Miljø- og Fødevareministeriet
Naturstyrelsen

ENERGI STYRELSEN

Kriegers Flak Offshore Wind Farm

Environmental Statement
Part 1: Non-Technical Summary

Miljø- og Fødevareministeriet
Naturstyrelsen

ENERGI STYRELSEN

Colophon

Title: Kriegers Flak Offshore Wind Farm. Environmental Statement. Part 1: Non-Technical Summary.

Keywords: EIA, substation platform, offshore wind turbines, offshore wind farm, population, landscape, noise, underwater noise, magnetic fields, electrical fields, CO_2, Natura 2000, Annex IV species, scour protection, seabed conditions, sediment, marine mammals, sea birds, migratory birds, navigation, fishing, underground cable, high voltage substation, horizontal directional drilling, cable corridor, cable route, construction phase, operational phase, decommissioning phase, nature conservation, visualisations, streams, outdoor recreation, cultural history, archaeologic cultural heritage.

Publisher: The Danish Energy Agency (Energistyrelsen) and the Danish Nature Agency (Naturstyrelsen)

Prepared for: Energinet.dk

Consultant/Author: NIRAS A/S and COWI A/S

Language: English

Year: 2015

URL: www.naturstyrelsen.dk

ISBN 978-87-7175-522-0

Publisher Category: Governmental

Version: Final

The English version of the Non-Technical Summary has been translated from the Danish version of the Non-Technical Summary. There will be individual phrases rewritten in the English version to improve the reader's understanding of the text.

Table of Contents

What is an EIA?

EIA is an abbreviation of Environmental Impact Assessment. The regulations for environmental impact assessments are intended to ensure that power production facilities at sea as well as construction projects on land that may be assumed to substantially impact the environment, can only be constructed subsequent to a so-called Environmental Statement (ES), presenting the contents of the EIA.

The goal of producing an ES is to provide the best possible basis for both public debate and for the final decision as to the implementation of the project. The Environmental Statement identify, describe and assess the direct and indirect significant effects of the project on the environment. This includes impacts on:

- Population, human health, and biodiversity
- Land, soil, water, air, climate
- Material assets, cultural heritage and the landscape
- The interaction between the factors above

The ES is published and provides the basis for the public consultation. Based on the ES and the comments received during the public hearing phase, the Danish Energy Agency (Energistyrelsen) and the Danish Nature Agency (Naturstyrelsen) evaluate whether the project is acceptable with the environmental impacts described in the ES.

Part 1 Non-Technical Summary

The Environmental Statement (ES) consists of five parts:

- Part 1: Non-Technical Summary
- Part 2: Goal and Background [in Danish only]
- Part 3: The Marine Environment [in Danish only]
- Part 4: The Onshore Environment [in Danish only]
- Part 5: Summary and Conclusion [in Danish only].

This report, the Non-Technical Summary, is Part 1 of the Environmental Statement for Kriegers Flak Offshore Wind Farm. For additional information about the structure of the report, please refer to the readers' guide in Part 2 of the Environmental Statement: Goal and Background.

Example of an offshore wind farm.

1 Introduction

Like many other countries, Denmark faces a significant energy policy challenge in securing energy supply and at the same time contributing to a reduction in global greenhouse gas emissions.

To meet this challenge, on March 22, a broad political majority of the Danish Parliament (Folketinget) passed an Energy Policy Agreement for the 2012-2020 period. The goal of this agreement is that Denmark's entire energy supply (power, gas, heating) and transportation will be based on renewable energy by 2050. The political Energy Policy Agreement will ensure that wind energy covers 50 % of the total Danish energy consumption by 2020.

The agreement includes a number of options for establishing new large scale offshore wind farms. One of these is an option to establish an offshore wind farm with on Kriegers Flak with an output of 600 MW. Kriegers Flak is located in the Baltic Sea between Bornholm and Møn. The offshore wind turbines will generate power equivalent to the consumption of approximately 600,000 homes.

Prior to the implementation of the offshore wind farm project, an EIA permit is required. This permit requires that an Environmental Statement (ES) is completed based on a number of preliminary investigations. The Environmental Statement (ES) provides a complete description of the project and its impact on the environment. This description forms the basis of the public consultation. On basis of the ES and the outcome of the public consultation the authorities will prepare a Summary Report. This Summary Report forms the basis for the issued EIA permit.

Since the project includes both onshore and offshore power facilities the Danish Energy Agency (Energistyrelsen) and the Danish Nature Agency (Naturstyrelsen) has chosen to prepare a combined ES and a shared public consultation process.

The Danish Energy Agency is the competent EIA authority for the offshore facilities and coordinates the government processing of the project. Based on the ES and other considerations, The Danish Energy Agency will grant the relevant permits for the offshore wind farm itself including the internal cable array offshore, offshore substation platforms, and offshore transmission cables which deliver the power to shore.

The Danish Nature Agency (Naturstyrelsen) is the competent EIA authority for the onshore facilities. The Danish Nature Agency will grant the EIA permit for construction of the cable and power facilities that will be necessary to deliver the power from the offshore wind farm to the Danish power grid. These facilities will

include a new high voltage substation , modifications to existing high voltage substations , and underground cables.

In April, 2012, the Danish Transmission System Operator, Energinet.dk, was instructed by the Minister of Climate, Energy and Building to manage the preparation of an ES for Kriegers Flak Offshore Wind Farm preceding the issuance of calls for tender for construction and operation of the offshore wind farm.

Energinet.dk is an independent state-owned company with its own board of directors. Energinet.dk owns, operates, and expands the Danish power grid.

The EIA process began in May, 2013. For the onshore facilities, ideas and suggestions were sought from the public in October, 2014. Subsequently, the inputs received were combined with the results of preliminary investigations and this ES provides an overall assessment of the potential environmental impacts.

