Offshore-Bürger-Windpark Butendiek

- **Environmental Impact Assessment**
- **Impact Assessment in relation to potential NATURA-2000-sites**

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On behalf of

ENGLISH SUMMARY

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Environmental Impact Assessment for the offshore wind park 'Butendiek'

1. Aim of the study

The Offshore-Bürger-Windpark-Butendiek GmbH & Co. KG (OSB), plans to erect 80, 3 megawatt wind turbines (WT) in the North Sea, approximately 35km to the west of the island of Sylt. The proposed site lies within the Exclusive Economical Zone of the Federal Republic Germany (EEZ) and at a sea depth of 20m. It is necessary to carry out an Environmental Impact Assessment (EIA) before a wind park with more than 20 WT and a respective output in excess of 10 kW or turbine height over 35m can be established (§ 3 UVPG in connection with Anl. 1, Pkt. 1.6.1). The requirement to carry out an EIA in this particular case originates from §2a in the marine facilities ordinance.

The proposed site lies within a important location for roosting birds (Important Bird Area), as well as inside a defined potential marine protection area. It is therefore necessary to consider whether the site is suitable enough to be registered on the NATURA 2000 network. It should also be examined as to whether the planning area is located within a potential nature reserve according to §38 in connection with §33 Federal Nature Conservation Law respectively within an „actual bird protection reserve". If this is the case, then it must also be considered whether this potential protected area can be adversely affected either by the planning on its own or combined with other proposals and running projects. According to the marine facilities ordinance it is furthermore necessary to examine, whether the establishment of a wind park adversley affects the safety and smooth operation of shipping traffic or endangers the marine environment, whereby stress is particularly laid upon migratory birds.

2. Structure of the Environmental Impact Assessment Study

The submitted Environmental Impact Assessment study has three particular subject areas. Firstly is an environmental impact assessment, followed by an assessment with regard to potential NATURA 2000 sites, and finally several in-depth analyses of specific subject reports, in which particular natural elements were investigated, described and evaluated. The in-depth analyses are concerned with various zones in the marine environment, where a particular need for research has been identified. These areas are :

- Seabed animals (Zoobenthos)
- Fish
- Wintering birds
- Migratory birds
- Marine mammals (Harbour Porpoise and seals)

The questions regarding shipping safety were dealt with in a study carried out by Germanischer Loyd. An additional investigation of the surface sediment was carried out using acoustic techniques (Side-Scan-Sonar) in order to describe the marine environment within the proposed site. A further parallel study dealt with how visible the wind park would be from the island of Sylt. The environmental impact assessment contains summaries of the

individual in-depth studies as well as further available sources, which were drawn up for the description and evaluation of the site in question and the expected effects of the proposed wind park.

3. Description of the proposal

The wind park planners propose to erect 80 wind turbines (WT) in total at sea in an area approximately 35 km to the west of Sylt. The planning area covers 30 km^2 and the water depth is around 20 m. The technical characteristics of the WTs to be used are currently not known in great detail as the planned 3 MW machine is not yet available on the market. The height of the whole WT will be between 120 and 150m. A transformer station platform in the middle of the wind park will also be erected in addition to the WTs. The transportation of the produced energy will be via a 110 kV three-phase current over Sylt (transformer station in Keitum) to a 380kV mains in Böxlund (Schleswig-Flensburg). The authorisation for a cable at sea is applied for through a separate procedure.

4. Description of the environment

The environment in the area potentially affected by the proposed wind park was described and evaluated in accordance with the individual in-depth analyses. The choice of the individual natural elements for analysis takes both the resulting effects of the project as well as the sensitiveness of the natural elements concerned. The significance of the planned site for the respective natural elements was evaluated on a uniform 9 grade scale. The natural elements with an above average level of importance (values 6-9) are of particular significance with regards to the environmental impact evaluation.

4.1 Plancton

Phytoplancton (single or several celled algae or cyanobacteria) is the most important primary producer in the marine environment. It normally develops a multitude of blooms of individual algae groups throughout the year. A dinoflagellate bloom follows on top of a diatom bloom in spring and then into autumn come more smaller blooms.

The name zooplancton is given to those creature that are not capable of effectively moving forwards against the current. The biomass of zooplancton in the North Sea is dominated by copepods. The importance of larvae from seabed animals (meroplancton) increases as one moves closer towards the coast. An instable plancton occurance is to be expected in the planned area due to the strong mixing of the water bodies and the natural tidal cycles.

