

Vattenfall

Vesterhav Nord windfarm

ESPOO

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1. Non-technical summary

In 2012 the Danish Parliament approved with heavily weighted political support the 'Danish Energy Agreement'. The agreement established a framework to ensure a larger proportion of Danish energy consumption will be covered by renewable energy in future. In accordance with the new agreement 450 MW of offshore wind turbines were to be installed in coastal areas. This figure was later reduced to 350 MW and the State committed to designate six sites (concession sites) for the new wind farms. In 2015 Vattenfall Vindkraft A/S was successful in tendering for the construction, and operation of the wind farms Vesterhav Nord, and Vesterhav Syd. This EIA report concerns Vesterhav Nord offshore wind farm.

Vattenfall is planning to erect 21 new wind turbines, along with submarine cabling at the Vesterhav Nord site which is about 5.5 to 8.4 km off the West Jutland coast at Harboøre (see Figure 1-1). This report (an Environmental Impact Assessment Report) describes the environmental impacts from this project. The report also offers information about the measures Vattenfall has taken to mitigate the environmental impacts. The general public and a number of neighbouring countries were asked to propose any specific aspects or subjects they wished to be included in the EIA report. As a result of this engagement the Danish Energy Agency expressed their opinion as to which subjects the report should cover. To ensure full compliance the final report will be issued for public hearing. Once all due process has been completed the Danish Energy Agency decides whether to permit the project, and on what terms.



Figure 1-1. This figure shows the layout pattern for the Vesterhav Nord offshore wind project. It also shows the concession site boundary in which Vattenfall is allowed to erect the turbines. This is also the area where a considerable number of environmental surveys have been conducted (the concession area/the survey area).

In 2015 a report was produced to determine the environmental impacts for the worst-case location of a wind farm within the concession area for Vesterhav Nord. The concession area was also termed the survey area because the environmental surveys focused specifically in this area.

The Danish Energy Board of Appeal decided that for Vesterhav Syd an assessment should be made covering the specific offshore project and not just a worst-case scenario which, resulted in the new environmental impact assessment of the offshore Vesterhav Nord project. The new assessment of wind turbines and submarine cables includes relevant information from the previous report, along with other new and publicly available information. In addition, new surveys and calculations have

also been conducted. It was deemed that the original assessment of the land-based facility complied with the statutory provision so consequently, this report does not address that.

Vattenfall has analysed various wind turbine layout patterns within the survey area. The objective has been to minimize the environmental impacts from the project. Wind turbine type and electricity production have also been important factors for the identification of a layout pattern. The chosen pattern consists of 21 wind turbines in a straight row along the western border of the survey area. The distance of the project from the coast helps ensure that noise from the wind farm stays within the threshold values for land-based noise. The distance also makes the wind turbines less conspicuous compared to positions closer to the coast. The turbines will also be visible for fewer days a year when compared to a site positioned closer to the coast. Furthermore, it was identified that a single row of wind turbines visually less invasive when compared with other layout options considered by Vattenfall. The chosen pattern also takes into account various environmental factors such as local bird life, ships at sea and heritage remains in, and on the seabed. The project delivers high energy yield with a low CO₂ footprint.

Two main alternative layout patterns were considered against the straight row formation. It was considered by Vattenfall that these two alternatives were characterised by more disadvantages than advantages when compared with the chosen project.

Alternative one is comprised of a row of wind turbines positioned along the north-eastern border of the survey area and a row positioned along the south-western border of the survey area. The impact of alternative one on the other environmental factors is found to be larger than, or comparable to the chosen project layout and/or alternative two. Alternative two is comprised of two rows of wind turbines in the north-eastern part of the survey area. In comparison to the chosen project alternative two features more wind turbines positioned closer to the section of coast with the largest population. However alternative two features fewer wind turbines close to countryside that has a higher number of hill tops and culturally significant/historical sites. The layout of alternative two is not ideal when compared to the chosen project as the distance to the shore is shorter. This gives the wind turbines a more pronounced appearance as they will be easier to see. The short distance also increases the noise heard from the shore. On the other hand, in alternative two the wind farm will not extend as far along the coast as it will for the chosen project layout. The impact on birds for alternative two as well as the number of heritages remains (including shipwrecks), is found to be slightly higher when compared to the chosen project layout.