The preliminary investigations and the ES cover the following:

- The offshore wind farm, including offshore wind turbines and offshore substation platforms.
- Offshore transmission cables connecting the wind turbines and delivering power from the offshore substation platforms to the shore.
- Onshore underground cables connecting the offshore wind farm to the existing power grid.
- Expansions of three existing high voltage substations and construction of one new high voltage substation onshore.

In addition to the project proposal, a possible alternative location for the new onshore substation is assessed.

The main elements of this ES are illustrated in the images below.

The design and layout of the offshore wind farm is not yet known, rather, the future concession holder will determine it. (Photo: Energinet.dk).

Construction of offshore substation platforms and transmission cables to deliver power onshore to the existing power grid. (Photo: Energinet.dk).

Onshore cable facilities will be built to deliver power from the cable landfall to the onshore substations where the power is connected to the power grid. (Photo: Energinet.dk).

As a part of the onshore facilities, one new high voltage substation will be built. In addition, three existing substations will be expanded in order for the power to reach consumers. (Photo: Energinet.dk).

Figure 1-1 shows the entire project including the area on Kriegers Flak where the offshore wind farm will be located. Additionally, the cable corridor for the offshore transmission cables to Rødvig and the onshore facilities with underground cables and proposed locations for the new substation are shown.

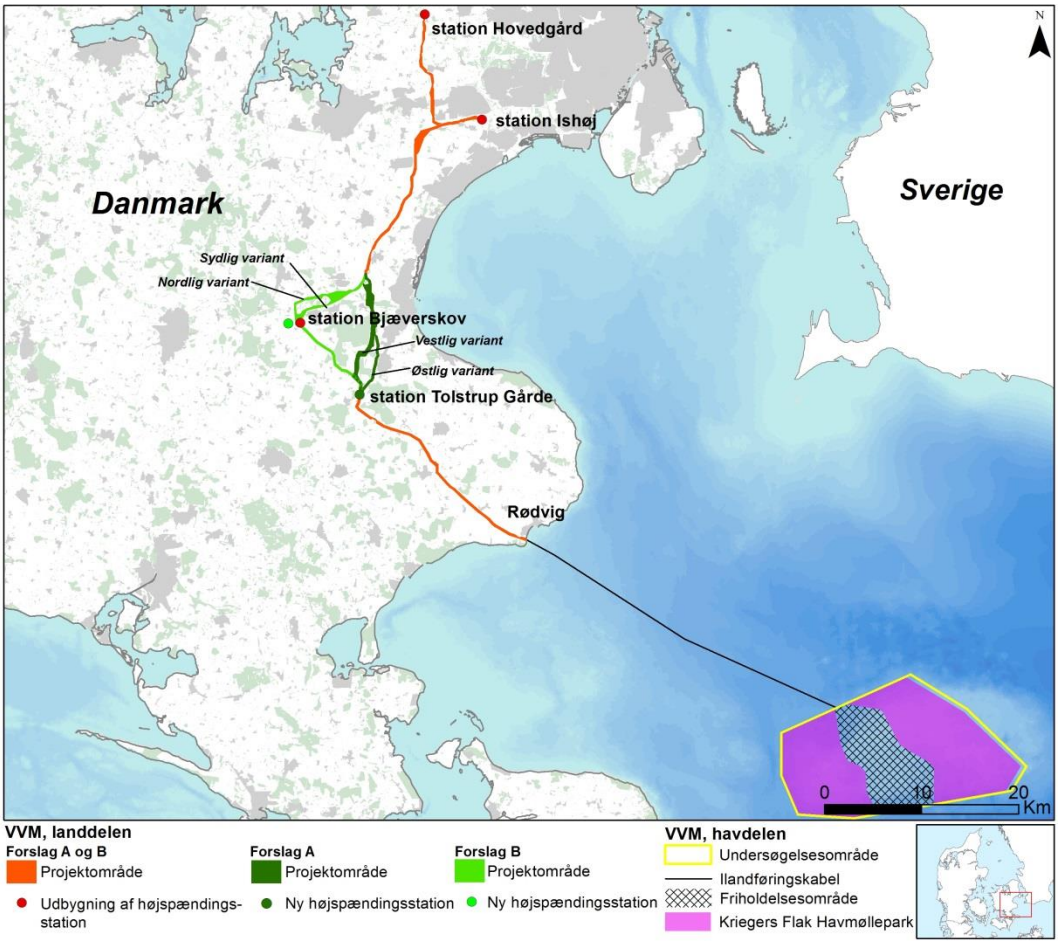

Figure 1-1. The entire project is shown including the area on Kriegers Flak, where the offshore wind turbines will be located (purple areas with restriction area show in between with hatched signature), the offshore transmission cable corridor for the offshore transmission cables (black line) and the onshore facilities (red signature), including proposal A (the project proposal shown with dark green) and proposal B (the alternative to the project proposal shown in light green).

2 Project Description

The project is comprised of an offshore wind farm and two to three offshore substation platforms which will be erected on Kriegers Flak, offshore transmission cables delivering the generated power onshore at Rødvig, and land facilities including a new high voltage substation which will distribute power across the Danish power grid.

2.1 The Offshore Wind Farm and the offshore transmission cables

Kriegers Flak is a shallow area in the Baltic Sea approximately 15 km east of Møn in the waters between Denmark, Sweden, and Germany. Kriegers Flak Offshore Wind Farm will be located inside an area covering approximately 250 km^2. Southeast of the area, a German offshore wind farm, Baltic II, is under construction and a similar project on Swedish territory is currently on standby following preliminary investigations.

Centrally in the pre-investigation area there is a restriction area. Part of this area is reserved for sand extraction with no permission for technical offshore wind farm components to be installed. The remainder of the restriction area is reserved for installations and submarine cables.

The offshore wind turbines are connected by cables which are laid below the sea bed. The power produced by the offshore wind farm is collected at offshore transformer platforms and is delivered to shore from those platforms via two buried offshore transmission cables. The area on Kriegers Flak where the wind turbines will be located and the cable corridor for the offshore transmission cables are shown in Figure 2-1.