4.2 Zoobenthos

The investigations into benthic communities were carried out by the Alfred-Wegener-Institut of Polar- and Marine Research, Wadden Sea Research Station, List in a separate in-depth study. The macrobenthic communities of the wind park site from Butendiek were investigated using grid sampling in several locations; in one alternative area on the southern border of the original site and then in several reference areas.

The investigation area is divided into two with regards to the sediment composition. The surface sediment in the northern section (where the wind park would be erected) ranges from coarse sand to gravel and its spatial distribution is heterogeneous. In the southern section (alternative area), however, is relative homogeneous fine sand. Under water video showed seabed ripples in the northern section of up to 0.5m in height and of up to 10cm in the southern section in the investigation area. This can serve as a relative measure for the intensity of natural sediment exchange. The investigations into surface sediments using Side-Scan-Sonar during February 2002 confirm these results. The investigations using side-scan-sonar also showed, that no cultural goods occur on the seabed.

The coarse sand northern section of the area under examination is populated by a *Goniadella-Spisula* community. This community is rare in the eastern part of the German Bight and is therefore valuable. Fine sand populated by *Tellina-fabula* communities is dominant in the southern alternative investigation area. This is the most frequently found marine community up to a depth of 30 m in western Nordfriesland. The species composition corresponds to the specifications given in the literature. The wealth of species in the *Tellina fabula* community found in the investigation area corresponds to the values given in the literature. We found, however, an unusually high number of species in the *Goniadella-Spisula* community. This is also valid for the density of species. From the 149 species that were found and identified, 5 were classified as endangered and a further 5 as potentially endangered. In addition, one specie was present that was on the pre-warning list and a further specie was known to be geographically restricted. The specific conservation status of the species found in this investigation were considered and evaluated.

4.3 Fish and moving macro fauna

The investigations into fish were carried out by the Alfred-Wegener-Institut of Polar- and Marine Research, Wadden Sea Research Station List and produced in a separate in-depth report. The composition of fish species and moving macro fauna (Nekton) was recorded in an alternative area on the southern border of the proposed wind park site as well as in several peripheral locations that come into question as reference areas. Samples were taken at these locations using a beam trawl (width 4m, height of fishing capability 45cm above the ground) and a towed net (fishing capability: width, ca. 25m, height ca. 1m above the ground). 19 fish species were identified in total. This excluded gobiiden species that have not yet been identified. No endangered fish species have as yet been found and identified through this research. The economic importance for the fishing industry also seems to be small as it was mostly concerned with juvenile, smaller fish, nevertheless, commercially important species were also taken into account. It is possible to see this as an influence of fisheries due to the high presence of fisheries in the whole area. The abundances of fish appear to be rather small in comparison to the rest of the North Sea.

4.4 Roosting Birds

The proposed wind park site lies in the eastern part of the German Bightbetween central North Sea water and fresh water from the Elbe estuary whose composition has been altered.

The seabird community provide a transition between species which are orientated towards open sea. Their easterly distribution border is found in this area (Fulmar, Razorbill, Guillemot). The second group are sea birds orientated towards the coast (gulls, terns) which are rarely found to the west of the proposed area. Within the framework of the investigations, roosting birds were recorded from ship and aeroplane counts. The investigation area for the counts conducted from the ship was 384 km². Aeroplane counts were able to survey an area of 2500 km², which was much larger than the proposed site itself.
11 516 seabirds from 27 species were recorded during 24 ship counts between December 2000 and May 2002. 66 970 seabirds from 21 species were surveyed from aeroplane counts. 15 species appear regularly in the proposed Butendiek wind park site. The proposed area is classified as insignificant in the population evaluation for all but 4 of the species that appear within it.

The sea to the west of Sylt serves as an important roosting place for divers in spring between March and April. The medium average density of divers in March and April arising from the ship counts from 2001 and 2002 is 1 diver/km². This value is under the average density for the IBM eastern German Bight which is 1.9 diver/km². The highest density of 1.9 diver/km² in the proposed area was reached during counts on 2 specific days. The impact assessment follows the precautionary principle and is thus always based on the highest values. It is impossible to define any stable concentration areas of divers within their distribution area west of Sylt, which extends at least 90 km to the west of the island and beyond a water depth of 40m.

The eastern German Bay, just like the adjoining eastern section of the Wadden Sea, is of international importance as a wintering site for Common Gull. Over 1% of the north western European population winter in this area. The eastern German Bightis not evenly used by gulls. The specie has a strong relationship with the coast and the population density decreases as the distance from the coast increases. Within the proposed wind park site is where the Common Gull reaches the westerly distribution limit for the eastern German Bay.