Failure to complete the project will have no impact on the environment. On the other hand, it will not contribute to a reduction of greenhouse gasses and to Denmark's goal to increase the use of renewable energy sources.

The assessments reach the following conclusions concerning the environmental impacts:

Hydrography, water quality and seabed

While excavating the seabed prior to installing wind turbines and cables some sediment (sand and other materials on the seabed) will be dispersed. This will also be the case when the wind turbines and cables are removed (during the decommissioning process). Some of the sediments will be subject to dispersal via currents and movements in the water column whereas others will settle again on the seabed. According to the analysis the volume of affected sediment from Vesterhav

Nord is found to be smaller than the volume that will naturally be dispersed by wave action and sea currents in the area and along the coast.

All other potential impacts to the seabed, hydrography and the water quality are found to be insignificant or none. Among these are some of the following: Dispersion of the nutrients nitrogen and phosphorous, which could potentially be in the seabed; dispersion of pollutants from the seabed or from Vesterhav Nord; changes to wave action and sea currents; and addition of hard substrate (wind turbines and foundations) to the seabed.

Natura 2000 and Annex IV species

The Natura 2000 sites are a European network of specially protected nature areas. They are intended to protect special living areas for animals and plants (habitats) or special bird species (bird protection areas). As a result of such legislation underwater noise from the pile driving operations for the wind turbine foundations will be dampened so as to ensure that porpoises and seals in the vicinity will not be affected beyond the thresholds permitted according to Danish guidelines.

It has been assessed whether the Natura 2000 areas may suffer significant impact from the project (known as a materiality assessment). According to the assessment the impact on the Natura 2000 areas will not be significant because of the long distance to the wind farm.

The so-called Annex IV species are plant and animal species enjoying specifically strict protection. The impact from the project on the Annex IV species porpoise and bat has been assessed, focusing on the so-called ecological functionality of these areas (the overall living conditions the area offers a species). As part of the project, the underwater noise from the pile driving operations for the wind turbine foundations will be dampened so as to ensure that porpoises and seals in the vicinity will not be affected beyond the thresholds permitted according to Danish guidelines. According to the assessment the project will not impact on the overall ecological functionality of this area for the Annex IV species (porpoise and bat).

Plants and animals on the seabed

No plants were observed on the seabed in the area that may be affected by excavation operations or sediment dispersion. The impact on seabed animals is found to be modest to insignificant/none. These animals have adjusted to regular, natural sediment changes and periods where there is much sediment in the water. Besides, the construction period is relatively short. Once construction has been completed the benthic animals can migrate from the surrounding areas again. The same also applies when the turbines will be dismantled. The overall assessment points to no significant changes to the composition of the benthic animal communities.

Fish

Surveys of the local fish community identifies many different fish species. The noise from pile driving operations for the turbine foundations will result in a minor impact on the fish. According to the assessment this noise will be of a short duration, and the fish will have ample opportunity to move away from the area. Furthermore, the noise will be dampened which is positive for the fish. The noise generated during the wind farm operating period will be more long-term but not as high. Consequently, there is found to be no impact. In addition, the impact to fish from sediments dropped during the construction phase is found to be insignificant due to the limited volume. The turbine foundations, and in particular the protection around the foundations (the

layers of rock), will be covered with seaweed thereby creating hiding places for several fish species and ensuring a positive outcome for the fish. A magnetic field will be generated around the submarine cables which could potentially impact the fish. Such an impact is found to be negligible as the strength of the magnetic field is lower than the natural magnetic field found in the area.

Birds and bats

The impact on roosting birds has been assessed for the project, which includes disturbance and displacement as well as minor changes to, and loss of living sites during all project phases. The impact on divers (red and black throated diver) is found to be modest. The divers are some of the local bird species most sensitive to noise. Considering the number of birds, the impact as a consequence of collisions is found to be modest for the common gull during the operating phase, and insignificant during construction and decommissioning. For all other bird species, the impact resulting from collisions is found to be insignificant. The assessment is based on the presence of the species and their flying height.

The collision risk has also been assessed for migrating birds. For all of the species analysed the risk is found to be modest during the operating phase, and insignificant during the construction and decommissioning phases. Wind turbines may also generate a barrier effect, meaning that birds would have to circumvent the turbines when travelling. For all migrating species this effect is found to be insignificant.