From the shore, the power is delivered via underground cables to a new high voltage substation south of Herfølge and from there to three existing high voltage substations: Subtation Bjæverskov, substation Ishøj and finally substation Hovegård west of Ballerup. In all, a cable corridor containing underground cables for both 220 and 400 kV Voltages and approximately 100km in length must be built. On some stretches of the cable corridor underground cables will be laid parallel to each other.

The offshore wind farm will have a maximum power production of 600 MW. Offshore investigations have been completed in the 250 km^2 area on Kriegers Flak and in the cable corridor for the offshore transmission cables which will land onshore South of Rødvig on Stevns.

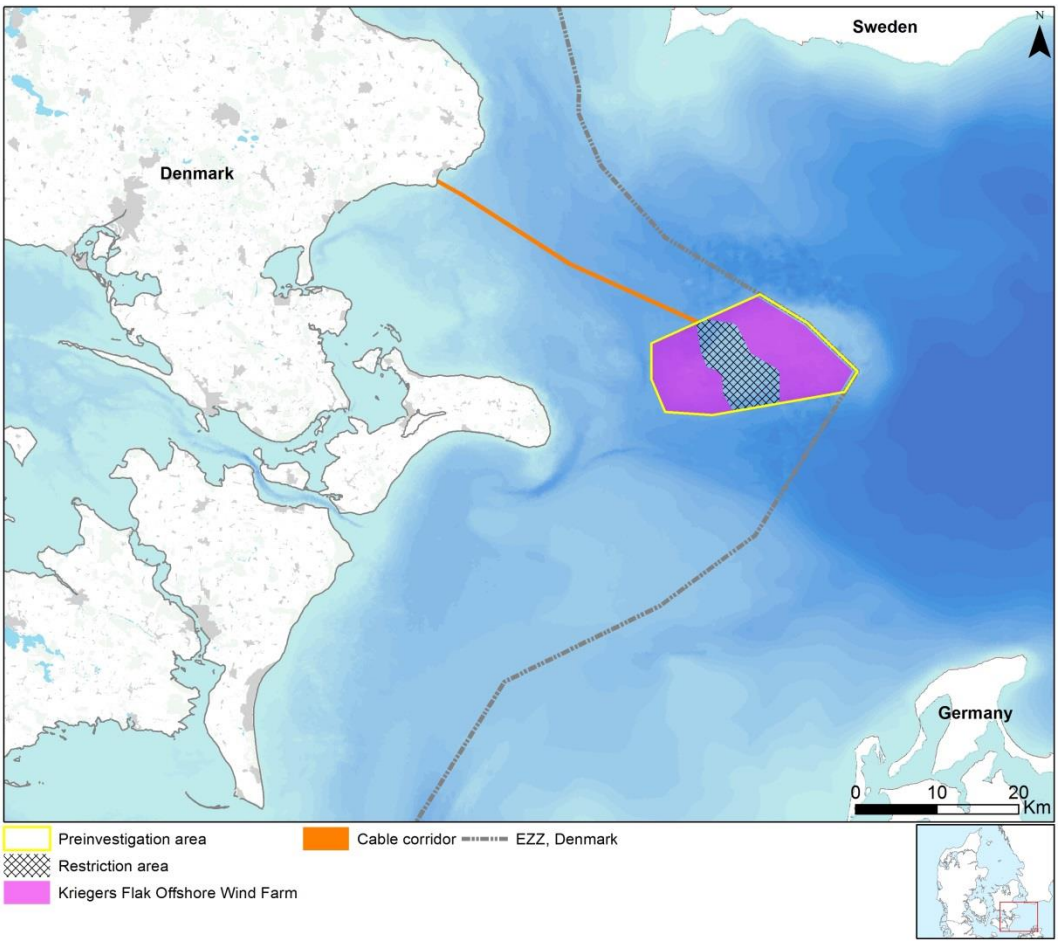

Figure 2-1. The investigated area on Kriegers Flak and in the cable corridor where power is delivered onshore by offshore transmission cables. Centrally in the area on Kriegers Flak there is an area to be kept free of wind turbines. This area is partially reserved for extraction of natural resources and the remainder of the area is reserved for facilities and offshore transmission cables for exporting the power generated.

2.2 Offshore Planning and Design

Neither the site layout nor the type of offshore wind turbines to be erected have been determined at this stage (this is to be determined by the future concession holder). Options include erecting many small turbines (e.g. 3 MW offshore wind turbines), few but large turbines (e.g. 10 MW offshore wind turbines), or any size wind turbine in between.

The height of the offshore wind turbines will vary between 137 m and 220 m depending on the type chosen.

A maximum of between 60 (10MW) and 200 (3MW) wind turbines may be in operation at any time in order to limit power production to no more than 600 MW. Erection of additional wind turbines is permitted to ensure that production can

be maintained at 600 MW when individual turbines are not in operation and wind conditions are optimal.

Regardless of the size of the offshore wind turbines and the site layout, the offshore wind farm will cover approximately the same area since the required distance between offshore wind turbines will increase for larger turbines as compared to smaller turbines.

Figure 2-2 shows an example of a potential site layout for 3 MW offshore wind turbines.