Little gulls winter in smaller numbers within the proposed area. In April 2002 strikingly high numbers of Little Gulls were seen. This can be expected due to the migration through the area at this time. 0.2 Little gulls/km² stop over here in winter and in spring the average is 0.7 Little Gulls/km². The aeroplane counts show that the centre of distribution lies near to the coast. Nevertheless, Little Gulls were both frequently and regularly sighted as far out as ca. 62 km from the island of Sylt.

The area has a potential importance for terns (Sandwich Tern, Common-/Arctic Tern). The terns are widely dispersed and occur in insignificant numbers after the breeding season.

4.5 Bird migration

The birds that migrate over the North Sea can be divided into 3 categories:

- Migration by seabird species which have either breeding or wintering areas within the North Sea, such as Gannet or divers. They constitute the largest number of migratory seabirds;
- Migration by water birds with respect to roosting areas in different coastal zones in the North Sea. Many geese, duck and wader species roost and winter in large numbers in the coastal waters or on the main land close to the North Sea coast;
- Migration by land birds, which cross over the North Sea as one of the obstacles along their migration route.

It is possible to build the following picture of bird migration in the north eastern part of the North Sea with reference to the available literature: A steep gradient exists for day-time migration of sea and water birds showing a decrease in migration intensity moving from the coastal areas towards the open North Sea. A steep gradient showing a decrease in migration intensity can also be seen moving towards the north west at least for migrating water birds. The migration of landbirds in the German Bight predominantly nocturnal and is part of a wide migration front taking up a large amount of space, to such a degree that one cannot expect to find variations in migration intensity in the north eastern German Bight aside from the coasts.

Radar and systematic migration observations as well as nocturnal acoustic investigations were carried out to ascertain the bird migration occurring in the proposed site. The dominant species during day-time migration were various gull species, and Meadow Pipits. Greylag Geese, Skylark and Chaffinch can also be added to the list from the roosting bird counts and Redwing, Song Thrush, Blackbird, Meadow Pipit and Black-headed Gull can be added from the nocturnal acoustic investigations. Most land birds migrated in a southerly to westerly direction when migrating in autumn. It was assumed that the starting points for the nocturnal migration of land birds were in southern Scandinavia (autumn migration) and in the Benelux States (spring migration)

The flight height of the migratory birds during autumn migration was distinctly higher than in spring. Bird migration took place at altitudes up to 3000m. Flight heights of up to 1500m were recorded during the autumn migration and up to 900m in spring. Flight height was distinctly lower than before after a period of rain and the migrating birds then were predominantly concentrated at heights under 450m.

4.6 Marine mammals

The planned site lies within a large sea area to the west of Jütland where the densities of Harbour Porpoises are relatively high. Marine mammal counts were conducted from both aeroplane and ship. In 2001 the population density of Harbour Porpoises showed a particular pattern over the year with low values in the winter months only reaching a maximum of 0.5 or less porpoises/km². In spring and summer, the values were distinctly higher. Highest densities with a value of 3.7 creatures/km² occurred in May. Spring numbers in 2002 indicated again a seasonal increase in density. We presume that there is a particular

tendency for Harbour Porpoises to immigrate into the a large sea area to the west of Jütland and also into the site under investigation.

It can be established from data collected from the aeroplane and ship counts that Harbour Porpoises are widely distributed and no stable concentrations could be identified. Porpoise numbers in the planning area do not differ from the surrounding waters. It was established that the proportion of mother and calf couples west of Sylt was much higher than could have been expected when the results for the entire investigation area were compared with those from previous years. The high density of adult Porpoises and mother and calf pairs is not only limited to coastal waters, but in fact extends to the western border of the investigation area (90 km west of Sylt). As yet it remains impossible to define the extent of the calving ground to the north and south.

It is worth mentioning that seals were sighted in the spring months from March to June 2001 and in March to April 2002. The highest density was in May 2001 with a value of 1.5 creatures/km². The density is always much lower than 0.2 Porpoises/km² outside the spring months.

5. Evaluation of the environment

The importance of the planned area for the respective subjects of protection that have been taken into consideration were evaluated using a scale with 9 classifications. The natural elements with an above average importance (classifications 6-9) are of particular significance in evaluating the environmental impacts. A few have been highlighted below:

Class 9: *"important for the whole North Sea and North Atlantic"*

The proposed area of the Butendiek wind park, is a part of an important wintering ground for divers (Red-throated Diver and Black-throated Diver) and has been graded in the highest classification as of international importance (grade 9).

