 (21st of June)	Security for sea transportation	Ministry of Economic and Business Affairs Danish Maritime Authority
15	Bekendtgørelse om beskyttelse af søkabler og undersøiske rørledninger BEK 1992:939 (27th of November) 1992	Protection zones for cables or pipelines (200 m)	Ministry of Economic and Business Affairs Danish Maritime Authority
16	Bekendtgørelse nr. 151 af 10/03/2003 om nettilslutning af vindmøller og pristillæg for vindmølleproduceret elektricitet m.m.	Rules for grid connection and financial regulations of offshore wind farms	Ministry of Economic and Business Affairs

Chapter 3

Offshore Wind Farm Planning in Germany[1]

3.1 Background

Governmental energy policy has set fairly high targets in Germany. Besides the use of new, durable energy resources, the rehabilitation of coal power plant in former East-Germany enables Germany to set these high targets. At this moment, renewable energy sources already account for emission savings of 53 million tons of CO_2 in Germany alone.

3.2 German wind energy policy

By the end of 2004, renewable energy sources accounted for roughly 3,6% of total energy generated in Germany. The share of renewable energy sources in total electricity consumption was 9,3%. It is the Federal Government's goal to double the share of renewable energy sources in energy supply by the year 2010. The target for the share in primary energy consumption is 4,2%, and for the share in gross electricity consumption 12,5%. The Federal Government has established increasing the share of renewable energy sources in power provision to at least 20% by 2020 as a medium-term target. In the long-term, i.e. by the middle of the century, the aim is to cover at least half of the total energy demand from renewable energy sources (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety 2005).

In the end of 2004, approximately 16.543 wind power installations with a total output of approximately 16,6 GW were installed in Germany. With a share of 44% of total power generation from renewable energy sources, wind power is now the most important renewable energy source, leaving traditional hydropower far behind. Furthermore, the industry manufacturing wind turbines currently employs more than 50.000 people, while the renewable energy sector as a whole provides a total of 120.000 jobs.

[1] The original chapter was compiled by Susanne Adam (ICBM) and Hans-Joachim Stietzel (SBUV), 29th January 2005. It has been revised by Susanne Adam (ICBM) and Hans-Joachim Stietzel (SBUV), 22th June 2005.

Since suitable sites for land-based wind power plants are growing more and more scarce, the industry has now begun to tap the great potential of the sea. Offshore wind farms are to help minimise pressure on landscapes and the environment. If these wind farms only produced an output of 20.000 to 25.000 megawatts by the year 2025 or 2030 - an assumption the Federal Government considers realistic -, 15% of current German electricity demand could be met using offshore wind power installations.

3.2.1 Spatial planning in the North Sea

Spatial planning competencies in Germany are distributed among several government bodies (Federal level, *Länder*, *Bezirksregierungen*, *Kreise*, and *Gemeinden*), in a rather decentralised structure. Concerning planning at sea, four *Länder* are concerned, i.e. Niedersachsen, Bremen, Mecklenburg-Vorpommern and Schleswig-Holstein.

Within the 12 nautical miles zone, the *Länder* are the competent authorities and permits must be obtained from the concerned *Land* or *Bezirksregierung*. Permits are necessary for the erection and operation of wind farms as well as for grid connection and cable routing, and provide major complications in practise. From a decision-making perspective, the main impediments for effective offshore planning in this zone are the uncoordinated and fragmented regional planning programmes in these *Länder* (Bulthuis et al. 2004). More seaward, the Exclusive Economic Zone (EEZ) covers the rest of the continental shelf. The continental shelf area covers the seabed and sub-soil seaward of the territorial sea extending maximally 200 nm from the coast. An integrated planning approach in the EEZ is being complicated, since competencies are distributed over a number of sector-based authorities (*Fachverwaltungen*).

Under the *Seeanlagenverordnung* (*SeeAnlV* - Marine Facilities Ordinance), the BSH (*Bundesamt für Seeschifffahrt und Hydrographie*, Federal Maritime and Hydrographic Agency) grants approvals for the erection, operation, and use of facilities (structures, artificial islands) in the EEZ, of which the production of energy from water, wind, and currents or other commercial uses, (e.g. the operation of sales facilities or recreational uses) are the main purposes. If a wind farms is once approved by the BSH, the Water and Shipping Directorate has to approve the given permit; in other words, the Water and Shipping Directorate has the judicial authority to veto. The Marine Facilities Ordinance has been changed and adapted several times in the last decades, illustrating the ongoing process of keeping up with new offshore developments.

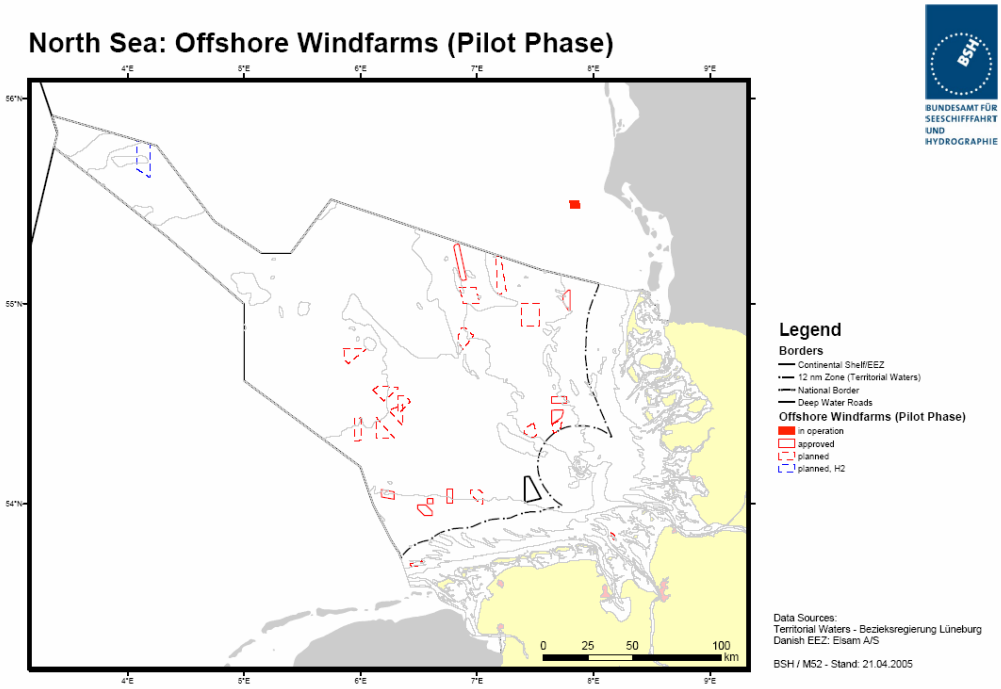
3.3 Current projects

The future wind power potential is estimated as 20-25 GW by 2030 (BMU et al. 2002). Since 1997, planning for several major projects in the EEZ has been under way. Up to now[2], 32 project applications (North Sea 27, Baltic Sea 5) have been received; some of them comprise several hundred wind turbines. In some cases, the applications cover small-scale pilot projects, which are to allow an assessment of environmental impacts, which have not been conclusively researched up to now. The development of offshore wind farms is the sole task of private parties; the German government's role is restricted to financing general research and guaranteeing the electricity price.

As map 3.1 shows, nearly all German projects are planned for areas that are clearly farther than 30 kilometres from the coast and in waters between 20 to 35 meters deep. On the one hand, this is a consequence of the heavy use of German coastal waters for shipping, as a military exercise region for the navy and the air force, and for fisheries and mining for excavation. On the other hand, nature conservation in North Sea and Baltic coastal areas is very important, as the Wadden Sea national park illustrates. Beyond that, most planners voluntarily keep to a minimum distance of 30 kilometres from the shore. Wind farms will then hardly be visible from land or from German islands.

It is planned that routing of nearly all electricity cables from offshore wind farms goes via Norderney to the mainland. But at this time only the project Borkum West has the authorisation to use this route. How far other projects will use the same route or will or run the cable nearby is still under discussion.

[2] January 2005.



Map 3.1. Planned German offshore wind farms in the North Sea, April 2005 (BSH 2005).

3.3.1 Borkum West

On 9 November 2001, the BSH granted the first consent for installation of an offshore wind farm. In the initial pilot phase, the energy company Prokon Nord has been allowed to install 12 wind turbines in the North Sea, 45 kilometres northwest of the island of Borkum, at a water depth of about 30 metres. Nevertheless, the building process has not started yet. This is primarily a consequence of technical and administrative factors. In the summer 2005 Prokon was authorised to lay the undersea cable via the 12 nautical mile zone under dike, water and nature protection laws. Therewith, they received all necessary permits as first German offshore wind power pilot project. The first phase of the Borkum wind farm is a pilot project. The construction of the twelve 5 megawatt wind turbines has not been started yet and until now, it is not clear, when this pilot phase, after being finally in operation, will be completed to the originally planned big project with about 200 turbines.

3.3.2 Other projects

Within the 12 nm zone adjacent to the Wadden Sea Area, two areas in Lower Saxony were appointed as pilot areas (Riffgat and Nordergründe) for which applications have been made. Outside the 12 nm zone on sites in the German North Sea EEZ, 27 planned wind farms are currently in application progresses in all kinds of planning stages. From these projects, building licenses were issued to:

- Borkum West (45 km north of Borkum, 12 turbines) in November 2001,
- Borkum Riffgrund West (50 km northwest of Borkum, 80 turbines) in February 2004,
- Borkum Riffgrund (34 km north of Juist, 77 turbines) in February 2004,
- Butendiek (34 km west of Sylt, 80 turbines) in December 2002,
- Amrumbank West (36 km south-west of Amrum, 80 turbines) in June 2004,
- Nordsee Ost (Amrumbank) (30 km north-west of Helgoland, 80 turbines) in June 2004,

- Sandbank 24 (90 km west of Sylt, 80 turbines) in August 2004,
- North Sea Wind Power (39 north of Juist, 48 turbines) in February 2005.

For these wind farms, capacities have been set for both the pilot and the end phase. In pilot phase, these wind farms would have a total capacity of 2,2 GW. Regarding the end phase, offshore wind farms with a capacity of 1 GW each are foreseen in German policy. An overview of the locations of existing and planned offshore wind farms is provided in map 3.1 and appendix 3.1.

3.4 The Renewable Energy Sources Act (EEG)

The Renewable Energy Sources Act (EEG) of 21st July 2004 requires grid system operators to ensure priority purchase of electricity produced from renewable energy sources and pay fixed rates for the amounts purchased. The entry into force of the first version of the EEG in 2000 triggered a boom in installations of new plants. In 2004, the EEG alone accounted for savings in CO_2 emissions worth 23 million tonnes. This makes the EEG a successful and indeed exemplary instrument at international level. Turnover of all branches of renewable energies now amounts to around € 10 billion. Renewable energies avoid around 70 million tonnes CO_2 emissions per year in Germany. The EEG is the main instrument in order to execute energy related policies.

3.4.1 Amending the EEG: Key provisions of the new EEG

On 17th December 2003, following a proposal by Environment Minister Jürgen Trittin, the Cabinet presented a Government Draft for a comprehensive amendment to the Renewable Energy Sources Act (EEG). After debating and modifying this Bill, the *Bundestag* adopted the Amended Act after its third reading on 2nd April 2004. On 14th May 2004 the *Bundesrat* convened a Mediation Committee, which on 17th June 2004 agreed on a text subsequently endorsed by the *Bundestag* on 18th June 2004. The *Bundesrat* thereupon refrained from raising objections to the Act as modified during the mediation procedure. The new EEG of 21st July 2004 was published in the Federal Gazette on 31st July 2004 and thus entered into force on 1st August 2004.

The objective of the Renewable Energy Sources Act is to increase the share of total power supply, which is derived from renewables to at least 12,5% by 2010 and at least 20% by 2020. To make this possible, the overall framework for feeding in, transmitting and distributing electricity from renewable energy sources will be considerably improved. This will maintain planning and investment security for manufacturers, plant operators, investors and banks. Drawing on positive experience with the EEG in its previous version, the renewable basis for producing power can now be expanded with even greater efficiency.

In its amended form, the EEG will also implement the European Union Directive on the promotion of electricity from renewable energy sources of September 2001. To this end, all renewable energy sources have been incorporated into its scope. Payments will, however, continue to be governed in full by the existing principle of exclusive use. This means that, as in the past, fees can only be paid under the Renewable Energy Sources Act if the electricity concerned has been produced exclusively at plant for converting renewable energy sources. Power derived from, for example, co-incinerating the biodegradable fraction of waste will thus be covered by EEG provisions on obligatory purchase and transmission, but it will still not be eligible for EEG payments.

The amended EEG has incorporated two preliminary Acts, which had come into force on 22nd July 2003 and 1st January 2004. These are the key changes and innovations that distinguish the amended Renewable Energy Sources Act valid from 1st August 2004 from the previous statute:

Purpose of the Act (§ 1):

The objective of doubling the share of renewable energies in the power base from 2000 to 2010, already enshrined in the previous Act, is laid out in specific terms. By 2010 renewable energy is to contribute at least 12,5% to the generation of electricity. The mid-term goal for 2020 is defined as at least 20%. This offers stakeholders a clear framework for the expansion of renewable energies. Further objectives are: to permit the sustainable development of energy provision in the interests of climate, nature and environment protection, to reduce the macroeconomic costs of energy provision by reflecting long-term external effects, to protect nature and the environment, to contribute towards

preventing conflicts over fossil energy resources and to promote the ongoing development of technologies to derive power from renewable energies.

Priority principle (§ 2):

The EEG regulates public grid connection for plant generating power from renewable energies and mine gas on the territory of the Federal Republic of Germany, including its Exclusive Economic Zone (EEZ). It provides for the priority purchase and transmission of, and payment for, such electricity by grid system operators and for a nationwide equalisation scheme covering this purchase and payment. It is clear from the duty to connect such installations without delay and as a priority that the connection of plant deriving power from renewable energy sources also has priority over the connection of conventional power plants. Pursuant to the new EEG, payment is also to be made for power from installations in which there is a public stake (either at federal or state level) of 25% or more.

Payments for power from on-shore wind farms (§ 10 (1 & 2))

Power from wind conversion will also be subject to payment for 20 years. Within that period two different rates will be applied. Plant commissioned after the new Act comes into force in 2004 will qualify over a minimum of five years for an initial payment of 8,7 eurocents/kWh followed by a base payment of 5,5 eurocents/kWh. To reflect developments in this wind technology, the initial rate has been lowered by 0,1 eurocents and the base rate by 0,5 eurocents/kWh compared with the previous legislation. The noticeable fall in the base rate will above all affect very productive coastal sites and is designed to stem potentially excessive incentives for these installations.

The period for which the initial payment applies may be extended, depending on local wind conditions. At average sites, the higher initial rate might, for example, apply for 12 years and the lower base rate for the remaining 8 years, together making up the maximum 20 years. The specific breakdown into initial and base rate is determined by the reference yield for the plant in question.

Plants that are unable, according to a prior expert opinion, to achieve at least 60% of the reference yield at the planned site will not be eligible for payment. This will quash any economic incentive to install wind turbines on sites with poor wind conditions. It is all the more important for onshore wind farming to tap the as yet unexploited potential for conversion at locations with eminently suitable wind conditions.

Coastal areas in particular are offered incentives for repowering, i.e. the substitution of older, smaller installations by state-of-the-art, high-output turbines. For new plant, the annual rate of decrease has risen from 1,5% to 2% to encourage optimum use of the predicted potential for cost reduction. Technological advances in wind conversion over recent years give grounds to assume that wind farming will continue to expand in spite of lower rates of payment.

Table 3.1. Electricity rates, as determined in the EEG.

Onshore wind farms	Art. 10(1)	8,7 ct/kWh (initial rate) 5,5 ct/kWh (final rate)	20 years	The higher rate is granted for 5 to 20 years, depending on reference yield.
Offshore wind farms	Art. 10(3)	9,10 ct/kWh (initial rate) 6,19 ct/kWh (final rate)	20 years	The higher rate is paid for plant commissioned before 2011. It is granted for 12 to 20 years, depending on site.