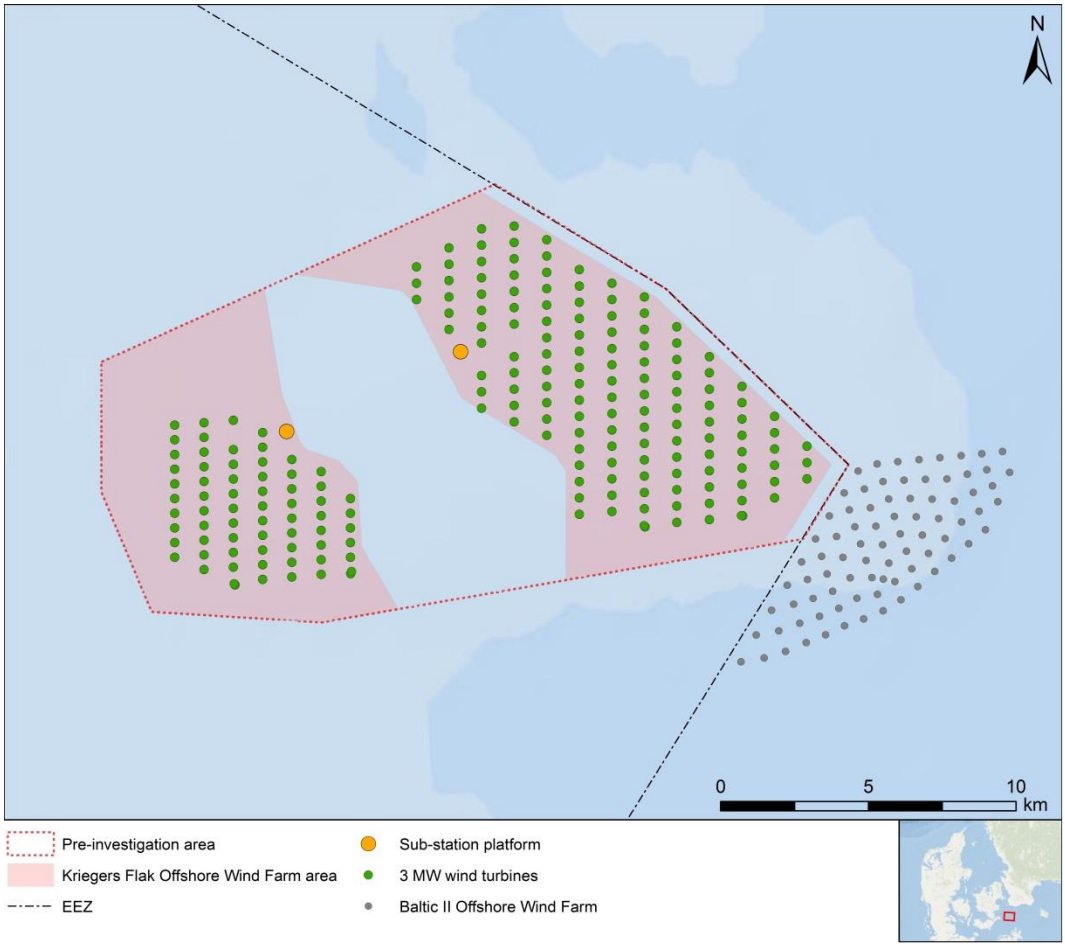

Figure 2-2. Potential site layout for 3 MW offshore wind turbines. Up to 200 3 MW offshore wind turbines may be in operation at any time and the power production may not exceed 600 MW. However, a total of 203 3 MW offshore wind turbines may be erected to ensure the maximum power production of 600 MW during periods when individual turbines are out of operation and wind conditions are optimal. Southeast of Kriegers Flak, the German offshore wind farm Baltic II is under construction during 2014-15.

Each offshore wind turbine consists of a round tower with a rotor and a nacelle at the top. The rotor is the propeller of the wind turbine and three rotor blades are attached to it. The nacelle contains the machinery of the wind turbine including a

generator. The wind turbines are required to be marked with lights and signage visible to ships and planes.

The offshore wind turbine towers must be attached to foundations on the sea bed. Foundations are expected to be of one of the following types:

- Monopile foundation– a tube of steel which is driven into the seabed
- Gravity foundation – a concrete construction which is kept in place on the seabed by the weight of the structure itself
- Jacket foundation – a three or four legged steel structure which is placed on the seabed using piles driven into the seabed
- Suction bucket foundation – an upside down bucket-like structure which is attached to the seabed by creating a vacuum.

Figure 2-3 shows examples of a monopile foundation and a jacket foundation and Figure 2-4 shows a gravity foundation and a suction bucket foundation.