The air space above the proposed area was also ranked as being in the highest classification due to the migrating Divers and Pink-footed Geese (Spitzbergen population) that fly through the area. The reasons behind this are that the high roosting populations of Divers at present indicate corresponding high migration numbers. The reason for Pink-footed Geese, of which only 80 specimens were seen during the counts conducted in the area, is that theoretically at least, a high importance can be assumed because of the location of the planned wind park in relation to the wintering areas of this specie along the North Sea.

Class 8: *"important for the German Bay"*

The planned area has been graded with class 8 for Harbour Porpoises because of its position within the area. Its importance exceeds the regional level in numbers and as a calving ground. No stable concentrations were identified in the 2500 km² investigation area, thus an equal importance for all parts of this area can be assumed.

The proposed location is also important as a wintering ground for Little Gulls, which are roosting and passing through the area. It lies inside the wintering ground IBA eastern German Bight, which is of international importance for this specie. This is nevertheless to the west of the core distribution area.

Class 4: *"important for the water body in front of Sylt"*
The proposed area has been classified as important with regards to the landscape scenery. The important factor here is the visual appearance from the west coast over to the island of Sylt. The present landscape is without any technological alterations and one can look out to the horizon and nothing stands in the way.
Regarding the seafloor, coarse sands and large stones have to mentioned, which are relatively rare in the North Sea and may be valuable as a habitat for fish. The planning area includes larger areas of the pisa moraine where these types of sediments are found.

Class 6: **"***important for the planned site and* ***ist*** *surroundings"*
The occurrence of coarse sand as well as gravelly sections with boulders inside the proposed area are prominent for fish. These are not often found in the North Sea but can be important habitats especially for seafloor fish. The coarser sands and the gravel substratum with boulders in the Pisa moraine area is also more important for the benthic communities than the sandy substratum in the remaining part of the investigation area.

The remaining environmental elements were given either a class **5** ("potential importance", namely the characteristic quality is wide spread, respectively the proposed area is possibly less important for the natural element) or **4** (unimportant, meaning the characteristic quality/the proposed area is not worth nominal importance for the natural element)

6. Expected considerable negative effects
The considerable negative environmental effects coming from the proposal were investigated and represented. The extent of the effects and risks were evaluated using a graded scale with 5 classifications with regards to the respective outputs and functions that were taken into consideration.

Grade 5: *"very high risk and very high intensity of negative effects"*
It is not expected that the proposal should bring about negative effects with a high impairment intesity or high risk factor.

Grade 4: "*high risk and high intensity of negative effects"*
It is not expected that the proposal should bring about negative effects with a high impairment intesity or high risk factor.

Grade 3: "*intermediate risk and intermediate intensity of negative effects"*
An intermediate risk and intermediate intensity of negative effects is present for wintering Divers on the basis of the predicted displacement which would mean the birds would be

forced to move out of the planned site during the operating phase of the wind park. As divers respond very sensitively to disturbance from ships it was assumed, that divers will be completely displaced from the wind park. The impact is however regarded as low, because it affects only a very small part of the wintering area of these species.

It has been established that a small to intermediate adverse risk would be present for Harbour Porpoises throughout the period taken to build the WTs. It is expected, that the foundation of the piles, which will last about 1.5 hours each, will create a strong disturbance to marine mammals although a direct damage may only occur in the direct vicinity of the working ship. Concerning the operation of the wind park, danish investigations indicate only very limited disturbance to marine mammals.
In addition to this, the change to the landscape (i.e. view from the island of Sylt; the closeness of the park e.g. seen from a boat) would produce an intermediate negative effect.

Grade 2: *"low risk and low intensity of negative effects"*
A low level of adverse impacts were predicted for the following outputs and functions:
Building requirements, short term adverse effects on ground creatures, fish and birds, as well as on the seabed,

- Disturbance from emissions (sound and light) and "silhouette effect" during the operational phase for marine mammals and birds,
- Birds being hit on the buildings and a barrier effect for migrating birds,
- Turbulence and hydrological changes (e.g. relationships between currents in the area close to the wind turbines), which would also affect the natural elements of soil and water,
- Fisheries would be adversely affected through the creation of non-fishing zones.

Grade 1: *"no negative effects"*
No more adverse effects were determined for the remaining outputs and functions of the environment.

The effects on bird migration, which as previously represented, only affect individual species in small sections of their distribution area or migration route and lead only to low adverse effects on the populations concerned. They do not represent any danger to bird migration with regards to the marine facilities ordinance.