Payments for power from off-shore wind energy (§ 10 (3) (BMU 2004))

The objective is a rapid development of offshore wind conversion. Power from offshore wind farms will be eligible for an initial rate of 9,1 eurocents/kWh if the plant is commissioned by 2010 (previously 2006). Wind farms are classified as offshore if they are constructed at least three nautical miles off the shoreline. The initial rate will be paid for 12 years. This period will be extended for installations built at a greater distance from the shoreline and at greater depths: for every

additional nautical mile beyond 12 nautical miles the period will be extended by 0,5 month and for every additional metre of depth by 1,7 months. The base rate, which follows the initial rate, is 6,19 eurocents/kWh. Power from offshore wind farms whose construction is licensed after 1 January 2005 in the EEZ or in coastal waters is only eligible for payment if the plant is built outside nature conservation or bird protection areas. This will ensure that no incentive is provided for incursions into these protected zones. The rate for offshore plant will not be subject to annual decrease until 2008. Table 3.1 summarises the above-stated.

3.5 Decision-making processes and competencies

The approval procedure is carried out taking into account German mining law regulations, concerning the exploration and exploitation of resources, as well as vessel traffic routing in the area of the German territorial sea and Exclusive Economic Zone. Moreover, also the interests of the German navy, fisheries, environmental protection, and those of the operators of submarine cables (e.g. telecommunication cables) and pipelines have to be taken into account. The plans are laid open for public inspection, which is a mandatory part of the approval process enabling citizens to make proposals and involving also the local, especially municipal, level.

According to the Marine Facilities Ordinance, an Environmental Impact Assessment is mandatory. Standards for EIA of Offshore Wind Turbines have been issued by the BSH in February 2003. Within the framework of the approval procedure for offshore wind farms in the EEZ, potential adverse impacts of the projected facilities on the marine environment have to be assessed. In the Standards for EIA, information is provided to applicants on the scope of investigations required by the approval authority, with all relevant details and explanations. The Standards for EIA constitute a framework of the thematic and technical minimum requirements for marine environmental surveys and monitoring in order to assess compliance with *Art. 3. Seeanlagenverordnung*.

3.5.1 Environmental Impact Assessment

The first update on the Standards for Environmental Impact Assessments is based on experience that has been gained with the version of 20th December 2001. Apart from the general increase in knowledge, experience from the German Marine Monitoring programme in the North Sea and Baltic Sea, the Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area, and the OSPAR Convention for the Protection of the North Sea and North-East Atlantic has been taken into account as well.

It should be noted that the Standards for Environmental Impact Assessments have been developed in consultation with numerous experts. The fact that various concepts discussed in the course of the decision-making process have not been considered in the Standards for Environmental Impact Assessments does not imply any criticism of such concepts. The approval authority, after having consulted the experts and studied the different concepts, in each case selected one of several possible solutions and also allowed alternatives considered suitable for the procedure.

The first stage is of the application procedure consists of a presentation of a literature study characterising the planning area and the proposal of an investigation programme accordance to the Standards for Environmental Impact Assessments. The actual EIA can be divided in three phases: a baseline survey, monitoring of the construction phase and monitoring of the operation phase.

Environmental Impact Assessment - baseline survey: a) preliminary studies

Characterisation of the planning area in order to determine the project area, monitoring programme, and reference areas for the environmental features to be protected

Environmental Impact Assessment - baseline survey: b) status assessment

Investigations prior to the start of construction to characterise the environmental features of the project and reference areas, particularly with a view to species and their seasonal dynamics

Environmental Impact Assessment - monitoring of construction phase

Investigations in the project and reference areas to assess impacts of the construction phase on the marine environment

Environmental Impact Assessment - monitoring of operation phase

Investigations in the project and reference areas to assess impacts of the operational phase on the marine environment

Alongside the application procedure, the *Träger öffentlicher Belange* (TÖB) are to be consulted. The next section pays attention to these TÖB and to the public debate in general.

3.6 Public debate

The majority of German population considers the modern wind technology as exceedingly positive. Surveys showed that the public wishes a more intensive utilisation of renewable energies. This applies to holiday areas with a high density of wind turbines as well as nationwide. An “Emnid” survey in March 2002 showed the following results: 92% of the interviewees would appreciate an increasing utilisation of wind energy. 86% Felt that the wind energy should have a greater stake in future energy production. Also the building of offshore wind farms is favoured by the big majority of 88,3%. The economic potential is assessed as positive with 73,9% (Bundesverband Windergie e.V. 1998).

3.7 Stakeholder groups

Despite the positive results in the above mentioned public survey, offshore wind energy is strongly discussed by the directly affected public and stakeholder groups. The debate is predominantly governed by emotional arguments as well as by disinformation and insecurity. Many stakeholders especially the fishery associations, the tourism sector and residents feel threatened in their existence. Mainly there are reserves against near shore wind farms (near shore is within the 12 nautical miles zone within the German Bight). The main arguments are the visibility of wind farms as well as the risk of ship averages within wind farms and the associated potential pollution of coastal areas. Moreover, offshore wind farms which are planned near or within nature protected areas or bird sanctuaries are widely criticised by nature conservation organisations (see below). There existing also isolated opinions like “We don’t want to come to agreements; we do not want offshore wind mills at all” (statement of an isle resident during a meeting regarding the planned offshore wind farm Butendiek offshore Sylt).

In general it can be said that most conflicts arises from nearly all stakeholders focussing in the first instance on the protection of their own interests. A positive attitude can only be observed in the sector of mussel fishery in Schleswig-Holstein. They expect synergy effects from coupling structures for mari-culture with offshore wind mills.

3.7.1 Environmental organisations[3]

All major nature and environmental conservation organisations emphasise the ecological advantages of offshore wind energy in respect to combat the climate change. BUND, NABU, WWF, Greenpeace and Robin Wood plead for a further and environmental compatible expansion of wind power and other renewable energies. Also the National Farmers' Union, labour unions and churches support the wind power utilisation. In doing so it is strongly asked for harmonised proceedings regarding landscape and environmental conservation in order to meet all facets of environmental protection and sustainable development. The organisations worked out different statements in which they listed all conditions to be fulfilled for an expansion of offshore wind energy. The statements are summarized and equalised in the “Position paper of the German environmental protection organisations regarding offshore wind energy assets”. Special attention is paid to:

- *national and international protected areas* - wind farm shall not be allowed in these areas,

[3] This information is derived from Ihnd Vauk-Hentzelt (Hrsg.) (1999), NABU (1999), BUND (1998; 2001) Greenpeace (2002).

- *risks resulting from ship collisions in wind farm*s - the risk should be minimised by wide measures including positioning of a further tug, adapting combat material and adjusted construction of wind farms,
- *grid connection* - as many as possible wind farms should connected with one cable to land,
- *bird protection* - there existing many insecurities regarding disturbance and banishment of marine birds, thus an ecological corollary research should be carried out.

3.7.2 Business interest groups

The federal associations for wind energy (e. g. Federal Association Wind Energy e. V., Federal Association Renewable Energies (BEE) e. V., German Association of Machinery and Plant-Building (VDMA) e. V., Development Fund Wind Energy e. V. Kiel, German Wind Energy Institute DEWI) support in general offshore wind energy. They see a great chance in the offshore development to back out of the nuclear energy program and to reduce the CO_2 - emission. Offshore wind energy is regarded further as particularly suitable for positive effects on the labour market and within the regional policy, as new jobs will be provided resulting from the building and operation of devices. Moreover they underline the industry's political chance to expand German's leading position on the world market due to the know-how obtained by a successful implementation of offshore techniques. The predominant part of the associations for wind energy considering the open discussed possible problems regarding the marine environment (ship safety, birds, fish, marine mammals, etc.) as well as public objections (residents, tourism) and competing utilisations (fishery, military, shipping) as resolvable. Nevertheless pilot projects with reduced number of power plants are considered as necessary to gain experience not only on areas of engineering but also on ship safety and aspects of nature protection (DEWI 2001).

3.8 Overview of stakeholders

Within the Exclusive Economic Zone the Federal Maritime and Hydrographic Agency in Hamburg is one of the major parties, as it consents offshore activities, e.g. wind farms, pipelines, submarine cables. When a wind farms is once consents by the BSH, the Water and Shipping Directorate – WSD (*Wasser - und Schifffahrtsdirektion*) has to approve the given permit; in other words has the judicial authority to veto. Hereby the WSD North is responsible for the Baltic Sea and the eastern North Sea and WSD North-West for the north-westerly part of the North Sea.

Within the 12 nautical miles zone, the *Länder* (Mecklemburg-Vorpommern, Schleswig-Holstein, Bremen, Niedersachsen) are the competent authorities and permits must be obtained from the concerned *Land* or *Bezirksregierung*. Permits are necessary for several issues from the erection and operation of wind farms to grid connection and cable routing. The planning procedure within this zone comprises such a lot of different federal bodies, which are competent for different consents that a statement of these holdings would go beyond the scope of this document.

3.8.1 Strategic stakeholders (non-statutory consultees)

Besides this governmental body in both cases, statutory consultees have do be involved in the planning process. This group can be defined as people who represent organisations, whether at a national, regional or local level whose support of or opposition to a development would be significant, or who have particular information or expertise to offer. All these stakeholders are informed by the BSH in the course of a planning procedure for an offshore wind farm project:

Shipping/ Ship Safety

- ConocoPhillips Skandinavia A/S
- Bundesministerium für Verkehr, Bau- und Wohnungswesen
- Deutsche Gesellschaft zur Rettung Schiffbrüchiger
- Deutscher Nautischer Verein e.V.

- Deutscher Motoryachtverband e.V.
- Deutscher Segler - Verband
- Havariekommando
- Verband Deutscher Reeder
- Wasser - und Schifffahrtsdirektion Nord
- Wasser- und Schifffahrtsdirektion Nordwest

Nature Protection

- Aktionskonferenz Nordsee e.V
- Bundesamt für Naturschutz (BFN)
- Bundesamt für Naturschutz (BfN) - Außenstelle Leipzig
- Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit
- Bund für Umwelt und Naturschutz Deutschland (BUND)
- Danish Forest and Nature Agency Ministry of the Environment
- Internationaler Tierschutz-Fonds (IFAW)
- Inter-Regional Wadden Sea Cooperation
- Landesnaturschutzverband Schleswig - Holstein e.V.
- Landesverband S - H e.V.
- Nationalparkamt SH Wattenmeer
- Naturschutzbund Deutschland e.V.
- Naturschutzbund Deutschland (NABU)
- Naturschutzgesellschaft - Schutzstation Wattenmeer
- Niedersächsisches Umweltministerium
- Schutzgemeinschaft Deutsche Nordseeküste
- Umweltbundesamt (UBA)
- Umweltstiftung WWF-Deutschland
- Verein Jordsand Haus der Natur
- WWF Deutschland - Projektbüro Wattenmeer

Fishery

- Amt für ländliche Räume - Abteilung Fischerei
- Bundesforschungsanstalt für Fischerei
- Deutscher Fischerei - Verband e.V.
- Landesfischereiverband Weser-Ems

- Landesvereinigung der Erzeugerorganisation für Nordseekrabben und Küstenfischer
- Staatliches Fischereiamt

Military

- Amt für Geoinformationswesen der Bundeswehr
- Marineamt MIL GeoZentrum Marine
- Wehrbereichsverwaltung Nord

Health and Safety

- Landesamt für Gesundheit und Arbeitssicherheit Kiel
- Ministerium für Soziales und Verbraucherschutz

Mining

- BSK Baustoffe und Seekies GmbH
- Landesbergamt Clausthal - Zellerfeld
- OAM-DEME Mineralien GmbH

Administrative Districts

- Bezirksregierung Weser-Ems
- Gemeindeverwaltung Baltrum
- Gemeindeverwaltung Langeoog
- Gemeindeverwaltung Spiekeroog
- Gemeindeverwaltung Wangerooge
- Inselgemeinde Juist
- Landkreis Aurich
- Landkreis Dithmarschen
- Landkreis Leer
- Landkreis Pinneberg
- Landkreis Nordfriesland
- Landkreis Wittmund
- Stadt Borkum
- Stadt Norderney

Sea Cable

- B.V. Nederlands Electriciteit Administratiekantoor
- Deutsche Telekom AG Technikniederlassung - Seekabel

- Gassco A.S
- Norwegian Petroleum Directorate
- RWE DEA AG Hamburg Mineralöl und Chemie
- Statoil A.S

Research&Science

- Alfred - Wegener - Institut (AWI) Bremerhaven

Stakeholder Windenergy

- Bundesverband Wind Energie e.V.
- Fördergesellschaft Windenergie e.V.
- Wirtschaftsverband Windkraftwerke e.V.
- Windenergie-Agentur Bremerhaven / Bremen

Other

- Bundesanstalt für Landwirtschaft und Ernährung
- DFS Deutsche Flugsicherung GmbH
- Innenministerium des Landes Schleswig-Holstein - Abteilung Landesplanung

3.9 Considerations

Germany has shown quite a potential for wind energy. Nevertheless, one of the major complications regarding offshore activities are the fragmented and lengthy licensing procedures. Especially projects within the 12 nautical mile zone are confronted with several federal competencies. Even projects in the EEZ were hindered in their advancement by getting cable permits within the 12 nautical mile zone, that emerged to one of the biggest problems for German offshore development. The combination of regional and state bureaucracy as well as the extensive presence of nature protection zones along the German coastlines has made gaining permits a time consuming process (Knight 2005). At this moment, a committee is elaborating on this, in order to speed up the decision-making process. Another obstacle is the fact that the Federal Maritime and Hydrographic Agency has only been responsible for the evaluation of the suitability of a site on a case by case basis; a comprehensive view on offshore activities could imply a huge amelioration and could be of great value encouraging offshore wind energy developments.

3.10 References

BMU (2004) *Z III 1*, August 2004 8/16

BMU, BMWi, BMVBM, BMVEL and BMVg (2002), *Strategie der Bundesregierung zur Windenergienutzung auf See*, strategic policy document

BSH (2005) *www.bsh.de/en/Marine%20uses/Industry/Wind%20farms/index.jsp*, last visited 25th January 2005

Bulthuis, J., S. Boschman, J. Kloosterman, E. Pijlman and S. Stutterheim (2004) *Windrichting op de Noordzee*, Faculty of Spatial Sciences, University of Groningen

BUND (1998) *Windenergie – BUND Forderungen für einen natur- und umweltverträglichen Ausbau*, Bund für Umwelt und Naturschutz Deutschland, Bonn

BUND (2001) *Position für einen natur- und umweltfreundlichen Ausbau der Windenergie*, Bund für Umwelt und Naturschutz Deutschland, Bonn

Bundesverband Windenergie e.V. (1998) *http://www.wind-energie.de/informationen/informationen.htm*, Institut für praxisorientierte Sozialforschung, im Auftrag des VDEW, Wunschenergien der Deutschen (1998). Emnid-Umfrage: Mehrheit der Bevölkerung für Förderung erneuerbarer Energien, in: Strom Magazin, (09/2002)

DEWI (2001) *Tagungsband zum Kongress Offshore-Windenergienutzung und Umweltschutz, Integration von Klimatschutz, Naturschutz, Meeresschutz und zukunftsfähiger Energieversorgung*, 14th -15th June 2001, Berlin, http://www.dewi.de/

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2005) *Renewable energies*, www.erneuerbare-energien.de

Greenpeace (2002) *Greenpeace Positionspapier zur Nutzung der Windenergie*, Hamburg

Ihde Vauk-Hentzelt (Hrsg.) (1999) *Vogelschutz und Windenergie – Konflikte, Lösungsmöglichkeiten und Visionen*, Osnabrück

Knight, S. (2005) *First permit granted for full cable route*, Windpower Monthly, 2005

NABU (1999) *Auf dem Weg ins Solarzeitalter – NABU Position für eine zukünftige Energieversorgung*, Bonn Petersen, H. en F. Neumann (2003) *Planning procedures for offshore wind energy in the EU*, workshop report, 14th January 2003, IMI, Brussel

Appendix 3.1: Overview of projects in the German North Sea[4]

Table 3.2. Approved projects in the German North Sea.