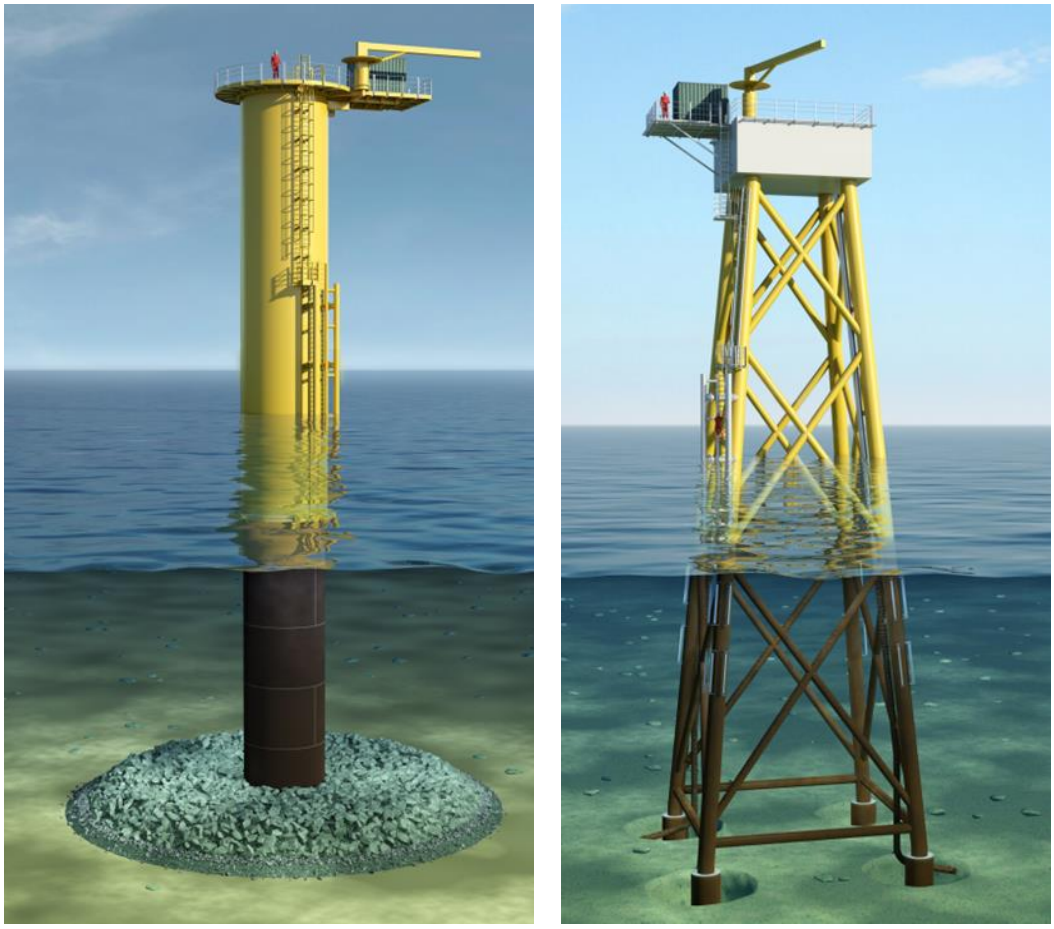

Figure 2-3. A monopile of steel (left) driven into the seabed. Surrounding the foundation on the seabed, scour protection consisting of large rocks is established. The jacket foundation (right) is a steel frame built around three or four legs. Each leg is fastened to piles driven into the seabed

Figure 2-4. Left: Principle sketch of a gravity foundation. The foundation on the left consists of a concrete foundation filled with sand or rocks. Around the foundation, erosion control made of rocks (scour protection) has been established on the seabed. On the right a suction bucket foundation is shown. (Photo: Aalborg University/Scanpix).

The seabed surrounding the wind turbine foundations is at risk for erosion. Ocean currents may remove sediment from the seabed leaving scour pits in the vicinity of the foundations. To avoid this, a protective layer of rocks can be established around the foundations.

The offshore transmission cables will be laid below the seabed in order to protect them from fishing gear, dragging anchors and other hazards.

One offshore substation platform will be built in the western part of the offshore wind farm. Another substation platform, or possibly two closely connected substation platforms, will be built in the eastern part of the offshore wind farm. From the substation platforms two offshore transmission cables will be laid to connect the offshore wind farm to the onshore power grid. The offshore substation platforms will be placed on either jacket foundations or gravity foundations.

Figure 2-5 shows examples of substation platforms on jacket and gravity foundations respectively.

Figure 2-5. Principle sketch of substation platforms. The platform on the left is installed using a jacket foundation and the platform on the right is on a gravity foundation. On the seabed surrounding the gravity foundation, scour protection consisting of rocks is in place. The offshore transmission cables shown are buried in the seabed.

The lifespan of the offshore wind farm is expected to be close to 30 years after which the wind farm is expected to be removed. There are several options for removing the wind farm:

- Completely removing the wind turbines.
- Removing foundations completely or removing only the parts above the seabed.
- Removing or leaving in place below the seabed offshore transmission cables connecting the wind turbines.
- Completely removing offshore transmission cables from the offshore wind farm to the shore.
- Leaving scour protection in place on the seabed.

Removal of the turbines is expected to be accomplished using the same methods and equipment that will be used during erection/installation.

At the time of decommissioning, the foundations are expected to have developed into reefs which are comparable to natural stone reefs. Removing the foundations is expected to impact the natural environment more than leaving them in place. Reuse or removal of foundations must be approved by the authorities.

2.3 Location and Design of the Onshore Facilities

South of Rødvig the two offshore transmission cables will be connected with two onshore cables. One cable will connect to the existing high voltage substation in Bjæverskov and the other cable will connect to the existing high voltage substation in Ishøj. A new station must be built somewhere along the cable route to counter the so-called reactive power which occurs in AC power cables.

The investigated area onshore is approximately 100 km long and consists of a 300 m wide corridor in which the cable route for the underground cables will be located.

A new high voltage substation must be constructed in connection with the cable installation. Two proposed locations for a new high voltage substation have been investigated. In the project proposal (proposal A) the new substation will be located at Tolstrup Gårde southwest of Herfølge. Today the area is an open field located close to the Køge-Næstved railway at the South Motorway exit 34. Energinet.dk has applied for this solution. As the location of the substation is in open land, The National Forest and Nature Agency has required Energinet.dk to examine an alternative in an industrial area included in an urban area development plan in Bjæverskov adjacent to the existing high voltage substation in Bjæverskov. The alternative (proposal B) has been described and analysed in the same level of detail as the project proposal in this ES.

Energinet.dk has assessed the cost of locating the substation in Tolstrup Gårde to be 65 million DKK lower than the location in Bjæverskov West, as the substation in Tolstrup Gårde – amongst others – will result in a shorter cable route and thus less loss of energy from the offshore wind farm to the substation. Furthermore location of the new substation at Tolstrup Gårde will imply, that the onshore cable installation will contribute to an improvement of the Zealandic power grid. That would not be the case, if the substation is located in Bjæverskov West.

Depending on the location chosen for the substation, two different proposals for routing the ground cable must be considered. However, the majority of the cable route (about 2/3 of the cable route) will be identical in either proposal. Only about one third of the cable route will change depending on the location chosen for the new substation.

The onshore facility affects nine municipalities as shown in Figure 2-6.