Bats may be attracted by insects gathering around the wind turbines during periods of calm winds and high temperatures. Overall, the impacts on bats during the operating phase are found to be modest. The assessment is based on the relatively long distance from the turbines to the coast, and the low density of bat species along the coast of Western Jutland. Also, to note the number of days with calm winds and dry weather is small.

Sea mammals

The sea around Vesterhav Nord is home to a number of sea mammals including, harbour porpoise, grey seal and harbour seal. Porpoise are only affected from within the water. Seals may also be affected at their land-based breeding and resting places. During the construction and decommissioning of the wind farm sediment will be spilled into the sea. Porpoise and seals have adapted to coastal waters where there are naturally changing sediment volumes in the water, finding prey in very poor visibility. Consequently, it is found that the impact from sediment spillage is insignificant for sea mammals.

During pile driving for the turbine foundations noise will be generated in the water. The impact from noise for porpoise and seals is considered modest. The mammals will be deterred from the area prior to pile driving operations, and during the driving operations dampening measures will be taken to avoid significant impacts from noise on porpoise and seals in terms of permanent hearing loss (PTS). By undertaking such measures, the project will comply with the Danish guidelines on noise. One way of dampening the noise could be by introducing a bubble curtain. This is a tube with holes which is placed on the seabed around the pile driving site. The tube will discharge air through the holes which generates a "curtain" of bubbles in the water around the foundation. This an efficient and recognized mode of submarine noise dampening.

During all three phases, and operation of the wind farm the marine traffic may also cause noise and disturbances. This impact is found to be modest based on the limited number of ships and wind turbines, resulting in the low noise level during construction and decommissioning phase, and insignificant in the operational phase.

Archaeology

Heritage remains of cultural and historical importance exist on the seabed and in the sediment, which include shipwrecks and stone age settlements. However, the distance to both wind turbines and submarine cables is so large that the project will not affect any cultural heritage remains. If new cultural heritage remains were to be identified during the construction work for Vesterhav Nord they will be reported to the Agency for Culture and Palaces. In such an event construction work will come to a temporary halt until a decision has been made concerning the next steps of the process.

Recreational use of the sea

Within the area designated for future erection of wind turbines and at the site where the submarine cables will reach the shore, recreational navigation, diving and fishing take place. Bathing and surfing also take place at the coast where the submarine cables are planned. The entire work site will be closed to the public for the full duration of the construction and the decommissioning phases, and recreational activities will not be possible. However, there are many alternative locations for this outside of the construction site. The site will be closed for about six months which is found to cause insignificant impact on the recreational use of the sea. During construction sediment will be spilled into the water, however, it will be less than what is naturally generated by wave action. Consequently, this is found to have an insignificant impact, and bathing can take place during all project phases without suffering impact from the spilled sediments.

It has been assessed for the operating phase that the wind turbines will not present a safety issue to recreational navigation, and others using the area. During the operating phase the wind farm will be open to traffic.

Radars, radio chains and aeroplanes

Vesterhav Nord wind farm has the potential to impact radars, aviation traffic and radio chains (e.g. data connections to mobile networks). The military installation at Thyborøn is close to Vesterhav Nord. The closest airports are found at Thisted and Lemvig, which gives aviation traffic ample distance from the project, so will cause no disturbance. The impact on ship radars is found to be modest to none since the ships also make use of other ways of navigating. The construction activities may lead to short-term disturbance of radar systems as navigation on ships.

During the operating phase, military radar systems will be affected by the wind turbines. These impacts involve reflections, blocking and echoing of radio signals which will cause aeroplanes or ships to “disappear” or be misplaced on the radar when travelling within or around the wind farm. As a result of such impacts Vattenfall has produced a detailed analysis for the Danish Defence of the impacts, assessing which preventive measures will be required in order to mitigate. Preventive measures will be taken according to the instructions provided by the Danish Defence in connection with the establishment of Vesterhav Nord. Vattenfall is in discussions with the Danish Defence and will arrange when and how to take preventive measures. The measures are expected to take place

as soon as the first wind turbine foundations are in place. Since the impact has been prevented it has been found that the efficiency of the Danish Defence radar surveillance will not to be affected.