NO	Developer	Project/ Location	Total MW	Power per Mill [MW]	No. of turbines	Planned Start of construction	water depth [m]
1	Prokon Nord (www.prokonnord.de)	Borkum West	pilot phase: 60, end phase: 1000	5	pilot phase: 12, end phase: 208	pilot phase: 2006, end phase: 2008 - 2012	appro x. 30
2	Bürgerwindpark Butendiek (www.butendiek.de)	Butendiek	240	3	80	2005 - 2007	appro x. 20
3	Plambeck Neue Energie (www.plambeck.de)	Borkum Riffgrund	pilot phase: 230 end phase: ~800	3, 4-5	pilot phase: 77, end phase: 180	2004 (not build yet)	23-29
4	Energiekontor (www.energiekontor.de)	Borkum Riffgrund West	pilot phase: 320 end phase: ~1800	4 - 5	pilot phase: 80, end phase: 458	2004/ 2005 (not build yet)	appro x. 30
5	Amrumbank West GmbH (Rennert Offshore Energieprojekte/ E.on Energy P.) (www.rennert-wind.de)	Amrumbank West	400	5	80	2006	20-25
6	Winkra Energie GmbH (www.winkra.de)	Nordsee Ost (Amrumbank)	pilot phase: ~400 end phase: ~1,000	4 - 5	pilot phase: 80, end phase: 250	2006	appro x. 22
7	Projekt GmbH (www.sandbank24.de)	Sandbank 24	pilot phase: ~400, end phase: ~5,000	pilot phase: 3-5, end phase: 5	pilot phase: 80, end phase: 980	2006	20-35
8	Enova (www.enova.de)	Offshore North Sea Wind Power	pilot phase: 240, end phase: 1250	5	pilot phase: 48, end phase: 250	pilot phase: 2007, end phase: 2011	26 - 34
9e	Enova GmbH[5] (www.enova.de)	12 nm, Dollart, Emder Hafen	4.5	4.5	1	build 2004	3
10	Energiekontor[6] (www.energiekontor.de)	12 nm, Nordergründe	~ 200	2.5 - 5	approval for 25 (planned	2005	appro x. 7

[4] January 2005.
[5] Within the 12 nautical mile zone.
[6] Within the 12 nautical mile zone.

					45)		
11	Winkra Energie GmbH[7] (www.winkra.de)	12 nm, Jade Estuary	4.5	1	1	build 2004	5

Table 3.3 Projects awaiting permits.

NO	**Developer**	**Project/ Location**	**Total Power [MW]**	**Power per Mill [MW]**	**No. of turbines**	**Planned start of construction**	**water depth [m]**
1	Windland (www.meerwind.de)	Meerwind	pilot phase: ~250, end phase: ~1000	3 - 3.6	pilot phase: 75, end phase: 270	2006	22 -32
2	Gesellschaft für Energie und Ökologie – GEO (www.geo-mbh.de)	Dan Tysk	pilot phase: 400, end phase: 1500	3.6 - 5	pilot phase: 80, end phase: 300	?	appro x. 30
3	Gesellschaft für Energie und Ökologie – GEO (www.geo-mbh.de)	Uthland	400	5	80	?	appro x. 25
4	Gesellschaft für Energie und Ökologie – GEO (www.geo-mbh.de)	H2-20	pilot phase: 400, end phase: 4000	5	pilot phase: 80, end phase: 800	~ 2020	30 - 60
6	Enova[8] (www.enova.de)	Offshore Windpark Riffgat	220	5	44	2007 / 2009	16 - 24
7	Prokon Nord (www.prokonnord.de)	Forseti	~ 17,500	5 - 10	1,750	2008 – 2025	20 - 40
8	ABB, GEO and GREP (www.noerdlicher-grund.de)	Nördlicher Grund	pilot phase: 360, end phase: ~2,200	4 - 5, 3.5 - 6	pilot phase: 87, end phase: 402	2006	23 - 40
9	Eos Offshore AG (www.eos-offshore.com)	He dreiht	535	4.5	119	2006/ 2007	appro x. 40
10	Eos Offshore AG	Hochsee Windpark Nordsee 54°25	pilot phase: 535, end phase: 4,720	3 – 5	pilot phase: 119, end phase: 980	?	appro x. 40
11	Butendiek (www.butendiek.de)	Weiße Bank 2010	2,700	5	540	?	?

[7] Within the 12 nautical mile zone.
[8] Within the 12 nautical mile zone.

12	Energiekontor (www.energiekontor.de)	Weiße Bank	pilot phase: 280 - 315, end phase: 595	3.5	pilot phase: 80-90, end phase: 170	2005	approx. 35
13	Plambeck Neue Energie (www.plambeck.de)	Gode Wind	pilot phase: 320, end phase: 896	3 - 5	pilot phase: 80, end phase: 224	?	?
14	Plambeck Neue Energie (www.plambeck.de)	Jules Verne	13,500	4 - 5	~ 3,000	?	?
15	Arcadis Deutschland GmbH (www.arcadis.de)	VENTOTEC Nord 1	pilot phase: 150, end phase: 600	3	pilot phase: 50, end phase: 200	?	?
16	Arcadis Deutschland GmbH (www.arcadis.de)	VENTOTEC Nord 2	pilot phase: 150, end phase: 600	3	pilot phase: 50, end phase: 200	?	?
17	EP4 offshore	TGB North	pilot phase: 1,004.5, end phase: 2.549.5	3.5 – 5	pilot phase: 287, end phase: 596	?	?
18	Nordsee Windpower GmbH & Co KG	Globaltech	pilot phase: 360, end phase: 1,440	4.5	pilot phase: 80, end phase: 320	?	?
19	BARD Engineering GmbH (www.bard-engineering.de)	Bard Offshore I	pilot phase: 400, end phase: 1,600	3 – 5	pilot phase: 80, end phase: 320	2007/2008	39 - 40
20	?	Austerngrund	400	5	80	?	?
21	?	Deutsche Bucht	400	5	80	?	?

Chapter 4

Offshore Wind Farm Planning in The Netherlands[1]

4.1 Background

Over the last decades, Dutch spatial policy has been admired for its consequent attention for environmental issues. The first National Environmental Policy Plan (*Nationaal Milieubeleidsplan*) dates from 1989, and from that time on spatial planning and environmental policy have, by and large, been developed in concord.

Following the Kyoto Protocol (1997) it was agreed that the total emission of greenhouse gasses by the member states of the European Union should be on average 8% lower in the period 2008-2012 than its level of reference. For The Netherlands a 6% reduction in the average emission level in the period 2008-2012 was agreed upon (Ministry of Housing, Spatial Planning and Environment 1999). Furthermore, 5% of the energy used should produced by renewable sources by 2010. For 2020, the objective is 10%, but this ambition is rather flexible and attention is shifting towards energy saving measures (Ten Hoove 2005). The ambition for 2010 is still at 5%, which is much lower than the EU ambition of 12 percent.

4.2 Dutch wind energy policy

The Dutch commitment to reduce the emission of greenhouse gasses has been subsequently elaborated in several policy papers on energy. All methods to generate sustainable energy – among others wind energy - were investigated to arrive at a mixed strategy to meet the Kyoto objectives. Besides the reduction of greenhouse gasses, another reason is mentioned to promote wind energy: to decrease the dependency on fossil resources.

At this moment, wind energy and waste combustion are the main instruments in achieving these objectives. For the case of wind energy, the Dutch Government strives at the production of 7500 MW by the year 2020, of which 6000 MW should be produced by offshore wind farms. If realised, it

[1] The original chapter was compiled by Sjoerd Zeelenberg and Gerard Linden (UoG), 7th January 2005. It has been revised by Sjoerd Zeelenberg, 8th of August 2005.

is expected to cover 24% of the total electricity use in The Netherlands by that time. It would provide one third of the total energy from renewable resources. The onshore target (1500 MW) has not been accomplished yet, although 1100 MW is reached recently. It is generally accepted that given the scarce space left on land and the growing negative reactions of citizens to wind turbines, future wind farms should be built offshore in the Dutch EEZ. The Wadden Sea is excluded, as a consequence of the high ecological values.

4.2.1 Spatial planning on the North Sea

Current Dutch planning policy at national level is arranged by the Spatial Planning Act and the National Spatial Strategy (*Nota Ruimte*). The spatial strategy is established by 4 ministries[2]. Although spatial perspectives on the Dutch Continental Shelf are based upon this strategy, the Spatial Planning Act is not effective outside the 1 kilometre zone. This is a consequence of the absence of municipalities and provinces outside this zone. The 1 kilometre zone belongs to the territories of municipalities and provinces and hence falls under their jurisdiction. The Dutch state is the legal owner and authority of the rest of the 12 nautical miles territorial and the EEZ (established by law in 2000).

Since the Spatial Planning Act is not applicable to the North Sea, the planning and licensing of offshore wind farms have to be arranged by means of other juridical instruments. Therefore, the Public Works (Management of Engineering Structures) Act (PWA) has been declared effective in the territorial waters and the EEZ. This act has no specific spatial background or perspective and solely focuses on individual projects located in, or concerning, national waters (Zeelenberg 2005). The PWA is executed by the Ministry of Transport, Public Works and Water Management and states that a permit is needed for the exploitation of an offshore wind farm in the North Sea. To obtain a permit, an Environmental Impact Assessment needs to be completed and approved. For most of the activities in the North Sea, a permit is compulsory based on the PWA. July 2005, the Integral Management Plan North Sea 2015 (*Integraal Beheerplan Noordzee 2015)* was presented. The IMPNS 2015 elaborates on the National Spatial Strategy. By this plan, North Sea policies are finally brought together in an integral decision-making framework (see section 4.4). Tables 4.2, 4.3 and 4.4 in Appendix 4.1 provide an overview of other acts and policy documents relevant to offshore activities[3]. Section 4.4 pays more attention to the juridical and decision-making aspects as well as policy contents.

The Dutch State is the legal owner of the territory in the EEZ. The North Sea Directorate (*Rijkswaterstaat Directie Noordzee, DNZ*), which is part of the Ministry of Transport, Public Works and Water Management (*Ministerie van Verkeer en Waterstaat*), is the mandated authority. Besides, the Dutch State is owner of the infrastructure of the national electricity network. By this, access for every producer of energy is guaranteed and a possible monopoly in the market is avoided. TenneT, the state-owned Transmission System Operator (TSO), is in charge of the high-voltage network.

From May 2002 until December 2004, no procedures could be started to obtain the necessary licenses to build and exploit a wind farm in the North Sea. This moratorium was used to establish new policy rules that can adequately guide the planning of offshore wind farms. The policy rules determine that one application can cover a maximum of 50 square kilometres (Ministry of Transport, Public Works and Water Management 2004). Besides this condition, the new rules mainly focus on procedural aspects. Since the new policy rules have been effective in January 2005, 78 applications have been submitted. It is generally agreed that there are no adequate means and knowledge to process 78 applications. Besides, it is expected that only a couple of the applications will reach the final building stadium. As a consequence, the Ministry has postponed the handling of these applications. See section 4.3.3 for an explanation.

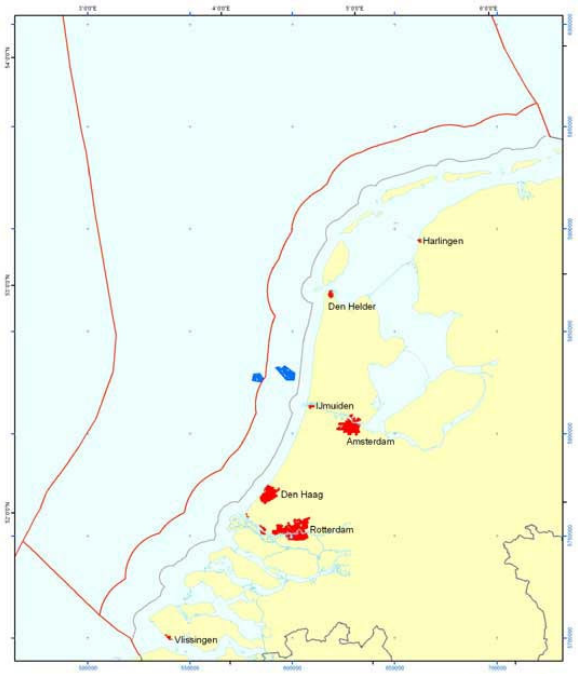
4.3 Current projects

At this very moment, the procedures of two offshore wind farms in the North Sea have been completed: a 100 MW pilot project within territorial waters (Near Shore Wind farm, NSW) and a 120 MW project in the EEZ (Q7-WP). These projects have been licensed by procedures that are no

[2] Ministry of Housing, Spatial Planning and Environment, Ministry of Economic Affairs, Ministry of Transport, Public Works and Water Management and Ministry of Agriculture, Nature and Food Quality.
[3] Think of excavation sites, seaways, oil platforms, nature conservation areas.

longer applicable. Nevertheless, the procedures of Q7-WP highly resemble the current policy rules. The locations of NSW and Q7-WP are shown in map 4.1.

Under the current policy rules, another 78 (concept) applications have been submitted. Section 4.3.3 pays attention to these proposals. Finally, 5 proposals are currently in an appeal procedure. These proposals have been submitted before the new policy rules became effective. The concerned applicants, Ecofys and E-Connection, are both related to some of the new proposal as well. The applicants have serious doubts concerning the arguments that were used to decline their applications by the Ministry of Transport, Public Works and Water Management. This rejection took place in 2002, during the preparation of the moratorium. The current status and expected outcome of the appeal remain rather unclear.



Map 4.1. Locations of NSW (within EEZ) and Q7-WP (outside EEZ) (Offshore Windenergie 2005).

NSW and Q7-WP, as well as the recent initiatives, are rather large scale offshore projects. Besides these, already 2 wind farms are realised in the IJsselmeer. Their total capacity is around 19 MW (Beurkens and De Noord 2003). Since these farms are located close to the shore, they cannot be regarded as genuine offshore wind farms within the scope of the POWER project. Thus they will not be taken into account.

4.3.1 Near Shore Wind Farm (NSW)

The NSW is designed as a pilot project and consists of 36 turbines with a total of 100 MW (2,75 MW each). It will be located about 11 kilometres from the coast, near Egmond (which is roughly 30 kilometres north of Amsterdam, at the North Sea coast). NSW is the only wind farms allowed within territorial waters. The cable will reach the shore at the site of Corus, IJmuiden (a large steel manufacturer). There's a €27 million subsidy available for the consortium in charge, called NoordzeeWind BV (a co-operation between two subsidiaries of Shell WindEnergyBV and NUON); in return a Monitoring and Evaluation Programme (MEP) is compulsory. This MEP will be used to assess the progress and to provide a better insight to offshore techniques, covering technical, economical and ecological issues.

The first project proposal for this wind farms was presented in 2000. Yet, it took almost 5 years before licences became irrevocable. This was mainly due to inadequate planning and juridical instruments (Zeelenberg 2005). A so-called Key Planning Decision procedure had to be followed.

This procedure is the most complex in Dutch spatial decision-making and requires a (partial) revision of national spatial policy. In this case, the Structure Scheme Electricity Supply II (*Tweede Structuurschema Electriciteitsvoorziening*) was modified. The Key Planning Decision has become effective in December 2001. Besides the location and construction of NSW, infrastructure and onshore facilities have been determined by it.

January 12th 2005, the Council of State has rejected the appeal by the Birds Society Egmond. The society argued that the methods used to estimate the total number of birds being killed by the NSW were not accurate and insufficient. The Council stated that the methods being developed at the very moment will prove to be adequate. Besides this appeal, financial arrangements have been insecure for a long time as well. As a consequence, the building of the turbines is expected to start this year and the farm should be operational in 2006.