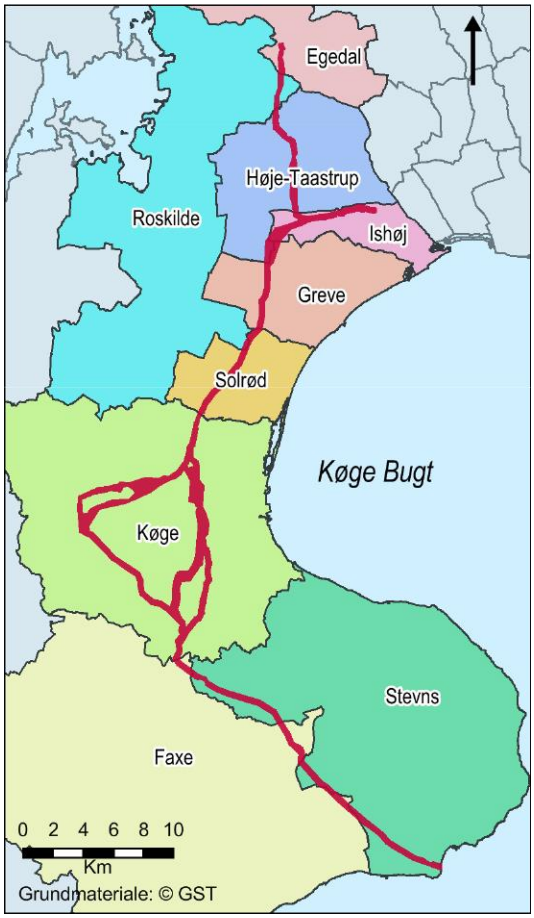

Figure 2-6. Overview of the municipalities which will be affected by the onshore facilities for Kriegers Flak Offshore Wind Farm.

Proposal A (project proposal): New substation Tolstrup Gårde

Proposal A is to locate a new high voltage substation at Tolstrup Gårde south of Herfølge. This proposal is shown in Figure 2-7. Immediately north of the new substation Tolstrup Gårde two variations of the cable route have been investigated: Herfølge western route and Herfølge eastern route. Only one of the two routes will be implemented if proposal A is selected.

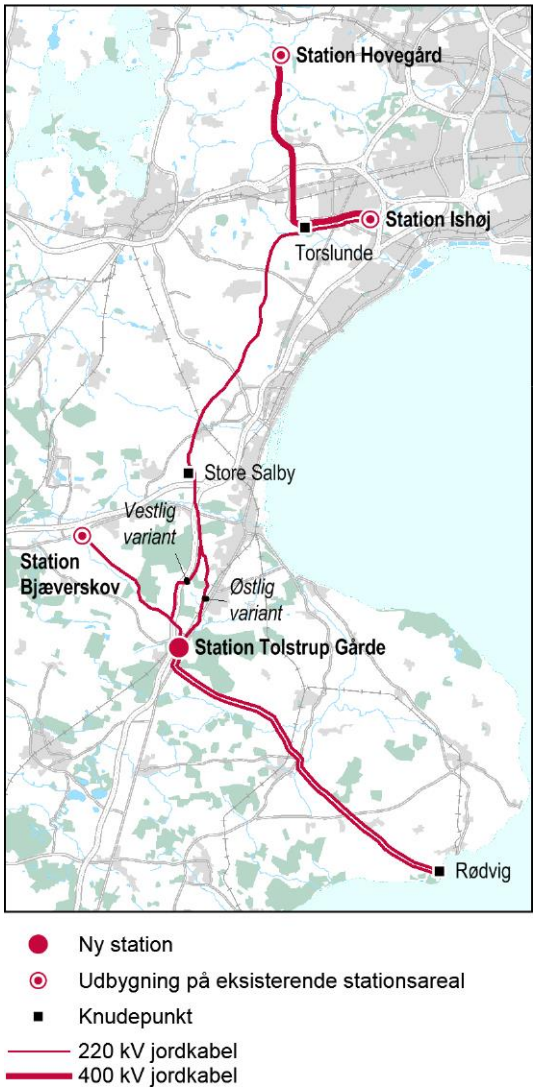

Figure 2-7 Proposal A (the project proposal) for the new onshore facilities includes a new substation at Tolstrup Gårde (large red dot) and expansion of existing substations (small red dot in circle). The figure also shows junctions which are geographical reference points that may be used for orientation purposes (black squares). Thin red line shows 220kV cable and bold red line shows 400Kv cable.

From the landfall of the two offshore transmission cables south of Rødvig a connection to the existing power grid must be made to deliver the power to the grid. At landfall the two offshore transmission cables are connected to the two onshore cables. The connection itself will be located underground and will not be visible. The only visible component will be a pit with access to the joint.

The two underground cables are routed from landfall in two parallel cable trenches to the new substation Tolstrup Gårde. From there one underground cable is routed to the existing substation at Bjæverskov where it is connected to the existing high voltage power grid. The other underground cable is routed north to sub-

station Ishøj, and subsequently connected to the existing high voltage power grid at substation Hovegård.