Navigation conditions

An analysis of the navigation conditions and marine safety during all three project phases shows an insignificant or modest impact from the project. The assessment applies to ship-turbine collision, for sailing and drifting vessels during the operating period. It also applies to collision between ships or ground support for all three periods of the project. A maritime coordination centre will be established to monitor marine traffic to and from Thyborøn Harbour, which will ensure that navigation conditions and marine safety will not suffer any impact.

Fishing

In and around the area where the wind farm is constructed, fishing takes place using trawl, boom trawl and net. During the construction phase fish in the local area may be affected by disturbances, noise or dropped sediments, which results in less evasive behaviour in fish that are sensitive to these impacts. This could also potentially affect fishing in the area. During the construction phase and presumably also during the decommissioning phase, all trawling will be prohibited within the wind farm and the cable corridor in a 500-meter zone. The impact to all fishing gears is found to be insignificant because the restrictions are for a limited area and for a limited period of time.

During the operating phase the fishery will be affected as there can be no fishing using regular trawls or boom trawls within the wind farm, and across the export cables going towards the shoreline. Net fishing will be allowed during the operating phase; however, ships are prohibited from anchoring within the 200-meter buffer zone applied to all submarine cables, of the Executive Order on the Protection of Submarine Cables (BEK no. 939 of 27 November 1992). The impact on trawl fishing during the operating phase is found to be moderate across the cables and modest within the wind farm. The impact on boom trawl fishing is found to be modest across the cables and insignificant within the wind farm. The impact on net fishing is found to be insignificant. The impacts have been assessed under the assumptions based on the fishing volume, size of the affected areas and that the impacts will last for 25 years.

Landscape and visual aspects

The wind turbines at Vesterhav Nord will have an impact on the character of the landscape and the experience of the view especially during the operating phase. The impact will be largest along the beach, from the tops of the sand dunes and hill tops. Also, the impacts will be seen from vantage points such as the cultural-historical Bovbjerg Fyr as well as any churches located on high hilltops. For these parts of the landscape, the visual impact is found to be significant. Today, the view is unobstructed towards the west. In future, the row of wind turbines will be prominent during good visual conditions and fill the entire scope of the view for a person looking across the water towards to the turbines (although still with a view between the turbines). The closest wind turbine will be positioned off Ferring and is found to be visually dominant. The turbines will turn at the same speed at high wind speeds (which should be 50 % of the time). During the night lights from the turbines will be visible. Behind the sand dunes and the hill tops the wind turbines will be partially hidden or less prominent because of the distance. In these areas you can already view several other land-based wind turbines, therefore here the impact is found to be gradually declining from moderate to insignificant. This also applies along the beach, and for the sand dunes further north and south of the project.

The project has been optimised to produce minimal impact on the landscape and visual aspects; no further measures can be taken to mitigate the impacts.

Population and health

During construction and decommissioning, the project impact on the population and human health will be limited to the periods involving of the individual activities. Among other things, there will be audible noise during some periods, although not to a degree that is found to impact on people's health. The general impacts for the construction and decommissioning periods are found to be modest or insignificant to the population and its health. Several of the factors associated with this have already been discussed elsewhere in this report within other environmental contexts. For example, the way in which the landscape is experienced, and the archaeology or recreational activities at sea or sailing. This applies to construction, decommissioning and operation.

The impacts from operating the wind turbines will exist throughout the lifetime of the wind farm, which is 25 years. The turbines will produce some level of noise however the level will be below the threshold value for noise and is therefore not considered to affect human health. A minor group of permanent residents and cottage owners may suffer impact from the visual appearance of the wind turbines from their dwellings. When the population visit the beach (e.g. for walks, enjoy the sunset and similar activities) the wind turbines will be in full view. To some people, wind turbines are associated with negative feelings. However, the health of the population is found not to suffer any impact from the view, since a number of scientific studies have been unable to verify any correlation between wind turbines and human health.

In general, when constructing wind farms, there is a concern whether the environmental impact of the wind farm could have a negative impact on local tourism. However, no studies have been able to verify any significant negative impact on tourism. Including such examples as visiting camping sites, weekend cottages and various tourist attractions.

Based on the above, it is found that the wind farm will have no general impact on the population and human health during the operating phase.

Climate

During the operating period, the impact exerted by Vesterhav Nord on the climate will be positive. The wind energy generated from the wind turbines will replace the use of power plants using fossil fuels for their energy production. The material consumption and the activities involved in establishing the wind turbines and decommissioning them will consume energy. As a result, there will be a modest level of CO₂ emissions, which will have an insignificant impact on the climate. An average offshore wind farm in the EU will typically reach carbon neutrality within seven to eight months¹.