4.3.2 Q7-WP

Despite the demonstration character of NSW, another 120 MW offshore wind farm is already fully licensed as well. Q7-WP is located in the EEZ, approximately 23 kilometres west of IJmuiden. It will be built and exploited by E-Connection[4]. The farm consists of 60 2 MW turbines that are constructed by Vestas. In contrast to the NSW procedure, a Key Planning Decision was not necessary for Q7-WP. Instead, the Public Works Act had become effective in the EEZ, providing a new, more efficient application procedure. This procedure has been amended lately, resulting in the current policy rules (see also section 4.3.3).

There has been quite some pressure on the Dutch government to partly fund Q7-WP as well, in order to be able to execute a MEP[5]. Instead of providing subsidies, the state has allowed fiscal regulations to support Q7-WP. The research programme will be executed in coordination with the MEP of NSW. The major reason for this was the fact that the farm might be operational at an earlier stage than NSW, or at the same time. It seems fair to state that both NSW and Q7-WP function as demonstration projects, providing knowledge for the upcoming offshore projects (Zeelenberg 2005). Due to uncertainty on availability of these subsidies and other fiscal provisions, the realisation of Q7-WP, licensed in 2002, has been postponed until 2005. Recently, E-Connection, has stated to start building in 2005. Thus, although the use of the PWA to grant licenses resulted in a more efficient and adequate procedure, financial insecurities in the development of the projects still caused serious delay.

4.3.3 New project proposals

Since the abolition of the moratorium, 78 applications were submitted by 6 companies or consortia. Presumably, only a small part of these projects will realised. As Scholtens (2005) suspects, the current initiatives represent no more than spatial claims, to assure future possibilities. This argument is confirmed by the fact that several proposals concern the same areas; the 78 applications cover 48 unique sites. Table 4.1 gives an overview of the parties that have submitted proposals. An up to date table of al current initiatives cannot be provided, due to insufficient supply of information.

The capacity of the proposed farms ranges from a small 60 MW up until 550 MW. Each wind farm covers an area not larger than 50 square kilometres. The total proposed potential exceeds 21 GW, but given the fact that some plans cover the same sites and the expectation that only a few farms per applicant will actually be built, the real potential will be much lower[6]. Except one proposal north of the Wadden Isles Ameland and Schiermonnikoog, all proposed farms are located west of the coast between Den Helder and Hoek van Holland, roughly between 22 and 70 kilometres from the coast[7].

Due to the unexpected high number of applications, the EIA-procedures have been postponed for 3 months by the ministry. The reason for this is the fact that the current policy rules are expected not to be an adequate framework for evaluating 78 projects and their consequences. The main

[4] Detailed information is available at www.e-connection.nl.
[5] Besides this Monitoring and Evaluation Programme, another experiment will be carried out as well. This project concerns the breeding and yielding of mussel semen on the turbine pillars.
[6] A modest example: if assumed that only 1 farm per developer will actually be built, this results in a capacity of roughly 1500 MW. This places the described numbers in a different perspective, keeping the national goal of 6000 MW offshore wind energy in 2020 in mind.
[7] http://www.noordzeeloket.nl/activiteiten_op_zee/windenergie/Stand_van_zaken.asp provides an overview, but is, as a consequence of the latest developments, no longer up to date.

concerns are the cumulative environmental impact and the connection to the onshore electricity grid. At this moment, several studies are undertaken, to analyse the yield of offshore wind energy. Besides, a research project assesses possible cumulative environmental impacts. Finally, a research is now conducted by the Ministry of Transport, Public Works and Water Management, the Ministry of Economic Affairs and TenneT (TSO) on how to fit in a maximum capacity of 21 GW to the current electricity grid.

At the same time, the Dutch regulations on financial contribution to offshore wind energy are being reviewed right now. Date and contents of the new financial regulations are unknown for now. The Ministry of Economic Affairs aims at reducing the current number of initiatives to more a realistic amount. Ideally, the number of licensing procedures undertaken should be the same as the number of offshore wind farms eligible for financial support mechanisms (Van der Heuvel 2005).

Table 4.1. Overview of new initiatives[8].

Company name	**Number of submitted initiatives**
WEOMM	8
E-Connection	11
Evelop	11
Airtricity	9
Raedthuys Holding	15
Arcadis Ruimte&Milieu	3
Unknown[9]	21
Total	**78**

The underlying message is clear: since the moratorium has no longer been effective, a huge pile of applications has been submitted at the Ministry of Transport, Public Works and Water Management. Apparently, there is significant interest among project developers to invest in offshore wind farms in The Netherlands, or to support offshore wind energy. Inevitably, this causes quite some pressure on the administration and ministries. It has even led to the remarkable current situation: the handling of the initiatives has been postponed, in order to reconsider the developments and the evaluation framework that is to be used. Planning strategies seem to be changed again. Although the framework is established now by the Integral Management Plan North Sea 2015 (see section 4.4), positions still need to be taken by the government concerning desirable and feasible developments.

4.4 Decision-making processes and competencies

As described earlier, the Public Works Act is the most important act regarding offshore wind farms. It arranges the licensing procedures and relates to other acts or policy documents. These acts and policy documents are listed in appendix 1. June 2005, the so-called Integral Management Plan North Sea 2015 has been presented (see also section 4.4.2). This plan is the result of an intensive co-operation, in which 8 ministries participated[10]. The IMPNS is based on the National Spatial Strategy. It provides an inventory of all current and expected spatial claims in the North Sea, as well as an integral framework to support policy decisions. Besides, it proposes the erection of a Management Platform. This platform will represent all governmental bodies that are involved in management, maintenance and execution issues. As it unites all relevant sectors, like fishery, shipping, excavation, energy recreation and environment, it is expected that this platform enhance decision-making and execution.

[8] For further information on the companies: www.weom.nl, www.e-connection.nl, www.evelop.nl, www.airtricity.com, www.raedthuys-partners.nl en www.arcadis.nl.
[9] The background of 21 proposals is currently unknown, as the licensing procedures are idle right now.
[10] These are: Ministry of Housing, Spatial Planning and Environment; Economic Affairs; Transport, Public Works and Water Management'; Agriculture, Nature and Food Quality; Finance; Defence; Foreign Affairs.

4.4.1 Licensing

To build and exploit and offshore wind farm in the Dutch North Sea, a permit is needed, based on de Public Works Act. This permit covers the site of the farm, as well as the cable route. To obtain this permit, an Environmental Impact Assessment (EIA) has to be executed as stated in the policy rules. Firstly, the applicant presents a starting document (*startnotitie MER*) in which the location, technical details and the next steps are explained. By presenting this document to the Ministry of Transport, Public Works and Water Management, the procedure is formally started.

Besides announcing the proposal, the starting document is used to establish guidelines for the upcoming EIA, by the so-called EIA-committee. Using these guidelines, the applicant starts with the actual assessment. In the EIA, the applicant describes and assesses possible environmental consequences of the proposed project. When several crucial decisions are to be made, one application process can contain several EIAs. When finished, the final EIA report is submitted to the Ministry of Transport, Public Works and Water Management. The Ministry judges the report on the contents and at the same time the EIA-committee assesses its scientific quality.

Alongside submitting the EIA, the applicant requests for a PWA permit. In considering this request, the Ministry uses the outcomes of the EIA, as well as technical and financial arrangements that have to be met by the applicant. Here, the interests of other functions on the North Sea are taken into account, embodied in other policy documents or acts. Both the EIA and the PWA procedure offer several moments for participation, objection or appeal by third parties. The eventually obtained permit is valid for only a fixed term (2 years); it cannot be used as spatial claim for future developments and is not transferable[11].

This permit comprises the wind farm itself and the cable route in the seabed. Within the 1 kilometre zone, municipalities and provinces execute their authorities. Therefore, an environmental permit and permission based on the Spatial Planning Act have to be obtained by the applicant. This procedure takes place alongside the request for a permit from the Ministry of Transport, Public Works and Water Management.

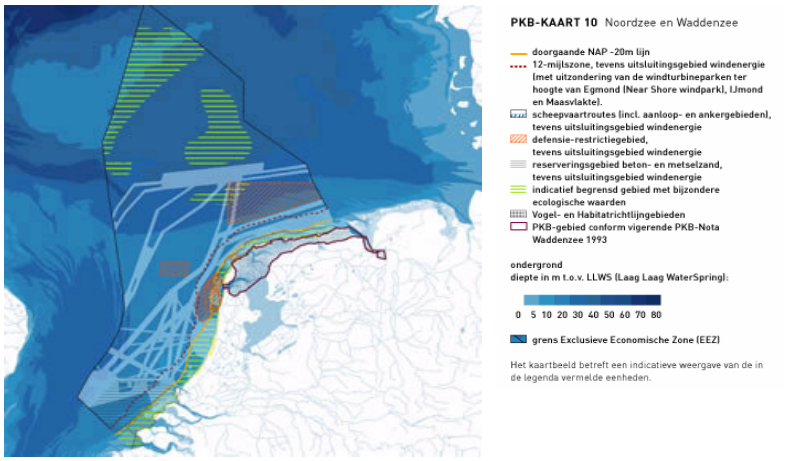
4.4.2 Spatial considerations

As described earlier, the Public Works Act assesses each proposal individually. It does not provide a spatial development perspective. Therefore, the policy rules determine that in considering an application, the spatial preconditions of several policy documents must be taken into account. These spatial conditions are determined in the National Spatial Strategy (*Nota Ruimte*). By means of the Integral Management Plan North Sea 2015 (IMPNS) a spatial framework is created to set conditions and to take other, sector-based, interests in account.

In the National Spatial Strategy, the Dutch Wadden Sea region is recognised for its unique ecological and natural values, by means of the Bird and Habitat Directives. Therefore, it is a protected area where new developments concerning industrial functions or infrastructure are prohibited[12].

As a consequence, possible offshore wind farms will be located in the North Sea. According to present planning ideas no wind farms – the Near Shore Wind Farm (NSW) pilot project excepted – will be allowed in the 12 miles zone. Unlike its predecessor, the *Nota Ruimte* does not indicate preferable locations for offshore wind farms in the North Sea. Instead, several areas are excluded for reasons of other use, such as international shipping routes, mineral extraction, national defence restrictions and, of course the Habitat and Bird Directive. A notable policy change is that other ecologically valuable areas are not excluded *a priori*. The environmental consequences of an application will be assessed in an *ad hoc* manner, using the existing knowledge at that time. The 'left-over' area, which is the vast majority of the Dutch EEZ, is principally suitable for offshore wind farms. Map 4.2 gives an impression. On the map, current and future uses in the North Sea are indicated.

[11] More precisely, the permit is not transferable without permission of the ministry in advance.
[12] It is expected though, that in the near future the drilling for mineral oil will commence, but only by means of onshore installations and techniques.



Map 4.2. Key Planning Decision on North Sea, part of National Spatial Strategy[13] (Ministry of Housing, Spatial Planning and Environment et al. 2004).

Notwithstanding the formal regulations, an inventory of most suitable locations for offshore wind farms – as well as for other uses – has been made in the IMPNS. The indicated area covers the majority of the new proposals, as mentioned in section 4.3.3. The main conclusions are that, as far as it concerns suitable sites, no problems are expected to meet the 6000 MW goal in 2020 (Ministry of Transport, Public Works and Water Management et al. 2005). Based on several other research reports, two sites have been distinguished for onshore grid connection: the Corus power station at Beverwijk and the power station at the Maasvlakte (Port of Rotterdam). Although not formally determined, these two sites are expected to be the most suitable to provide onshore electricity facilities. For the implementation of the first 3000 MW, no major technical difficulties expected. Though, to bring into use an offshore capacity of 6000 MW, vast improvements of infrastructure will be necessary to the mainland grid.

Nevertheless, the licenses that have to be obtained for the construction and use of cables and facilities on land cause serious difficulties and delays. Although it is intended to establish a platform to speed up and simplify procedures for offshore activities, it remains questionable if and how the procedures onshore will be changed. Municipalities and provinces can pose conditions and regulations that seriously obstruct the development of offshore wind farms.

In the decision-making framework presented in the IMPNS 2015 it is stated that de building en exploitation of offshore wind farms in the North Sea is of urgent, public importance. As a consequence, proving the benefit of a specific wind farm is not needed by a project developer. On the other hand, precaution and spatial efficiency need to be guaranteed and will be assessed during the procedure Besides the 2 areas designated through the Bird and Habitat Directive (BHD), 4 areas of exceptional ecological value are designated in the IMPNS 2015. In these areas, offshore wind farms will not be allowed, unless there are no alternative sites available. The upcoming years, these 4 areas will become of the BHD areas as well (Ministry of Transport, Public Works and Water Management et al. 2005).

4.5 Economic conditions for offshore wind energy

As described in 4.4 and 4.4, the financial regulations concerning offshore wind energy are affected by the current flow of initiatives. The increased attention to offshore wind energy has not only led to changes in licensing procedures, but also in the mechanisms supporting offshore activities and, more general, policy regarding renewable energy resources.

There were 3 financial regulations applicable to NSW: a one-time state subsidy of €27 million, fiscal incentives, and feed-in tariffs. For the case of Q7-WP, only the fiscal incentives and feed-in tariffs

[13] The complete National Spatial Strategy as well as the accompanying maps are available at http://www2.vrom.nl/notaruimte.

are applicable, respectively called *VAMIL* and *MEP*[14]. It is expected that these regulations remain effective, though with new specifications. *VAMIL* is a fiscal regulation, which allows investors to use different depreciation rates; investments in offshore wind farms can be more profitable. The *MEP* regulation provides financial support from the national government, for each produced kWh. So, electricity generated by offshore wind farms will be in conformance to market prices (Ministry of Economic Affairs and COD 2004, Shaw et al. 2002). Both *VAMIL* and *MEP* are established to support the production of renewable energy in general, so biomass and solar techniques are comprised as well.

At this moment, new applications to *VAMIL* and *MEP* will not be considered, as a consequence of budgetary problems at the Ministry of Economic Affairs. Recent months have shown a remarkable increase of requests, which resulted in an expected high amount of financial support. It is expected that the new *VAMIL* and *MEP* regulations will become effective in 2006. The short-term consequences of this revision might differ between offshore projects and for example private initiatives. The latter will probably show a decrease of temporary requests. For the case of offshore wind farms no serious delay is expected for now, given the long period of time needed to prepare the actual application procedure.

Recently, the ECN (Energy Research Centre for The Netherlands) has calculated the costs of electricity, generated by wind farms. The price of onshore wind energy is estimated 8,8 eurocents per kWh; for offshore wind energy 10,3 eurocents per kWh was computed. Given the fact that current market prices of electricity in The Netherlands vary between 2,9 and 5,8 eurocents per kWh, it is expected that onshore wind energy will be competitive within 10 years. Since future developments in offshore wind energy are hard to foresee, no forecasts have yet been done for this price. Though, it is generally accepted that competitive prices will be established.

4.6 Public debate

The public debate in The Netherlands is influenced by NIMBY-ism. Most public organisations as well the majority of the population are convinced of the necessity, and aware of the opportunities to alter energy consumption and to change to sustainable ways of producing energy. Renewable energy is widely recognised and accepted as one of the means to do so. Nevertheless, when it comes to the allocation of sites on land (i.e. for wind farms or biomass-use installations) severe local protest tends to occur, not in the least by local authorities. As discussed earlier, lack of suitable sites on land and expected negative reactions of the public when building on land were among the main reasons to restrict the establishment of future wind farms to the EEZ.

In the case of offshore wind farms, the subsequent stakeholders can be distinguished. The information is derived from Ministry of Economic Affairs and Ministry of Housing, Spatial Planning and Environment (2001), We@Sea (2003), Evelop (2005) and WEOM (2005).The overview gives an impression of the actors involved, but is surely not exhaustive.