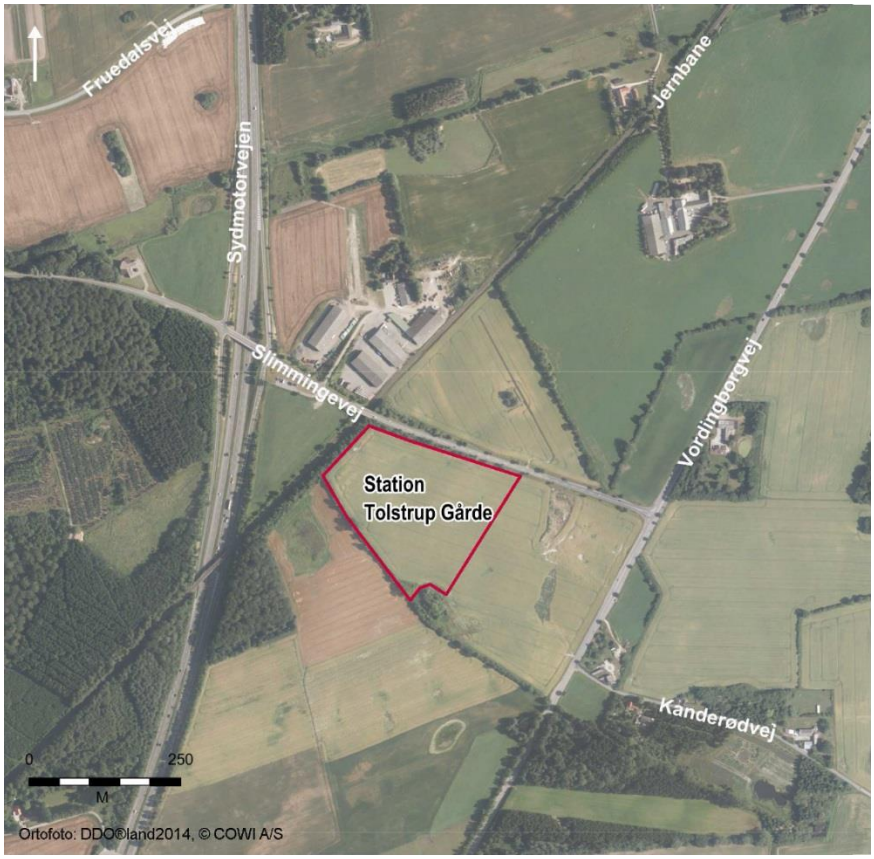

Figure 2-8. Proposal A: The location of the new substation Tolstrup Gårde south of Slimmingevej near South Motorway (E47) exit 34.

Substation Tolstrup Gårde will be located south of Slimmingevej near exit 34 on the South Motorway (E47) (Figure 2-8.). The area required for the substation is about 5 ha. Figure 2-9 shows a visualisation of what a new substation at Tolstrup Gårde might look like.

Substation Tolstrup Gårde will be built as an outdoor substation facility with most of the technical components of the substation will be outdoors. The substation will be built with underground cables only so that no overhead power lines will be visible to and from the substation

In addition to the technical components, the substation will include a building expected to cover about 360 m² and be about 6 m tall. Construction will also include a parking lot covering approximately 500 m². Finally, access roads, and roads for internal cables between the different parts of the installation will be built.

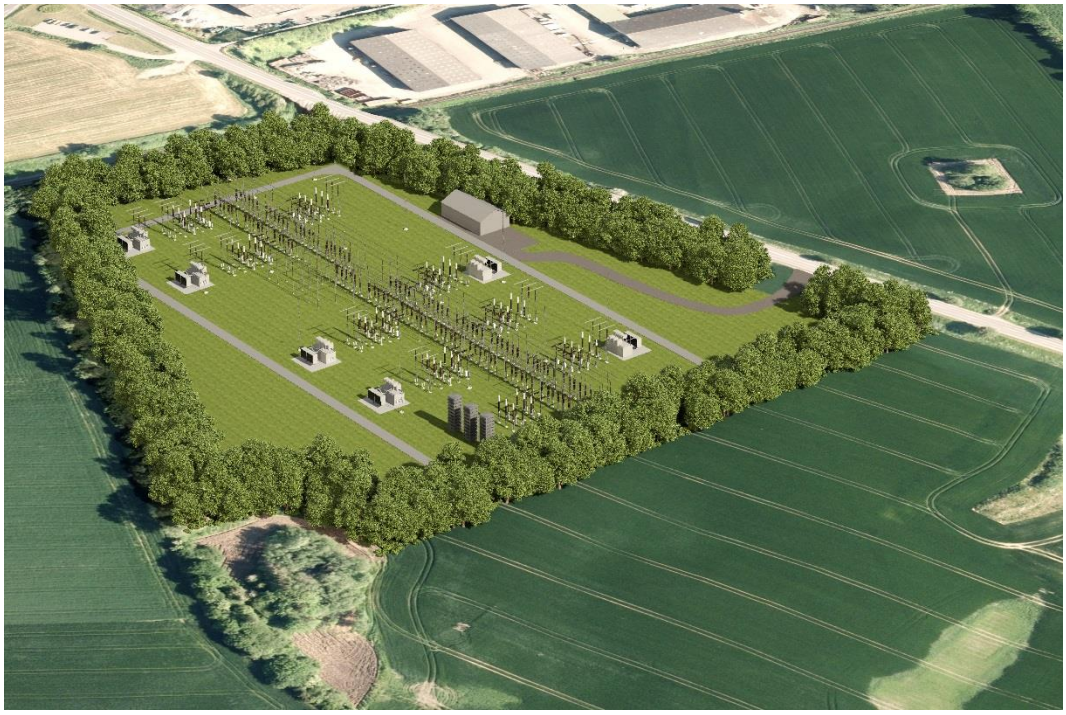

Figure 2-9. Visualisation of what a new substation Tolstrup Gårde might look like.

Figure 2-10. Partial view of an outdoor substation of the same type as the new substation Tolstrup Gårde. The high voltage installation itself is seen in the foreground and in the back ground are the lightning rod.

The tallest components of the substation will be the lightning arresters; the masts of the lightning arresters are expected to be about 28 m tall. A partial view of a similar outdoor substation is show in Figure 2-10.

The project also includes establishing a new 220 kV transformer area at the existing substation Bjæverskov. The transformer area will be in the eastern part of the existing substation area. Technical changes to the existing substation will also be necessary. Finally, access roads and roads for internal cables between the new installations will be built inside the current substation area.

Like the expansion at substation Bjæverskov, the expansions of substation Ishøj and substation Hovegård will be contained within the current substation areas. Seen from the outside, only the lightning arresters of the expansion will be visible. At substation Ishøj, the plan is to install of one additional transformer and one additional shunt reactor inside the substation area. At substation Hovegård the plan is to install one additional shunt reactor inside the substation area.