¹ Siemens Gamesa Renewable Energy. A clean energy solution – from cradle to grave. Environmental Product Declaration. SG 8.0-167 DD. <https://www.siemensgamesa.com/-/media/siemensgamesa/downloads/en/sustainability/environment/siemens-gamesa-environmental-product-declaration-epd-sg-8-0-167.pdf>

River Basin Management Plans, the Water Framework Directive and the Marine Directive

Denmark has made an international commitment to protect and improve the aquatic environment. Closest to the shore, it is paramount to ensure good ecological and chemical conditions for the marine environment. This will be safeguarded through the so-called 'River Basin Management Plans'. Further out to sea, the Danish marine strategy ensures the aquatic environment remains in good condition.

Overall, the assessment shows that the project will neither deteriorate the current state of the aquatic environment nor prevent the achievement of the objectives set out in the plans.

Cumulative impacts

The assessment not only looks at the environmental impact of Vesterhav Nord, but also at the impacts combined with other projects (the cumulative effect). The assessment of the individual topics above considers other activities that already exist, including such aspects as cumulative noise or cumulative visual impacts from existing wind turbines. In addition to the existing projects there are also several other new projects planned. Wind farms in particular, the extraction of sand from the seabed and the establishment of new amusements on land can impact on the same environmental conditions as Vesterhav Nord. For all environmental conditions, the assessment shows that none of the cumulative impacts will be significant.

Mitigation and monitoring

The report identifies the necessity to prevent any impact on the Danish Defence's radar. As a result, Vattenfall has reached an agreement with the Danish Defence concerning measures to be taken to prevent impact from the wind turbines.

Furthermore, during the design and planning process the project has been continuously adapted to minimize the impact on the environment. Consequently, consideration for the local environment is already included as part of the project. An example of this is the attenuation of underwater noise, which will be done in accordance with the Danish Energy Agency's guidelines for the demolition of monopiles for marine mammals. There will also be positive outcome for the fish (see section on sea mammals and fish above).

In order to accommodate citizen queries, Vattenfall has applied to the authorities for permission to turn off the wind turbines' marker lights at night when there are no aircraft in the area. The authorities' decision whether to allow this is pending. Consequently, it is not included in the assessment of the visual aspects.

The assessment has not identified any need to monitor significant impacts on the environment. The only significant impact from the project relates to the landscape and the visual conditions during the day. Yet it is not considered meaningful to monitor the impact described because it would not lead to further information.

Transboundary impacts

The impacts are found not to extend beyond Denmark's border to neighbouring countries (transboundary impacts). In terms of climate, Vesterhav Nord generates a reduction in CO₂ emissions compared with current conditions. However, in isolation, it will not be of a magnitude that will have an effect on global warming and the climate. Biodiversity impacts (including fish,

birds, bats or sea mammals) are so local and limited that they will be of no significant importance to the populations in other countries.

Similar to marine traffic generated by Danish ships, international marine traffic may also be affected. However, international ships travel mostly along routes further to the west. In view of the low numbers of international ships in the area and the results from the analysis of the navigation conditions, the assessment has identified no impact on international marine traffic.

2. Complementary memo concerning transboundary impacts

2.1 Introduction

For the purpose of the ESPOO consultation, this memo complements the section “Non-technical summary” from the Environmental Impact Assessment (EIA) report for Vesterhav Nord.

The memo provides additional information in relation to the non-technical summary concerning potential transboundary impacts. Issues that will be addressed relate to birds, marine mammals, marine navigation and climate. The following sections provide summaries of the assessment and offer additional details of relevance for the various subjects.

2.2 Assessments from the EIA report

2.2.1 Birds

In relation to birds, it is likely that individuals from populations in neighbouring countries or individuals migrating between, for example breeding and wintering sites, will on occasion pass through the area at Vesterhav Nord offshore wind farm. This could produce a transboundary impact.

The species and families primarily in focus in the assessment comprise diver (*Gaviidae*), common scoter (*Melanitta nigra*), velvet scoter (*Melanitta fusca*) and northern gannet (*Morus bassanus*). These species are of international importance because they form part of the designation basis for marine Natura 2000 areas in both Denmark and surrounding countries in the same biogeographic region.