4.6.1 Government bodies

The government bodies that already have been mentioned are involved in every EIA or consents procedure in The Netherlands, most of the time in decision-making or supporting role. Besides these, we distinguish some authorities, participating in offshore wind farm projects. The main reason for these parties is presumably the planning of the cable routes and their onshore connections.

- Ministry of Housing, Spatial Planning and Environment
- Ministry of Transport, Public Works and Water Management (North Sea Directorate)
- Ministry of Agriculture, Nature and Food Quality
- Ministry of Economic Affairs
- Ministry of Defence

[14] Not to be confused by the Monitoring and Evaluation Programme, for which the same abbreviation is used.

- Advisory Council on Spatial Planning
- EIA committee
- Management platform Integrated Management Plan North Sea 2015
- Municipalities
- Provinces
- Port Authorities
- District Water Control Board for Drainage Sluices

4.6.2 Interest groups

Nationwide interest groups have quite a share in decision-making in The Netherlands. They are usually consulted in an early stage of the process. For the case of offshore wind farms, the next organisations are distinguished.

- Dutch Fisheries Union
- Foundation for Nature Conservation and Environmental Protection
- Dutch Bird Protection Society
- Greenpeace The Netherlands
- North Sea Foundation
- Regional Environmental Federations
- Wadden Sea Foundation
- Dune Conservation Foundation

4.6.3 Private parties

The following parties are united in the consortium We@Sea. This consortium covers all relevant aspects of offshore wind energy; its goal is to promote offshore wind power, by participating in public debates, creating new technical solutions and designing development plans. Most of the partners are involved already involved in either the two Dutch projects or wind farms like Horns Rev and Blyth.

Offshore technology

- Ballast Nedam
- Fugro Engineers BV
- Genius Vos BV
- Gusto MSC
- SmartTowerk BO io

Wind energy technology

- DUWIND/Delft University of Technology
- Energy Research Centre of The Netherlands (ECN)
- Multiwind

- Neg Micon
- Rheden Steel
- Vestas Nederland Windtechnology BV
- WMC

Offshore wind farm development

- E-Connection
- Shell WindEnergyBV
- Siemens

Energy sector

- NV Delta Nutsbedrijven
- NUON
- ENECO Energy
- TenneT BV (owner of the electricity grid)
- Logistics
- Dynamar Consultancy BV
- Investors
- NIB Capital Bank

Energy consultants

- Ecofys
- Fabricom
- KEMA

Environment and nature

- Bureau Waardenburg BV/Alterra/NIOZ
- RIVO
- TNO

Besides this consortium, other private investors appear the upcoming years. Finally, wind farm developers that have recently submitted proposals for the North Sea must be mentioned:

- WEOM
- E-Connection
- Evelop
- Airtricity
- Raedthuys Holding

- Arcadis Ruimte & Milieu

4.6.4 Pressure groups

These pressure groups are mostly locally orientated and their activities can be characterised as re-active and *ad hoc*. For the case of NSW, the following pressure groups have participated.

- Bird Group Castricum
- Bird Foundation Egmond
- Local Coast Conservation Group

4.6.5 Citizens

During the NSW procedure, several citizens have submitted objections or amendments to the draft KPD. At this moment it is impossible to provide an overview on their motives. Though, it seems fair to state the majority is based on personal nuisances (i.e. onshore infrastructure or visual disturbance).

4.7 Considerations

It seems fair to state that the planning of offshore wind farms is a rather complicated process in The Netherlands, seeking for direction and guidelines. Public, technical and financial restraints play a part in this and need to be dealt with. The new policy rules and Integral Management Plan North Sea 2015 provide a new an up to date framework to guide licensing. Nevertheless, the current situation is insecure. Two wind farms will be built and are expected to be operational in 2006. What the outcome of the recent initiatives will be is to be seen. One lesson can already be learned: there's a considerable potential for offshore wind energy in The Netherlands.

The Netherlands is the first of the countries bordering the North Sea that has a comprehensive planning framework applicable to the planning of offshore wind farms. It provides a spatial agenda for the North Sea. The discussions on the content and scope of it can be of great value to the POWER project.

The author has gratefully used the websites www.noordzeeloket.nl and www.offshore-wind.nl.

4.8 References

Beurskens, L. en M. De Noord (2003) *Offshore wind power developments. An overview of realisations and planned projects*, ECN, Unit Policy Studies, nr. 7.7449, Petten

Evelop (2005) *Startnotitie Milieueffectrapportage offshore windpark WP Noord Hinder*, 25th February 2005, Evelop, Utrecht

Heuvel, R. van der (2005) 'Procedures windenergie op zee opgeschort' in *IDON nieuwsbrief Integraal Beheer Noordzee*, nr.1, August 2005

Hoove, S., ten (2005) 'EZ verwacht weinig van zon en wind' in *de Volkskrant*, 21 May 2005, p. 7

Ministry of Economic Affairs and COD (2004) *Development of offshore wind energy in Europe*, policy workshop background document, 30th September and 1st October 2004, Egmond aan Zee

Ministry of Economic Affairs and Ministry of Housing, Spatial Planning and Environment (2001) *Partial review of the second electricity provision structure plan (Selection of the location for the Near Shore Wind park project) – Government final position*, 27nd March 2001, The Hague

Ministry of Housing, Spatial Planning and Environment (1999) *Uitvoeringsnota Klimaatbeleid (Implementation Plan Climate Policy)*, The Hague

Ministry of Housing, Spatial Planning and Environment, Ministry of Economic Affairs, Ministry of Transport, Public Works and Water Management and Ministry of Agriculture, Nature and Food Quality (2004) *Nota Ruimte (National Spatial Strategy)*, http://www2.vrom.nl/notaruimte, last visited 20th May 2005

Ministry of Transport, Public Works and Water Management (2004) *Beleidsregels inzake toepassing Wet beheer rijkswaterstaatwerken op installaties in de exclusieve economische zone (Policy rules concerning the application of the Public Works Act on installations in the exclusive economic zone)*, established 29th December 2004, Staatscourant nr. 252, p. 19

Ministry of Transport, Public Works and Water Management, Ministry of Agriculture, Nature and Food Quality, Ministry of Economic Affairs and Ministry of Housing, Spatial Planning and Environment (2005) *Integraal Beheerplan Noordzee 2015 (Integral Management Plan North Sea 2015)*, IDON, The Hague

Offshore Windenergie (2005) *Planned Wind Farms*, www.windopzee.nl/kaart.asp?id=14, last visited 23th May 2005

Scholtens, B. (2005) 'Uitzicht op duizenden windturbines voor de kust' in *de Volkskrant*, 7th May 2005, p. 7

Shaw, S. M. Cremers and G. Palmers (2002) *Enabling offshore wind developments*, 3E and EWEA, Brussels

WEOM (2005) *Startnotitie Milieueffectrapportage inrichting Offshore Windpark Den Haag 1*, 9th February 2005, WEOM, Veenendaal

We@Sea (2003) *We@Sea: Wind Energy at Sea*, Stichting We@Sea, Petten

Zeelenberg, S. (2005) *De planning van windmolenparken op de Noordzee – Over politieke overtuigingen, juridisch geworstel en Europese ervaringen*, paper presented at PlanDag 2005, 2nd June 2005, Leuven

Appendix 4.1: Overview of relevant acts and policy documents

Table 4.2. Overview of acts relevant to North Sea related policies (Evelop 2005).

Spatial Planning Act	Wet op de Ruimtelijke Ordening
Public Works Act	Wet beheer Rijkswaterstaatwerken
Environmental Management Act	Wet Milieubeheer
Environmental Protection Act	Natuurbeschermingswet
Sea Water Protection Act	Wet Verontreiniging Zeewater
Excavation Works Act	Ontgrondingenwet
Bottom Protection Act	Wet Bodembescheriming
Route Act (determining seaways)	Tracéwet
Electricity Act (1998)	Elektriciteitswet

Table 4.3. Overview of international documents (Evelop 2005).

Policy area	**International Treaties and EU Directives**
Climate	UN Framework Convention on Climate Change (1992) Kyoto Protocol (1997)
Environment	RAMSAR treaty (1971-1975) Convention on the conservation of European wildlife and natural habitats of Bern (1979) Convention on the Conservation of Migratory Species of Wild Animals The Bonn Treaty (1979) Agreement on the Conservation of African-Eurasian Migratory Water Birds AEWA (1995) EU Bird Directive (1979) EU Habitat Directive (1992) Bio-diversity Treaty of Rio the Janeiro (1992) (Convention for the protection of the Marine Environment of the North-East Atlantic) OSPAR treaty (1992)
Law of the Sea	United Nations Convention on the law of the sea, Unclos (1982) Safety Of Life At Sea (SOLAS) treaty (1974) EEG decree 3760 on collective fishery policy (1992)

Table 4.4. Overview of relevant Dutch policy documents (Evelop 2005).

National Spatial Strategy (2004)	Nota Ruimte
National Environmental Policy Plan 4 (2004)	Nationaal Milieubeleidsplan 4
Structure Plan Rural Areas (1995)	Structuurschema Groene Ruimte
Water Management Plan 4	Vierde Nota Waterhuishouding
Structure Scheme Pipelines (1984)	Structuurschema Buisleidingen
Integral Management Plan North Sea 2015 (2005)	Integraal Beheersplan Noordzee 2015
Management Plan North Sea 2010 (1993)	Beheersvisie Noordzee 2010
Coastal Policy Paper (2000)	Derde Kustnota
National Plan Environment and Economy	Nota Milieu en Economie
Implementation Plan Climate Policy	Uitvoeringsnota Klimaatbeleid
Structure Plan Electricity Supply II	Tweede Structuurschema Elektriciteitsvoorziening
Electricity Act	Electriciteitswet
National Energy Plan 3 (1995)	Derde Energienota
Structure Plan on Military Facilities (2004)	Structuurschema Militaire Terreinen
Structure Plan on Surface Raw Materials	Structuurschema Oppervlakte delfstoffen
Regional Excavation Plan North Sea 2 (2004)	Regionaal Ontgrondingenplan Noordzee 2

Chapter 5

Offshore Wind Farm Planning in Belgium[1]

5.1 Background

Belgium has integrated the European targets concerning electricity coming from renewable sources within its regional and federal legislation. The actual contribution of renewable sources in Belgium is approximately 1% of the electricity consumption. In 2010, 6% of the electricity consumption should be provided by renewable sources (Fedra 2004).

5.2 Belgian wind energy policy

The Belgian state level reforms have resulted in a series of competencies being transferred from federal to the regional levels. Nevertheless, the reforms of 1980 were particular restrictive with respect to the transfer of power on energy policy to the regions - referring to the oil crisis in the 1970's the federal government wanted to keep full control over the national energy policy. Though, the reform of 1988 gave autonomous competencies to the regions with particular respect to renewable energy. Another structural change in energy policy was the liberalisation of energy markets from 1999 onwards, which had a direct impact on renewable energy policies (Palmers et al. 2004).

Belgium is a federal state consisting of communities, regions and provinces. As such, the decision-making power does not lie solely with the federal government and the federal parliament. In fact, the management of the country is delegated to several co-operating authorities, which exercise their competencies independently in different fields. With regard to economic issues, competencies are divided amongst the three regions, each having autonomous power: the Flemish Region, the Brussels Capital Region and the Walloon Region. The country is further divided into ten provinces and 589 municipalities.

[1] The original chapter was compiled by Hasse Petersen (IMI), 10th December 2004. It has been revised by Sjoerd Zeelenberg (UoG), Filip Vercauteren (PoO) and Emmanuël Timmermans (PoO), 16th August.

Competencies between the federal and regional authorities are attributed according to territorial and material concerns. The federal state retains certain important areas of competence including: foreign affairs, defence, justice, finances, social security, important sectors of public health and domestic affairs etc. The regions are competent in the fields of nature and water management, land zoning and nature conservation, spatial planning and public works housing, agricultural policy, economy, energy management and renewable energy, local authorities, employment, transport and research and development. However, within any given territory, the repartition of material competencies between the federal and regional authority is based not only on the kind of economic activity, but also on the importance and the scope of the economic implications of the activity.

On energy matters the federal government retains competency for:

- The national indicative programme
- The nuclear cycle
- Large energy infrastructure and storage facilities
- Tariffs
- Offshore energy production

Competencies at sea remain with the federal government. Some specific competencies at sea, such as pilotage and beaconing in relation to seaports, rescue operations, coastal defence works and harbour works, have been transferred to the Flemish region, bordering the North Sea (Shaw et al. 2002).

5.3 Current projects

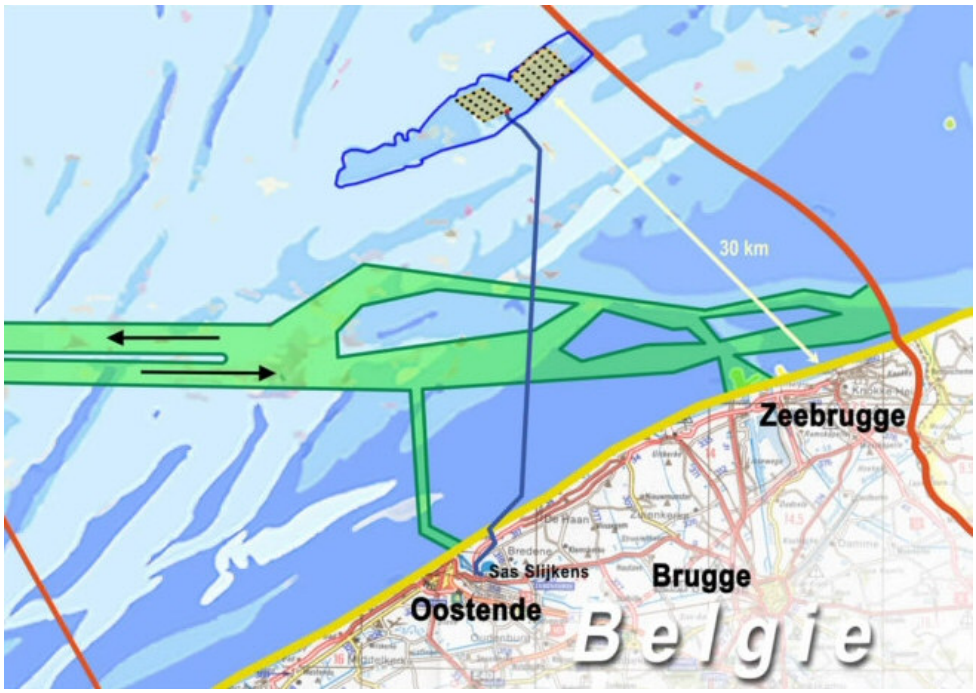
Since 2001 various project initiatives have been launched in view of exploiting offshore wind energy in the Belgian part of the North Sea. Though, not one project has been realised yet. It is expected that the first wind farm will be operational at Thornton Bank, in 2006 or 2007 (See 5.3.1). Other attempts (at the Wenduine Bank, Vlakte van de Raan and Thorntonbank near the Dutch Border) are (temporarily) annulled. These will be described in 5.3.2 and 5.3.3. A complete overview is given in appendix 5.1.

The first Belgian experiences concerned a plan for a 100 MW project at Vlakte van de Raan by Electrabel - Jan De Nul and a 100 MW project at Wenduinebank by C-power. Because of various reasons, both projects have been annulled. In the meantime, the Belgian Government determined a preferred zone for the development for offshore wind energy. This zone is roughly covered by the area starting from the Thorntonbank, going North, in between the Dutch border and the gas pipeline Interconnector (It is not designated on map 5.1).