The evaluation of the environmental impact assessment is based on the importance of affected goods and functions as well as the intensity of the arising negative effects and the probability these will occur. It can basically be said that low to intermediate problems and risks are not regarded to have considerable negative effects. Due to the predominantly low intensity of negative effects of the proposed wind park, despite the indisputable high conservation values for the proposed site, the proposed wind park can be classified as ecologically compatible and not harmful to the environment.

7. Summarised evaluation of the impact assessment with the aims of NATURA 2000

Through the planned proposal there will be inevitable disturbances and negative effects for species listed in appendix II EU habitat directive and appendix I EU bird directive. The results of the specialist evaluation of these effects is that the negative effects will not considerable effect the protection and conservation status of a potential protection area (following EU habitat directive), even when they are combined with other plans and projects. It is therefore compatible with regard to Art. 6 EU habitat directive.
There are no considerable effects to worry about in the IBA as a potential EG-bird protection reserve regarding the survival of diver species or their reproduction within their distribution ranges. The proposal is thus compatible with Art. 4 EU bird directive.

8. Summary of the Risk Analysis
Contract Holder: Germanischer Lloyd

The aim of the risk analysis was to show how shipping traffic is influenced by the running of the planned wind park. The study shows possibilities to learn about the potential dangers presented by wind turbines as well as about safety measures. The risk from various scenarios (undesired events) was determined in the analysis by specifying the frequency and severe damage incurred from such events. The risk analysis concluded with the evaluation of calculated risks. This took into consideration the risks from other offshore features as well as possible risk minimizing measures.

The starting points for the study were up-to-date information about the planned wind energy park (e.g. position, area, number and arrangement of the wind turbines, maintenance and safety concept), as well as the construction dates for the planned wind turbines and the transformer station. Alongside these was the heading sea area, under which came climate, weather and hydrology, shipping traffic, air traffic, other offshore features (e.g. platform, pipeline, sea cable, wind energy parks) and coastal protection including salvage and emergency rescues at sea.

Future development in ship technology and shipping traffic as well as intentional or grossly reckless handling of the handling of a ship, such as possible neglect by those people who are responsible for the safety of the ship in the concerned sea area were not treated in this analysis. Further issues not taken into consideration include war and criminal action, events occurring in connection with aeroplane accidents, ships colliding with each other, as well as yachts and vessels creating a water displacement of under 500 t.

A number of qualitative and quantitative analysis techniques were used for the assessment of the risks connected with the wind park. A multitude of conceivable dangerous situations were calculated with the help of a qualitative analysis technique and the situations/events after the largest danger potential were filtered out. It was then estimated that the possible collisions between ships and the various wind park structures were the most dangerous. The qualitative and quantitative analysis results can be summarised as follows. A quantitative

analysis was carried out for the risks of possible collisions between manoeuvrable ships and wind turbines as well as between unmanoeuvrable ships and wind turbines. The results of the quantitative analysis are summarised in the following table:

Scenario	Frequency [1/year]	Consequence [$t_{Öl}$ /collision]	Risk [$t_{Öl}$ /year]
"Collision of a manoeuvrable ship with a wind park structures"	5.531E-16	5.35E+01	2.960E-14
"Collision of an unmanoeuvrable ship with a wind park structures"	3.882E-04	3.46E+02	1.345E-01
Total	3.882E-04	3.47E+02	1.346E-01

The quantitative analysis resulted in an expected collision frequency from 3.882E-04[1/year]. This frequency represents an average time of 2576 years between two collisions. An average amount of released pollutants of was calculated at 347 [t] for every collision event. Ship fuel and the oil carried onboard oil tankers, as well as the pollutants from the wind turbines were considered as being pollutants. The combination of frequency and resulting consequences produces in a risk of 1.346E-01 [t] of fuel and/or oil per year.

The results show that a considerably higher risk value was calculated for the scenario "collision between unmanoeuvrable ships with wind park structures" in comparison to the scenario "collision between manoeuvrable ships and wind park structures". It can therefore be said that the greatest danger for both the wind park and the environment is presented by drifting, damaged ships.

The cumulative effects of further comparable and possible projects (Dan Tysk, Amrum Bank, Winkra, and in the wind park currently under construction at Horns Rev) were determined in the risk analysis. Considering the assumptions made in the risk analysis and taking cumulative effects into account, the frequency of collisions is increased to an average time of 437 years between two collisions. An average amount of pollutants in the event of a collision was calculated at 347 [t].

It was shown that in comparison with the results from the risk analyses of other wind parks, the calculated collision frequency was considerably lower for the Butendiek park. Furthermore, the calculation results for the qualitative analysis presented in risk matrix showed, that these results along with the risks connected with the wind park could be considered as acceptable.