The data used in the assessment is based on small grid aerial surveys, conducted in the period 2013–2015, and also larger grid aerial surveys completed in 2018. The data has been supplemented with information from other surveys conducted in the period 2018–2019 as part of the national surveillance programme for marine foraging birds. Finally, data from 2019 is also included from surveys conducted in connection with other wind farms scheduled in the North Sea and from a coastal monitoring programme off the wind farm where a permanent bird monitoring station is located (Blåvand Bird Observatory).

These results are applied directly but population densities and population sizes have also been computed using modelling processes (by means of the software Distance 6.2).

The potentially negative impacts relation to the risk of collision, area requisitioning which will displace the birds, and wind turbine effects generating a barrier to bird migration routes. For the birds, area requisitioning involves both the construction and the operating phases. The collision risk is largest during the operating phase, but the assessment also looks at the risk during the construction period when the number of ships and cranes will increase for this area. The displacement of selected species and the collision risk have been calculated.

The nearest marine-only bird protection areas where the species referred to are included in the designating basis is located 80 km away, and more than 100 km from the area where the wind

turbines will be erected. Bird protection areas are also designated at a distance of 4 km and 10 km from the wind farm site, which include inner parts of the fjord and surrounding land areas, but the species referred to here are not included in the designation basis for this area. The area where the wind turbines will be installed is not included in the IBA designations (International Bird Areas).

According to the results, a relatively low number of individuals from these species is found in the area where the wind turbines will be erected. For diver, between 0 and 0.3 individuals are found per square metre during the winter months. For common scoter, velvet scoter and northern gannet, the number of individuals found within the wind farm site is very low. In the case of the common scoter it is estimated that during the winter season there is less than one individual per year per km². This means that there will be no direct impact resulting in reduced food forage opportunities once the construction period has come to an end.

Once the wind turbines have been erected this will generate displacement. According to scientific studies a 2 km displacement zone can be used as a conservative precaution. Based on the counts this gives a total displacement from the area of about 130 divers. Other studies have shown that up to 1% of the displaced birds will die, equivalent to maximum one or two individuals for these species.

In terms of collision risk, it is essential that the turbines sit in a north-south row in parallel with the migration routes. When bird routes and flying heights are included in the equation, calculations demonstrate that 0–1 divers, 0–1 velvet scoters, 0–1 common scoters but no auks will collide with the turbines per year.

It is found for all of the species and families referred to that there is no significant negative impact on the birds. The overall conclusion is that there will be no impact on bird populations, both in terms of roosting and migrating birds.

2.2.2 Marine mammals

The relevant species included in the assessment comprise harbour porpoise (*Phocoena phocoena*), harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*). These species are of international importance and consequently of relevance when it comes to transboundary impacts. One of the reasons for this is that they are included in the designation basis for Natura 2000 areas. Furthermore, porpoises are under strict protective measures according to Annex IV of the Habitat Directive, seals also protected under Annex V of the Habitat Directive. Seals are typically found at the coasts and on land, whereas porpoises only reside in marine locations.

The assessments are based on data collected by mapping the marine mammals in an extended area surrounding the planned wind farm site in 2013–2014. This identification process was conducted using aerial survey and placing C-PODs that collect the sounds made by porpoises when looking for food or communicating with each other. Also new data has been used from surveys conducted under the national surveillance programme in the period 2017–2019. Population densities have been estimated for the species based on these sources.

The potential impacts relate to reduced foraging and loss of prey as a consequence of elevated concentrations of sediments in the water column, submarine noise from the turbine foundation

driving operations, noise and disturbance from marine traffic, habitat changes, noise from detonation of unexploded ammunition in the seabed (UXO) and behavioural changes caused by electromagnetism around the submarine cables.

The most significant source of impact to marine mammals will be noise from the monopile foundation driving operations. A model of the dispersion of submarine noise during the driving operation was developed in 2019. Noise can lead to temporary hearing loss (TTS) or permanent loss of hearing (PTS), depending on the noise level. For this assessment, the Danish threshold values have been used; these are SELcum 200 dB (PTS) and SELcum 176 dB (TTS) for seals and SELcum 190 dB (PTS) and SELcum 175 dB (TTS) for porpoise. The submarine noise will be dampened so as to comply with the current Danish threshold values for these species, and thereby avoid significant impacts on the marine mammals. It is possible to deter animals away from the site before the driving operations to avoid negative impacts or dampen the noise impact using bubble curtains.