5.3.1 Thornton Bank

The Thornton Bank offshore wind farm will be built at Thornton Bank by C-Power, a consortium of five companies[2]. With a distance of 37 km to Oostend, the wind farm will not be visible from the coast. In the past, visual disturbance has been a rather important issue, as it contributed to the rejection of the offshore wind farm at Vlakte van Raan (See 5.3.2). The project will consist of sixty turbines rating between 3,6 and 5 MW, resulting in a total capacity of approximately 216-300 MW. The total costs are estimated to be around €500 million. A concession for the project was granted in 2003 and an environmental permit was granted in 2004. The offshore wind farm will provide around 1,3% of the total Belgian electricity demand. The building of the first part will start in 2006 or 2007. Thornton Bank will be built in three phases. Final realisation and operation is due in 2010.

[2] See www.c-power.nl. The consortium consists of Interelectra, SIIF Énergies, Ecotech Finance, SOCOFE and Dredging International.



Map 5.1. Location of Thornton bank (C-Power 2005). Vlakte van de Raan is located south east of Thornton Bank, against the Dutch EEZ (Schelde Informatiecentrum 2005).

5.3.2 Vlakte van de Raan

In June 2002, the environmental permit and the authorisation for the exploitation and the construction of an offshore wind farm on the Vlakte van de Raan were granted to Electrabel - Jan De Nul. The project consisted of 50 wind turbines (2 MW) 12-15 km of the coastline at Knokke-Heist. In February 2003, the permit and the authorisation were granted for the exploitation and installation of electricity cables on the seabed. Finally, the project received also the domain concession and had thus the necessary permits and authorisations to go ahead.

After two years of procedures, the building and environmental permits were redrawn. Possible visual disturbance and a participation process that evolved irregularly contributed to this (Petersen and Neumann 2003b). At the same time, the Belgian government had defined an exclusive zone for the development of offshore wind farms, as explained in section 5.3.

5.3.3 Seabruges

June 2004, the Belgian Minister for the North Sea rejected to grant a concession to the power company SPE concerning the establishment of 7 wind turbines at a breakwater near the Port of Seabruges (federal domain). Like Vlakte aan de Raan, the concession was denied by the federal authority due to the prior decision of limiting the exploitation of offshore wind energy within territorial waters to the Thornton Bank area.

5.4 Two scenarios for development of offshore wind energy

Currently, there remains only one project which is fully authorised: Thornton Bank. The only future prospects come from two scenarios that have been developed.

These scenarios have been developed to analyse technically feasible exploitation of offshore wind power in Belgium in the future (Palmers et al. 2004). The scenarios have been based partially on experiences from neighbouring countries and partially on technological innovations. They have been developed by the Belgian Science Policy and serve to support future decision-making.

The first scenario is called BAU (business as usual). It and assumes a continued policy support for wind energy without major infrastructural investment or structural changes in legislation. In the second scenario called PROA (pro-active), structural investments in offshore electric infrastructure and power management are envisaged. The estimated offshore capacities for both scenarios are respectively 500 MW in 2010, or 2672 MW in 2025. The scenario BAU is as follows:

- Offshore wind project on Thornton Bank: construction work will start in 2006 or 2007. The offshore wind farm is expected to be fully operational in 2010.
- Other projects will follow with currently available technology up to 500 MW installed capacity of offshore wind energy.
- No grid reinforcement will be made.

In the PROA scenario, an offshore zone has been designated for exploitation of offshore wind energy. This designated area would cover approximately 267 square kilometres and the maximum installed capacity would be 2,6 GW. The distance to the coastline would differ between 22 and 55 kilometres, avoiding visual disturbance. The closest and most obvious connection point to the electricity grid would by Seabruges. In the PROA scenario, the following assumptions apply (Palmers et al. 2004):

- Offshore wind farms and technology will develop further and investors' confidence is affirmed on the basis of international offshore wind developments.
- Infrastructure developments are made in Belgium during the period of 2010 – 2020 to allow the complete development of the designated area for exploitation of offshore wind energy. New methods for power management will be applied, allowing an optimised integration of large volumes of wind power into the Belgian energy system.

This designated area is optimally developed with highly improved technology, resulting in an additional capacity of 1000 MW in 2020 and an extra 1172 MW in 2025. (Palmers et al. 2004) Though, it remains rather unclear what the eventual consequences will be of the developed scenarios.

5.5 Decision-making processes and competencies

The procedure to obtain a licence to establish an offshore wind farm in Belgium involves a domain concession from the Belgian Minister of Energy as well as an Authorisation and Permit for the establishment and exploitation of the offshore wind farm from the Minister of Environmental Affairs.

Applications for a domain concession for offshore wind farms are directed to the Commission for Regulation of Electricity and Gas (CREG). After publishing and a competition procedure, the application CREG sends the application to a number of 'concerned departments'. On basis of the advices CREG carries out the evaluation and finally, the federal Minister of Energy decides whether the domain concession should be granted (Petersen and Neumann 2003a).

MUMM (Management Unit of the North Sea Mathematical Models) is a department of the Royal Belgian Institute of Natural Sciences and is responsible for marine environmental protection and resource assessment. The minister responsible for the North Sea is advised by MUMM on the decision of granting an environmental permit.

In addition to the environmental impact requirements associated with obtaining the licences and concessions, there is a general reference to the influence of offshore wind farm activities on other important maritime activities, such as shipping and fishery. It stipulates that the influence of the installation on other permitted activities in the sea area must be considered amongst the selection criteria used in the granting of a domain concession.

After granting of a licence or authorisation, the activities at sea will be submitted to a permanent evaluation by monitoring programmes and examination. During the exploitation phase regulatory

and procedural requirements consist mainly in providing information to the competent authorities regarding the fulfilment of requirements related to the conditions under which the granting of licences, authorisations and concessions were agreed. This would concern in particular the onshore and offshore construction and environmental requirements (Shaw et al. 2002).

5.6 Economic conditions for offshore wind energy

Although all renewable sources are given priority access to the grid, access in practice is not guaranteed at the moment, as a consequence of limited grid capacity in some (rural) areas. The basic costs associated with grid connection are met by the developer.

The federal government has guaranteed a fixed price for offshore wind power. The grid operator is obliged to purchase the electricity at a minimum price of 9 eurocents per kWh. This minimal fixed tariff is applicable for a period of 10 years from the time the electricity is first injected into the grid (Shaw et al. 2002).

Other financial and fiscal support is reviewed currently. Several changes in the legal and financial framework are expected during 2005 in order to make investments in offshore wind energy more economically viable.

5.7 Relevant stakeholders

The main governmental organizations that are involved in support and promotion of wind power are[3]:

- ODE Vlaanderen – Organisation for renewable energy
- Apere – Association of promotion of renewable energy in Belgium

The environmental organisations, such as Natuurpunt (Flemish association for nature conservation), Birdlife, Greenpeace, are generally in favour of wind power. However, they might oppose individual projects because of concerns of adverse impacts on protected nature and the landscape.

ELIA is the Belgian grid operator (TSO)[4]. It owns almost the totality of the Belgian high-voltage network. The CREG is a federal committee, responsible for the regulation of the market[5]. Its task is both to advise authorities and to secure that laws and regulations are properly followed and executed.

5.8 Obstacles in the development of offshore wind energy

Various offshore activities and nature protection considerations limit the available sea area for offshore wind energy to a one third of the Belgian Continental Zone.

Despite the spatial claims of these activities, available space is expected not to be a major impediment for offshore wind energy. A major current obstacle for the development of offshore wind energy is the available electricity grid, the imposed distance to the coast and the water depths. A static analysis demonstrates an available capacity of between 50 and 750 MW wind power (subject to conservative assumptions). However, this has not been confirmed by ELIA. A further increase would involve additional grid reinforcements or alternative routes for wind power (Van Hulle et al. 2004).

[3] This section will be ameliorated and completed soon.
[4] See www.elia.be.
[5] See www.creg.be.

In relation to the procedures with the grant of EIAs, the question how to judge significance of adverse impacts on the marine environment has created a lot of discussion and uncertainty (Petersen and Neumann 2003b).

5.9 Considerations

At the Belgian political level, the attitude towards offshore wind energy seems to be relatively positive, which is reflected by the fact that Belgium has established relatively substantial indicative targets for renewable energy in general. However, the first offshore wind farm (at Thornton Bank) has still to be implemented.

The main obstacles throughout the various project applications for developing offshore wind energy have been respectively visual impacts, nature protection issues in the marine environment, and particular grid issues. As a result of confusion regarding visual impacts of offshore wind projects in the territorial sea, all prospective planning of offshore wind energy will now take place in the EEZ.

In the past years, project developers in the Belgian part of the North Sea have run into various obstacles in the decision-making processes, while the framework for exploitation of offshore wind energy was still in a relatively early process of development. Up to now, the siting of project proposals was based on case by case studies without any limitation in the Belgian North Sea. The current framework for offshore wind energy has been improved considerably, as it designates a specific area suitable for offshore wind energy. To POWER, it is crucial to analyse how this designation has taken place and what the legal status is. This will be a determining factor for the development of offshore wind energy in Belgium.

5.10 References

C-Power (2005) *http://www.c-power.be/applet_mernu_nl/cartes/cartelayout.jpg*, last visited 28th June 2005

Fedra (2004) *Database of Belgian Federal Research Actions*, http://www.belspo.be/belspo/fedra/proj.asp?l=en&COD=CP/23, last visited 10th December 2004

Hulle, van F., S. Le Bot, V. Van Lancker, S. Deleu, J. Henriet, Y. Cabooter, G. Palmers, L. Dewilde, J. Soens, J. Driesen, P. Van Roy and R. Belmans (2004) *Optimal offshore wind energy developments in Belgium, Scientific support plan for a sustainable development policy*, Belgian Science Policy, Brussels

MUMM (2004) *Management Unit of the North Sea Mathematical Models*, http://www.mumm.ac.be/EN/Management/Sea-based/windmills_table.php, last visited 9th December 2004

Palmers, G., G. Dooms, S. Shaw, J. Neyens, C. Scheuren, P. André, F. De Stexhe and J. Martin (2004) *Renewable energy evolution in Belgium 1974 – 2025*, Scientific support plan for a sustainable development policy, Belgian Science Policy, Brussels

Petersen, H. en F. Neumann (2003a) *Offshore wind farms and designated areas*, workshop report, 14-15th January 2003, IMI, Brussel

Petersen, H. en F. Neumann (2003b) *National planning procedures for offshore wind energy in the EU*, workshop report, 5th June 2003, IMI, Brussel

Schelde Informatiecentrum 2005, *Windmolens in en rond het Schelde estuarium*, http://www.scheldenet.nl/?url=/nl/dossiers/windmolens01/index, last visited 28th June 2005

Shaw, S. M. Cremers and G. Palmers (2002) *Enabling offshore wind developments*, 3E and EWEA, Brussels

Appendix 5.1: Proposals for Belgian offshore wind farms

Table 5.1. Current Belgian proposals for offshore wind farms (MUMM 2004).

Project developer	Location	Number of wind turbines	Total capacity (MW)	Water depth (m)	Shortest distance to the shoreline (km)	Domain concession	Environmental permit
C-Power II	Thornton Bank	60	216-300	6-25	27	Concession granted on 27-06-03.	Requested on 17-06-03. Procedure stopped on 01-08-03. New permit requested on 10-10-03. MUMM advice submitted on 02-03-04. Permit granted on 14-04-04.

Table 5.1. Past Belgian proposals for offshore wind farms (MUMM 2004).

Project developer	Location	Number of wind turbines	Total capacity (MW)	Water depth (m)	Shortest distance to the shoreline (km)	Domain concession	Environmental permit
Electrabel - Jan de Nul I	Vlakte van de Raan	50	100	5-10	12,5	Granted on 27-03-02. Redrawn in 2005.	Granted on 25-06-02. Suspended since 25-03-03. New permit requested on 01-10-03. Redrawn in 2005.
SPE	Zeebruges harbour	14	28	-	7 wind turbines off the coast and 7 wind turbines on the break-water.	-	Requested on 12-11-03. Public consultation in January 2004. Denied on 14-06-04.
SPE-Shell	Thornton Bank	110	275-300	6-25	27	Unfavourable advice of CREG on 17-04-03. Denied June 2003.	-
Fina-Eolia II	North of Vlakte van de Raan	36	108-129	6-20	16,5	Favourable advice of CREG on 17-04-03. Denied June 2003 .	Requested on 06-02-03. Procedure stopped on 27-06-03
C-Power I	Wenduine-bank	50	115	5-10	5,1	Granted.	Denied on 05-08-02. Annulment procedure under consideration by the Council of State.
Fina-Eolia I	Vlakte van de Raan	33-40	100	5-10	8	Granted .	-
Electrabel -Jan De Nul II	Vlakte van de Raan	50 * 2 MW & 80 * 2½ MW	300	5-10	11	Granted	-

Chapter 6

Offshore Wind Farm Planning in the United Kingdom[1]

6.1 Background

The development of renewable energy in the UK has received major governmental support. This has been highlighted through the publication of the Energy White Paper in 2001 (Department for Trade and Industry, DTI), setting the ambitious target to generate by 2010 10% of electricity needs from renewable energy, with the aspiration to increase this percentage to 20% by 2020. It has endorsed both on- and offshore wind energy.

Many regions have endorsed these targets, and firmed them up by setting up regional targets. For example, the East of England has set its own renewable energy targets, aiming to reach by 2010 a 14% contribution of renewable energy (4% of which from offshore wind) to total electricity consumption in the East of England, increased to 44% by 2020 (27% from offshore wind) (EERA 2004, p.189).

In August 2004, the UK Government (Office of the Deputy Prime Minister, ODPM) also published Planning Policy Statement 22 (PPS22): Renewable Energy. This PPS, targeting onshore renewable energy, takes a very positive stand on renewable energy, demanding that regional spatial strategies and local development documents should contain policies to promote and encourage, rather than restrict, the development of renewable energy resources.

6.2 UK wind energy policy

While onshore wind energy applications are usually determined by local authorities, the responsibility for offshore wind farms lies with the national Government.

[1] The original chapter was compiled by Michael Moll (SCC), 16th November 2004. It has been revised by Michael Moll, 8th August 2005.

6.2.1 Onshore wind farms

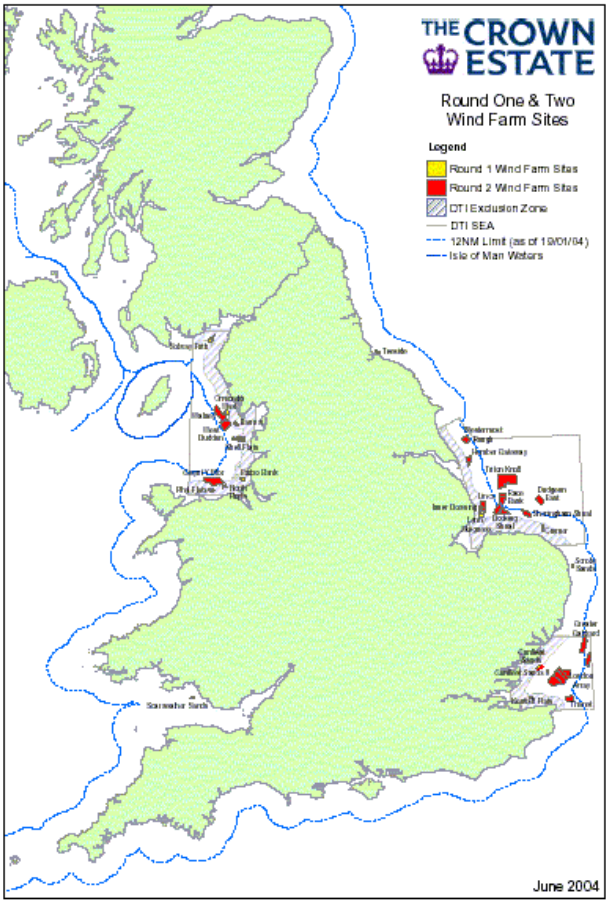
Planning applications for wind turbines are usually determined by local authorities, unless the wind farm is over a threshold of 50 MW, in which case it is determined by national or devolved (Scotland, Wales) government. In general, there is no site-specific wind farm allocation in English planning; planning decisions are made on a criteria-based approach, relating to location specifics, such as landscape character.

In most cases, onshore wind farm proposals receive vocal opposition, starting often long before applications are submitted. Main grounds of opposition are visual/landscape impacts, fear of noise and concerns for impacts on property values. While there is usually vocal opposition, surveys have found that the majority of the public is generally in favour of wind farm developments.

6.2.2 Offshore wind farms

Decisions on offshore wind farms are taken by national or devolved (Scotland, Wales) government (a detailed description is given in section 6.4). The Department of Trade and Industry and The Crown Estate are responsible for the development of offshore wind energy. The former deals with energy policies and licensing procedures; the latter is owner of the seabed.

Currently, 2 offshore wind farms are operational: Blyth Offshore and Scroby Sands, providing a capacity of 80 MW. Another 5 are consented, of which 2 are already under construction. These projects are expected to provide around 650 MW. A list of planned, constructed and expected offshore wind farms in the North Sea on the UK's East coast is given in appendix 6.1. A more detailed description of the offshore wind farms can be found in the appendix of the POWER Offshore Wind Supply Chain Study for the East of England, conducted by Douglas-Westwood Ltd. (2005) (available at www.offshore-power.net).



Map 5.1. Locations of round 1 and round 2 offshore wind farms (CE 2004).

Up to now, there have been two national rounds of UK offshore wind development, where the Crown Estate licensed offshore wind farms. Round 1 has been a demonstration round for the testing of technology, with wind farms in low water depths (<20m), <12km offshore, with a maximum of 30 turbines. The sites were brought forward by developers.

For Round 2, a different approach was taken, with three strategic areas being identified through a Strategic Environmental Assessment: the Greater Wash, Thames Estuary and the North West. The government invited tenders for wind farm licenses within these areas. In England, no offshore wind farms outside of these three strategic areas have come forward so far.

15 Round 2 projects were awarded a license from The Crown Estate in December 2003. All 15 licensed wind farms together could have a generating capacity of up to 7,2 GW, generating some 7% of UK electricity supply, or 18% of domestic requirements. The developers of these sites are now preparing full Environmental Impact Assessments, to be submitted with the planning applications. Several of the Round 2 proposals are located outside of territorial waters. To enable these projects to move forward, the current Energy Bill will need to be passed by Parliament to allow for a change in legislation.

Several Round 1 offshore wind projects have been financially backed up by capital grants of roughly 10% from the UK Government. No similar incentive has been made for Round 2. The main mechanism to support offshore wind farms (and renewable energy in general) is the Renewables Obligation, which will be described in section 6.3.

The following planning issues for some of the Round 2 offshore wind farms can be emphasised:

- Grid connection: In particular the Greater Wash projects will have the challenge to establish a grid connection point. Currently, there are no grid connection points at the local coast line. It is still unclear what the solution will be, and who will fund the connection.
- Birds: The RSPB has raised opposition to the second largest of the Round 2 wind farms, the Thames Array, being concerned about the impacts on birds. However, the concern is specifically for this wind farm proposal.

6.3 Renewable Obligation

The UK's Renewables Obligation (RO) places a legal obligation on all electricity suppliers to source an increasing proportion of their power from renewable sources. This percentage rises from 4,9% now to 15,4% in 2015-2016. Companies which fail to achieve their percentage have to pay a "buy-out" price for any shortfall, currently 3,05p (4,4 eurocents) per kWh. These payments are then re-distributed among those suppliers which successfully achieved their targets.

Renewables generators, including wind plant operators, receive Renewables Obligation Certificates (ROCs) from suppliers in addition to the market price for their electricity output. Because not enough new renewable capacity has been encouraged by the mechanism so far, ROCs are currently valued at about 5p (7 eurocents) per kWh, although suppliers are likely to offer a lower rate than this for a long term contract with generators.

The British Wind Energy Association says the RO has been successful in attracting new entrants and capital to the UK wind business, including offshore. A government review of the RO's progress is currently underway, but is not expected to make any fundamental changes to its operation. The results are expected at the beginning of 2006 (EWEA 2004).

6.4 Decision-making processes and competencies

Offshore Wind Energy developments in the UK are the national responsibility of Department for Trade & Industry (Energy Policy) and Crown Estate (owner of the seabed). Therefore, the decision-making is top-down, with local authorities only being consulted. As explained in 6.3, while the Round 1 offshore wind farm sites were brought forward by developers, for Round 2, the UK

Government established three strategic areas for wind farm developments, through a Strategic Environmental Assessment.

6.4.1 Crown Estate Agreement for Lease[2]

The Crown Estate owns the seabed out to the limit of territorial waters. Offshore wind farm development on the CE's marine estate requires the CE to grant a lease over a particular site. Similar considerations will apply in the REZ, although here the CE will issue a license to develop a wind farm rather than a lease (as the CE does not own the seabed beyond the territorial limit). In consultation with DTI, the CE will seek bids for site leases in rounds of leasing. The most recent round – the second – concluded in December 2003. For sites outside of the territorial waters, the current energy bill will have to be passed parliament to allow for leases.

The Agreements for Lease over Round 2 sites grant developers a development option for 7 years during which time the successful bidders have to obtain the relevant statutory consents. Once the necessary statutory consents are in place, developers will be able to convert their agreements for lease into full leases, allowing for the construction of the wind farms and associated infrastructure.

6.4.2 Legal consents

Table 6.1 presents an overview of relevant act concerning offshore wind energy. Other consents might be required, depending on the detailed proposal.

Table 6.1. Relevant acts (DTI/MCEU 2004, p. 9).

Electricity Act 1989 (EA) - Section 36 [Department for Trade & Industry - DTI]	For offshore wind power generating stations within territorial waters adjacent to England and Wales. The Energy Act 2004 extends the requirement for this consent to the REZ.
Transport and Works Act 1992 Order (TWA) [Department for Transport – DfT]	Provides an alternative route to the EA route above (with FEPA) for obtaining certain statutory rights necessary for the development of an offshore wind farm in territorial waters only. It displaces the need for EA and CPA consents.
Food and Environment Protection Act 1985 (Part II) (FEPA) – Section 5 [Department for Environment, Food and Rural Affairs]	For depositing articles or materials in the sea / tidal waters below MHWS (mean high water springs) around England and Wales including the placement of construction material or disposal of waste dredgings etc. Will be needed irrespective of whether the EA or TWA approach is used.
Coast Protection Act 1949 (CPA) - Section 34 [Department for Transport – DfT]	Construction under or over the seashore lying below the level of MHWS. The Energy Act 2004 disapplies the requirement for a CPA consent for projects in English and Welsh territorial waters and the REZ which have a section 36 consent granted after commencement of section 99 of the Energy Act. A CPA consent is not required if the TWA route is followed as navigation matters are dealt with as part of the process.

The DTI`s Offshore Renewables Consents Unit (ORCU) serves as a focal point for offshore wind farm consent applications, and promotes a coordinated and streamlined approach to administering the package of consents required by developers. The purpose of the ORCU is to be specifically responsible for handling applications for wind farm consents received under the Electricity Act (EA) and the Transport and Works Act (TWA). The Unit will also provide developers with a single liaison point for questions regarding the administration of applications, to clarify issues and to provide updates on the progress of all the required consent applications (DTI/MCEU 2004, p. 6). Additionally, a planning consent from the Local Planning Authority may be required for onshore elements of the offshore wind development, which may cause problems in connecting the wind farms to the grid.

[2] The information on consents derives from DTI/MCEU (2004).

6.5 Stakeholder groups

While a number of stakeholders are statutory consultees, others are important public opinion makers. The following paragraphs give first an overview of opinions of main stakeholder groups, both statutory and non-statutory, followed by a listing of the decision makers and statutory consultees.

6.5.1 Opinions of main stakeholder groups

General public perception

In general, there is a positive public perception to offshore wind farms. In some cases, even near-shore wind farms, being just 2 kilometres away from the shore, receive strong public support (e.g. Scroby Sands Offshore Wind Farm off Great Yarmouth). For some coastal resorts, offshore wind farms are also expected to have positive impacts on tourism – this is already proven by unexpectedly high visitor numbers to the Scroby Sands Information Centre in Great Yarmouth.

Opinions of Environmental groups

The majority of established environment stakeholder groups have a principally positive attitude to wind energy, unless they have serious concerns about impacts of specific wind farms on the environment. There is general acknowledgement that renewable energy is essential to combat climate change, which is a far greater threat to the natural environment. Organisations with this attitude include the Royal Society for the Protection of Birds (RSPB), English Nature, the National Trust, Greenpeace, Friends of the Earth and the WWF.

Opinions of Aviation Authorities/Ministry of Defence

Major objectors to wind farm developments, both on- and offshore, are the Civil Aviation Authority (CAA) and the Ministry of Defence (MoD). Both are formally consulted by wind energy developers at an early stage in the consenting process. Where a site falls within 30km of a safeguarded aerodrome, the CAA generally devolve safeguarding responsibility to the airport in question.

The MoD also operates a network of early warning radar sites, principally along the East Coast. At present holding objections are made to wind farm proposals within 74km of these facilities, subject to the undertaking of detailed assessments of potential impacts.

Opinions of other groups

There are several national campaign groups against wind energy; the best known is Country Guardian, as well as a new organisation called “Renewable Energy Foundation”. Other organisations take a more balanced, yet still critical approach, while keeping their main objective to safeguard the landscape of the rural areas; an example is the Council for the Protection of Rural England. However, opposition is considerably less for offshore wind energy than for onshore wind.

Most major players in the energy industry, including nuclear and oil and gas companies, have become involved in the wind energy, both on- and offshore, so while they try to protect their interests in selling energy from other sources, they accept the evolving offshore wind energy industry.

Finally, with regard to offshore wind energy, there are specialist stakeholder groups that take a very careful attitude to offshore wind farms, focussing on the protection of their interest. These include shipping industry, fisheries and yachting organisations.

6.5.2 Stakeholders involved in the decision-making process[3]

Decision-makers

- Crown Estate – owns the sea bed, issues licenses/leases to developers.

[3] The lists below (without the descriptions) are taken from BWEA (2002).

- Consents are necessary from Department for Trade & Industry, Department for Transport and Department for Environment, Food and Rural Affairs.

Statutory Consultees

- These are required to be consulted by the decision-makers, and their opinion and advice needs to be considered in the decision-making process. To a large extent, these are Government bodies.

Government Departments

- Department for Culture Media and Sport (DCMS)
- Department for the Environment, Food and Rural Affairs (DEFRA)
- Department for Trade and Industry (DTI)
- Department for Transport (DfT)
- Ministry of Defence (MoD) (puts in holding objections to wind farm proposals within 74km of early warning radar sites)

Environmental agencies

- Centre for Environment, Fisheries and Aquaculture (CEFAS): An Executive Agency of DEFRA and internationally recognised centre of excellence for research, assessment and advice, advising on fisheries management, aquaculture and environment protection.
- Countryside Agency: Government agency funded by DEFRA, advising on countryside issues.
- English Heritage: Government's statutory adviser on the historic environment, funded by the Department for Culture, Media and Sport (DCMS).
- English Nature: Government agency funded by DEFRA, championing the conservation of wildlife, geology and wild places in England.
- Environment Agency: Agency for protecting and improving the environment in England and Wales.

Other national organisations

- Civil Aviation Authority (CAA): Aviation regulator, advising the Government on aviation issues (not funded through Government). (Puts in a holding objection to any wind farm proposal closer than 30km to an aerodrome)
- Health and Safety Executive
- Maritime Coastguard Agency
- Radio Communications Agency
- Trinity House Light House Services

Local and regional authorities

- Local Authorities (County Councils, District Councils, Unitary Authorities)
- National Parks Authorities (if appropriate)
- Regional Development Agencies

Strategic stakeholders (non-statutory consultees)

This group can be defined as people who represent organisations, whether at a national, regional or local level whose support of or opposition to a development would be significant, or who have particular information or expertise to offer. Some of these have been particularly important for the consent process, e.g. the RSPB and the National Fishermen's Organisations. Non-statutory consultees include:

- Council for the Protection of Rural England (CPRE)
- Friends of the Earth
- Greenpeace
- Joint Nautical Archaeology Policy committee (JNAPC)
- Marine Archaeological interests
- Marine Conservation society
- National Fishermen's Organisations
- National Trust
- Nautical Archaeology Society
- Ramblers Association
- Regional coastal fora
- Royal Society for the Protection of Birds (RSPB)
- Royal Yachting Association
- Sea Fishery Committees
- The Wildlife Trusts
- Trade Unions
- WWF

Additionally, it is advised to consult a wide range of community stakeholders.

6.6 Considerations

The UK has shown considerable progress on offshore wind energy. A shift has occurred from individual site selection by the developers towards a more integrated approach of a Strategic Environmental Assessment, resulting in the designation of three preferred areas. In essence, the somewhat fragmented first phase has been replaced by a more decisive and ambitious approach, combined with a withdrawal of investment subsidies by the government for Round 2 projects. Despite societal resistance to onshore wind energy, the overall environment favours current offshore wind developments. Even more, some coastal resorts expect positive impacts on local economy and tourism; Scroby Sands is a good example of this.

The so-called one-stop shop procedure, comparable to the Danish situation, might be a step forward in streamlining approval procedures. The lessons learned from this Offshore Renewables Consents Unit (ORCU) and of the executed SEA can be of great value for POWER partners. On the other hand, the connection to the inland electricity network is expected to cause difficulties, as well as challenges to the progress of offshore wind energy, both in the UK and in the North Sea Region as a whole.

6.7 References

BWEA (2002) *Best practice guidelines: consultation for offshore wind energy developments*, British Wind Energy Association, London

CE (2004) *Round One & Two Wind Farm Sites*, http://www.thecrownestate.co.uk/34_r1_r2_windfarm_location_maps_04_08_13.pdf, The Crown Estate, last visited 18th January 2005

DTI/MCEU (2004) *Guidance Notes: Offshore Wind Farm Consents Process*, http://www.dti.gov.uk/energy/leg_and_reg/consents/guidance.pdf, Department for Trade and Industry/Marine Consents and Environment Unit, last visited 11th May 2004

EERA (2004) *Draft East of England Plan (RSS14)*, East of England Regional Assembly

EWEA (2004) *'Focus on UK'* in *Wind Directions*, November/December 2004

Douglas-Westwood Ltd (2005) *POWER Offshore Wind Supply Chain Study for the East of England*, on behalf of Suffolk County Council and POWER

Appendix 6.1 Summary of offshore wind farms

Table 6.2. Offshore wind farms before Round 1.

Project Name	Company	Status	MW (no. of turbines)	Area	Detailed Location
Blyth Offshore	AMEC Border Wind	Operational (since 2000)	4 MW (2 tur.)	North East England	1 km off Blyth

Table 6.3. OWF's Round 1 (only the wind farms in the North Sea).

Project Name	Company	Status	MW (no. of turbines)	Water depth	Area	Detailed Location
Lynn	AMEC Offshore Wind Power	Consented	≤108 MW (30 tur.)	10 m	Greater Wash (Lincolnshire)	5,2 km off Skegness
Inner Dowsing	Offshore Wind Power	Consented	≤120 MW (30 tur.)	10 m	Greater Wash (Lincolnshire)	5 km off Ingoldmells near Skegness
Cromer	Norfolk Offshore Wind	Consented	≤108 MW (30 tur.)	10-25 m	Greater Wash (Norfolk)	7 km off Cromer
Scroby Sands	Powergen Offshore Renewables	Operational (ca. 11/04)	≤76 MW (38 tur.)	<10 m	Greater Wash (Norfolk)	2,5 km off Gt. Yarmouth
Gunfleet Sands (1)	GE Gunfleet Limited	Consented (Construction in 2005)	≤108 MW (30 tur.)	10 m	Thames Estuary (Essex)	7 km SE of Clacton-on-Sea
Kentish Flats	Global Renewable Energy Partners	Under construction	≤129 MW (30 tur.)	<10 m	Thames Estuary (North Kent)	8,5 km off Whitstable/ Herne Bay
Teeside	Northern Offshore Wind	Application expected	≤76 MW (38 tur.)		North-East England	1,5 km off Teesmouth & Redcar

Table 6.4. Round 2 offshore wind farms in the UK North Sea area (All of these have been awarded a license from the Crown Estate, and currently prepare their application and Environmental Impact Assessment.).