Models of the sediment dispersion from construction work have also been produced to assess whether the foraging options will be reduced for seals and porpoise, or whether their food resources will be reduced as a consequence of the elevated sediment concentrations. Sediment waste is mainly generated by the water jetting for the submarine cables.

As regards the unexploded ammunition (UXO), the assessment concerns the potential impact due to the noise level from their detonation.

If unexploded ammunition is identified on the seabed during the planning of the construction work, the objects will be removed if they are found to pose potential risk of detonating while construction work takes place or pose a general safety risk to the users of the water. This must take place upon the advice and approval of the Naval Staff of the Joint Defence Command Denmark (EOD) who will undertake the actual operations. This means that removal of the UXOs falls under the responsibilities of the Ministry of Defence. In view of the animal density and the probability of identifying UXOs, the impact will potentially affect a very small number of individuals.

It is found for the species referred to that there is no significant negative impact. The overall conclusion is that no transboundary impact on animal species exists.

2.2.3 Marine navigation

Establishment of the wind farm may potentially impact navigation conditions and marine safety which could have a transboundary impact by also potentially affecting international traffic and non-domestic vessels.

As part of the environmental assessment a marine navigation risk assessment was conducted in 2019 based on IMO international guidelines (the International Marine Organisation). In addition to this, a HAZID study (Hazard Identification) has been conducted involving a public meeting with sea users, and information based on AIS data (Automatic Identification System) from vessels navigating the area has been included.

Data shows that the primary marine traffic is made up of ships arriving and departing from the nearest harbour, Hvide Sande, and ships entering and existing from the nearest inlet, Limfjorden. These are typically smaller ships, mostly fishing vessels. Normally major freight and passenger ships do not navigate the area where the wind turbines will be erected, they will typically travel west or north of the site.

The annual number of ships currently passing through the area is between 764 and 958 of a length below 25 m, and between 1,651 and 1,716 ships of a length above 25 m. In terms of ships exceeding 100 m, the number is very low.

The collision risks for drifting vessels, sailing vessels colliding due to human errors and an increase in ship-ship collisions have been assessed. In terms of ship-turbine collisions, the concept of 'return period' (probability) is used, which is the calculated duration or frequency of calculated collisions. If the ships do not change traffic patterns, the calculations give a return period of 47 years. If all ships shift to the new, rerouted patterns, the return period for sailing ships will be 303 years.

Overall it is found that there will be no significant impact on the collision risk. The existing traffic within the area allocated for Vesterhav Nord is made up of mostly smaller ships arriving and departing from Thyborøn Harbour or the Limfjorden inlet. The international traffic of especially freight and passengers ships mostly follows north-south routes located far off the coast, and thereby also at a considerable distance from the planned Vesterhav Nord offshore wind farm. Consequently, it is not found for this aspect either that marine navigation will suffer transboundary impacts.

2.2.4 Climate

Naturally any effect on the climate could have a transboundary impact. The climatic impact relates to emissions of greenhouse gasses (including CO₂, N₂O and CH₄). Greenhouse gasses are generated by combustion of fossil fuels and these contribute to global warming thereby adding to the risk of climate change.

The assessment in the EIA report is based on the estimated use of materials and the consumption of raw materials and energy, which particularly concerns the construction and decommissioning phases. The assessments also include the derived positive impact, since the wind turbines to some degree result in a positive impact on the climatic conditions during the operating phase, by substituting the energy produced by conventional power producing plants. It has been estimated that an average wind farm is carbon neutral within seven to eight months; at that time the volume of energy it has produced is equivalent to the consumption from producing, operating and maintaining the wind turbines.

Overall the assessment of the report estimates that the establishment of the wind farm will lead to a CO₂ reduction of about 0.3 % of the annual Danish emissions by 2025. The 0.3 % reduction that is seen here cannot be considered significant when assessing the benefit of an individual project and will not affect transboundary impacts on global warming and the climate.

2.3 Summary

According to an overall assessment for installing Vesterhav Nord, and specifically the impact on birds, marine mammals, marine navigation and climate, any transboundary impacts from this establishment can be rejected.