Project Name	Company	TOTAL MW	MW < 12nm	MW > 12nm	Strategic Area
Docking Shoal	AMEC	500	500	-	Greater Wash
Dudgeon East	Warwick Energy	300	-	300	Greater Wash
Humber	Humber Wind Limited	300	300	-	Greater Wash
Lincs	Offshore Wind Power	250	250	-	Greater Wash
Race Bank	AMEC	500	-	500	Greater Wash
Sheringham	**Ecoventures**	315	315	-	Greater Wash
Triton Knoll	National Wind Power	1200	-	1,200	Greater Wash
Westernmost Rough	Total	240	240	-	Greater Wash
Greater Gabbard	Airtricity-Fluor	500	300	200	Thames Estuary
Gunfleet Sands II	Delatic	64	64	-	Thames Estuary
London Array	London Array	1000	1000	-	Thames Estuary
Thanet	Warwick Energy	300	300	-	Thames Estuary

Table 6.4. Additional project outside the Round 2 process (with £7m funds from DTI, Scottish Executive & EU).

Project Name	Company	Total MW	Water depth	Strategic Area
Moray Firth Beatrice Field	Talisman/SSE	Test phase 5 MW (extension 1000 MW?)	40 m	Scotland – Moray Firth (19 km off coast)

Chapter 7

Perspectives

Offshore wind energy is a major issue in European and in national policies on spatial planning, energy, economy and related discussions on regional development. It poses major opportunities and challenges to regional and national government and industry. The descriptions of the state of affairs in the 5 countries in the North Sea region have shown various ways of coping with this potential change. Despite the fact that the countries share the belief in the benefits of offshore wind energy, there is a diverse range of attempts, successes and failures in the development of offshore wind energy. Local and national circumstances have been determinative in the technical, societal, environmental and political process towards the actual erection and deployment of wind turbines, both on- and offshore. Denmark has shown a resolute and well-considered approach, which has resulted in the highest production of offshore wind energy in Europe, whereas The Netherlands and Belgium have experienced considerable delays in decision-making. Which factors have attributed to this and how are we to explain and assess the differences? Germany has exploited its inland wind potential vigorously, but is still waiting for the realisation of the first offshore wind farm. What caused this rather slow course of development, and, even more interesting, what can be learned from it?

Given the international scope of policies and directives, it is expected that international comparison and adjustments will proof to be a valuable and efficient method to cope with impediments and problems occurring both at project and national level. The presented chapters have provided an explorative basis for this, and have implicitly displayed current opportunities and challenges for the POWER project. This concluding chapter discusses some of the main issues.

7.1 Planning practices

The planning and building of offshore wind farms have proven to be subject to complex and complicated processes. Regarding possible locations for offshore wind farms, The Netherlands and Belgium do not explicitly designate preferred areas, contrary to Germany, the UK and Denmark. The Netherlands and Belgium exclude several areas reserved for other uses (e.g. excavation, shipping routes, Habitat or Birds Directive) whereas Denmark and the UK have done strategic environmental assessments in order to point out suitable areas for offshore wind activities. In this view, current developments in The Netherlands might well point at an upcoming shift towards another way of governmental guidance. Though, we cannot reasonably expect that Dutch government will designate preferred areas within short time. Instead, there is increasing interest in

a more pro-active approach, in which market players participate from the beginning. This approach is now being elaborated, as the handling of the 78 proposals is postponed and market and government deliberate on how to continue.

Although one could question the actual relevance of the difference between *exclusion-based policies* and *designating policies*, it illustrates the governments' attitude towards offshore wind energy. We cannot deny the progressive and unambiguous approach and its results in both Denmark and the UK. In this way, the steering philosophy of governments can play a crucial role in the progress of offshore wind farms. The upcoming studies are to explain to what extent specific governmental attitudes contribute to or impede offshore developments. As a result of the somewhat fragmented and uncoordinated planning regulations and attempts, Germany still lacks a clear view on both the North and Baltic Sea. Amelioration of this situation is expected, but for now it remains a fine example of the mismatch of government arrangements and policies.

The handling of new applications on a case by case basis might lead to insufficient attention to cumulative aspects of offshore wind farms. Here, we should think of not only cumulative environmental impacts (see section 7.3), but also the grid connection, use of cable routes and the effect on fishery industry. A case by case approach might decrease financial, administrative, technological and ecological efficiency. Therefore, the experiences in the UK and Denmark can be highly important in the course of POWER.

One way or another, in each country certain requirements apply, regarding the location of offshore wind farms. Since the same juridical conditions concerning property and legal rights in sea apply within the 5 countries, the next table can be drawn.

Table 7.1. Site conditions for offshore wind farms in the North Sea[1]*.*

	Territorial waters	**EEZ**	**Applications outside preferred areas**
Denmark	SEA designated 5 areas.	Allowed, no site conditions.	Extra costs for grid connection.
Germany	Allowed. Two built and two projects underway.	Yes, SEA and spatial planning ahead.	Allowed, but no guaranteed price if licensed after 01.01.2005.
The Netherlands	Not allowed. Except the NSW pilot project.	Allowed, no preferred areas.	No preferred areas
Belgium	Not allowed.	Allowed.	Former applications have been refused.
UK	Allowed, few projects underway.	SEA carried out. 3 preferred areas.	Only under exceptional conditions.

From a planning perspective, Germany shows a rather remarkable situation. In the 12 nm zone, spatial competencies are distributed among the *Länder*. Permits have to be obtained from several sector based authorities. However, the EEZ is the domain of Federal Maritime and Hydrographic Agency that grants the approvals and permits. Especially within the 12 nm zone, the combination of fragmented regional planning regimes and sector-based approaches results in rather disconnected requirements and conditions for the application of offshore wind farms. This procedure is bound to change, given the expert opinions on suggested changes from advisory committees,

In the other countries, competencies are with national government bodies only, mostly departments of trade, energy or environment. The general procedure for obtaining the necessary permits is somewhat comparable; possible explanations for this are the EU Directives that have to be met. In each country, an EIA is required (in The Netherlands, the requirement for several EIA in the same project is not unusual) as well as extensive consultation of a wide range of advisory councils and stakeholders. Furthermore, monitoring and evaluation of the first projects is common practise. In the EU policy workshop on offshore wind energy in Europe (Department of Economic Affairs and COD 2004), the so-called 'one-stop shop' system to the application procedure in Denmark and the UK came across. This instrument reduces the number of application procedures to one integral process, in order speed up and harmonise application procedures. The Dutch and Belgian procedures can potentially benefit from these kinds of incentives.

[1] This table is partially derived from Department of Economic Affairs and COD (2004, p. 28).

By means of the Integral Management Plan North Sea 2015 (IMPNS 2015), planning and coordination of activities on the Dutch part of the North Sea are guided by a new framework. This unique framework provides a spatial perspective, in which current and future uses are accommodated. Specific attention is paid to areas of high ecological quality, and the restrictions that apply (Ministry of Transport, Public Works and Water Management et al. 2005). Besides, the plan aims at reducing administrative complexity by presenting a so-called Management Platform. In this platform, management, licensing, maintenance and safety issues will be regulated.

Attempts to harmonising application procedures and the IMPNS 2015 can be of specific interest for POWER. Their actual contribution to the development of offshore wind energy will be analysed and evaluated.

7.2 Grid issues

If only environmental and spatial aspects are seen as the main challenges for the planning and realisation of offshore wind farms, a key issue is overlooked: the electricity grid.

All countries require one or several licences to connect wind farms to the national grid and to determine the cable route. The current capacity of the grid is crucial in this, and a possible major challenge. In Belgium, the risk of the low capacity of the current grid is already commonly known. Major investments will have to be done when the development of offshore wind farms really takes off. Agreements on the distribution of the costs have not been made to date, which poses crucial problems in the near future. Both planned wind farms in The Netherlands will be connected to Corus, a major steel manufacturer; a both creative and practical solution. Corus independently produces electricity and is connected to the national grid in order to be able to supply and purchase energy when necessary. Recent studies have determined that the Corus site and the Maasvlakte (Port of Rotterdam) are the most likely to be used for future wind farms.

The UK chapter also shows expected grid problems: the Greater Wash projects (one of the designated areas) will face a challenge to establish a grid connection point. Both solution and funding are still unknown. In the German case, the ‘grid situation’ is closely related to problems mentioned earlier. The *Länder* firmly object to proposed cable routes and grid connections, arguing that the environmental qualities of the coastal areas are significantly affected. In Lower Saxony one single cable route for all wind farms is insisted upon. This causes serious delay and poses potential technical problems. As a consequence, the feasibility of the current proposals might need to be reconsidered. The behaviour of the *Länder* seems rather paradoxical, as the allocation of onshore wind farms does not encounter comparable opposition. The German case clearly shows the conflicting interests between different government levels, as regulations of the *Länder* seem to thwart projects that are already consented at a higher level. The same goes for the Dutch experiences where environmental permits on land turned out to cause a major delay.

The electricity grid and grid connection could be important issues regarding the development of offshore wind energy. It needs no explanation that the location of possible grid connections on land can be highly determinant for offshore initiatives. An overview of the spatial distribution of possible grid connection points in the countries can be useful, accompanied by a discussion of the role and importance of this grid on the planning of offshore wind farms. Who owns the grid and is access and usage guaranteed? Are grid issues indeed major constraints and how can the different countries cope with them? What options and opportunities can be created by an internationally connected network of demand and supply? Relating issues can be the strategic upgrading of electricity networks and system issues; how are we able to equip the electricity network to cope with the fluctuating input of electricity? An international perspective on these issues might provide suitable responses.

The funding of possible upgrades in the grid can be of major importance to this discussion. Denmark already uses these costs as an instrument to influence location choice of applicants; the grid connection of wind farms outside the preferred areas is partially to be paid for by the developer of the wind farm. In the other countries, the grid connection costs are financed by the wind farm developer, whilst the reinforcement of the existing grid is funded by the grid owner.

7.3 Legal and organisational aspects of environmental issues

Several Member States have taken a rather careful approach with relatively few pilot wind farm developments and proposals. This approach provided the opportunity of a feedback of information and experiences to the decision-making processes. Meanwhile, the UK already has a considerable number of relatively small scale wind farm developments planned around its coast for which the EIAs have been assessed individually. However, the UK has also had a second phase of larger developments planned further offshore tied in with an SEA programme. Despite different approaches, the problems identified in both EIAs and SEAs for offshore renewable energy developments have been very similar for the five countries.

In the UK, Belgium, and particular The Netherlands the requirements for appropriate assessment – in accordance to the EC Birds and Habitats Directives – has opened up considerable discussions regarding offshore wind energy (CEFAS 2003). Additionally, there seems to be insufficient knowledge of how to integrate all the positive environmental impacts of offshore wind energy properly in the requirements for appropriate assessment. If this would be integrated in the assessments, it might reduce restraints on offshore wind energy development.

There is also indistinctness on the breadth of required studies concerning adverse impacts on nature reserves in the marine environment, including safety issues. E.g. currently there is lack of knowledge of how to deal with the requirements of adverse impacts on migratory sea birds, which are protected under the species protection requirements in accordance to the Birds Directive (Petersen and Neuman 2003). Other questions include how to mitigate and compensate for adverse impacts on sea birds, which follow international migratory routes at sea - this is particularly of concern in relation to the next round of offshore wind energy development in Danish waters.

Without a clear outline on how to address the legal and organisational aspects of environmental issues (including safety) in relation to planning and implementing offshore wind energy, it is rather difficult for a project developer to allow strategic decisions to be made whilst ensuring compliance with EC Directives at an early stage.

Recently, members of work package 1 have contacted COD (Concerted action for wind energy deployment). Previous experiences and the current agenda of COD[2] are closely related to environmental issues concerning offshore wind energy. Possible information exchange or collaboration will strengthen both research agendas.

7.4 Economic conditions for offshore wind energy

It is generally accepted that public support is needed to stimulate the development of renewables, and offshore wind energy in particular. Financial and fiscal incentives are the most common means to do so. Table 7.2 provides an overview; it should be kept in mind, though, that Belgian regulations are being revised and rather unsure for now.

Table 7.2. Policy instruments to stimulate offshore wind energy[3].

	Investment subsidies	**Fiscal incentives**	**Feed-in tariffs**	**Renewable obligation/ green certificates**
Denmark	X	X	X	
Germany		X (cheap loans)	X	
The Netherlands	(X)	X	X	
Belgium		X	X	X
UK	(X)	X		X

[2] See www.offshorewindenergy.org.
[3] This table is partially derived from www.worldwidegreen.com/europe.htm (last visited 29th January 2005) and from Dutch Department of Economic Affairs and COD (2004).

In the case of The Netherlands and Denmark, investment subsidies are provided in exchange for extensive monitoring and research programmes, focussing on environmental consequences of offshore wind farms. The investment subsidies in the UK have only been provided for the first round projects. The German and UK case show that it is possible to agree upon lower guaranteed prices (UK) or decreasing prices when long-term contracts are arranged (Germany). This should be interpreted as a sign that energy suppliers have a rather confident attitude towards the development of offshore wind energy. The main importance here is to make sure that offshore energy can cope with 'starting problems' on the energy market, in order to get a stable position and to be competitive.

7.5 Stakeholders

Generally spoken, the distribution of knowledge, power and instruments among parties are major conditions and characteristics of planning processes. In order to guide and ameliorate decision making, an insight to this distribution is crucial, as well as effective means to intervene in this process. As the previous chapters have shown, the discussions on both offshore activities and renewable energy are provided with complex, diverse and opposite interests and motives.

Regarding offshore wind energy, it is essential to be able to cope with this situation in an effective manner. The Middelgrunden project is a fine example; local citizens have participated extensively in the decision making process, resulting in a common interests and efforts. The Information Centre at Scroby Sands (UK) and the expected positive effects show how offshore wind farms and regional development can provide mutual benefits. Regarding offshore developments, private parties and (national) authorities depend on each other, as knowledge, competencies and (financial) means are indispensable, but dispersed. In the course of work package 1, elaborating on the stakeholder structure as provided in the quick scans will be of great value for the eventual design of the Decision Support System (DSS), and this can be used to work on the proposed guidelines.

7.6 In conclusion

This quick scan has provided an insight to national (policy) developments of offshore wind energy. Rapidly growing attention, from government, non-government parties and society, has resulted in various and diverse attempts to give direction to developments of offshore wind farms. In this study, five issues have been addressed that are in need of further analysis, within the course of work package 1. However, it must be kept in mind that these issues do not exclusively determine the upcoming months. The upcoming proposal for case study research is partly based on this compilation and will in itself be the basis for amendments on this compilation; both products will develop and interact in a circular way. The same goes for the development of the DSS, the information tool and other activities within, and outside POWER. In this manner, the progress of both work package 1 and POWER will prove to be well-balanced and in line with the stated aims and purposes.

7.7 References

CEFAS (2003) *Environmental assessment of renewable energy in the marine environment*, Ospar Workshop, 17th and 18th September 2003

Department of Economic Affairs and COD (2004) *Development of offshore wind energy in Europe*, policy workshop background document, 30th September and 1st October 2004, Egmond aan Zee

Ministry of Transport, Public Works and Water Management, Ministry of Agriculture, Nature and Food Quality, Ministry of Economic Affairs and Ministry of Housing, Spatial Planning and Environment (2005) *Integraal Beheerplan Noordzee 2015 (Integral Management Plan North Sea 2015)*, IDON, Den Haag

Petersen, H. and F. Neumann (2003) *NATURA 2000 implications for development of wind energy*, workshop report, 20th – 21th November 2003, IMI, Brussel