Proposal B (alternative): New Substation at Bjæverskov Vest

Proposal B (the alternative to the project proposal) is show in Figure 2-11. Proposal B differs from proposal A in that the new substation is located immediately adjacent to the existing high voltage substation at Bjæverskov (Figure 2-12). Consequently the two underground cables will run parallel from landfall at Rødvig and all the way to substation Bjæverskov. A new substation in the Bjæverskov Vest area (proposal B) will be of substantially the same design as the new substation described for proposal A.

Figure 2-11. Proposal B (the alternative proposal) for the new onshore facilities includes a new substation at Bjæverskov Vest (large red dot) and expansion of existing substations (small red dot in circle). The figure also shows junctions which are geographical reference points that may be used for orientation purposes (black squares). Thin red line shows 220kV cable and bold red line shows 400Kv cable.

One of the two underground cables will be connected to the existing high voltage power grid at substation Bjæverskov as in proposal A. The other underground cable will continue northeast to substation Ishøj. Between Bjæverskov and Salby two possible cable routes have been investigated: – the Regnemark northern route and the Regnemark southern route. Only one of the two routes will be implemented if proposal B is selected for the project.

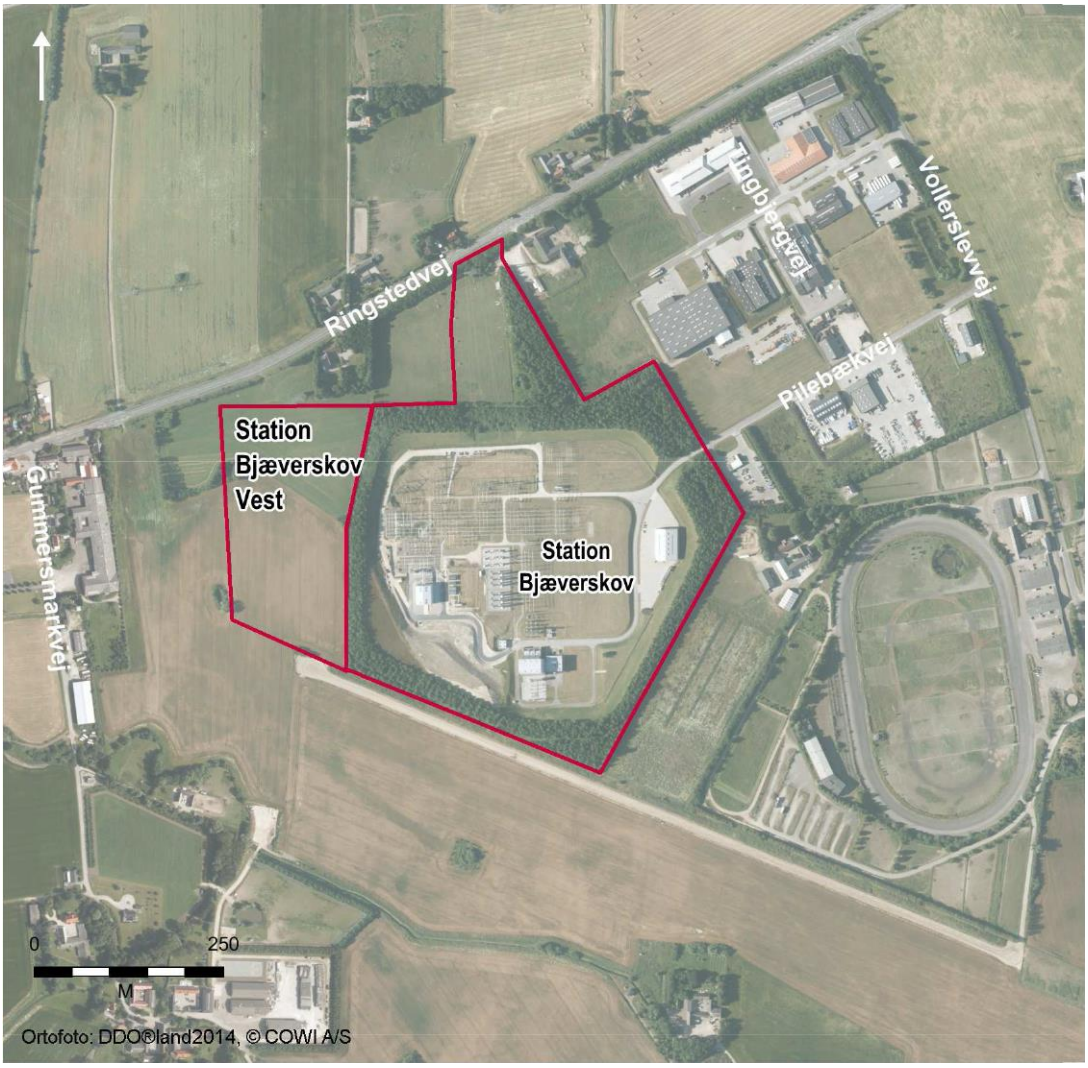

Figure 2-12. Proposal B includes building a new substation at Bjæverskov Vest. The substation will be located immediately west of the existing substation in Bjæverskov.

2.4 Time Table

The projected time table for the offshore and onshore construction of Kriegers Flak Offshore Wind Farm is shown in Figure 2-13. Construction relating to connection to the power grid, i.e. the substation platforms, offshore transmission cables, and onshore facilities, will take place during 2016 through 2018. The owner of the offshore wind farm, i.e. concession holder, is expected to be identified and appointed at the end of 2016 and to begin the detailed project design and construction of the offshore wind farm immediately following the appointment. Kriegers Flak Offshore Wind Farm is expected to be completed and in operation no later than 2021. Construction of the offshore wind farm and the associated technical facilities onshore will take place over a period of approximately 2 years.

Once the offshore wind farm is completed, its life span is expected to be up to 30 years while the onshore facilities will have a lifespan of about 40 years.

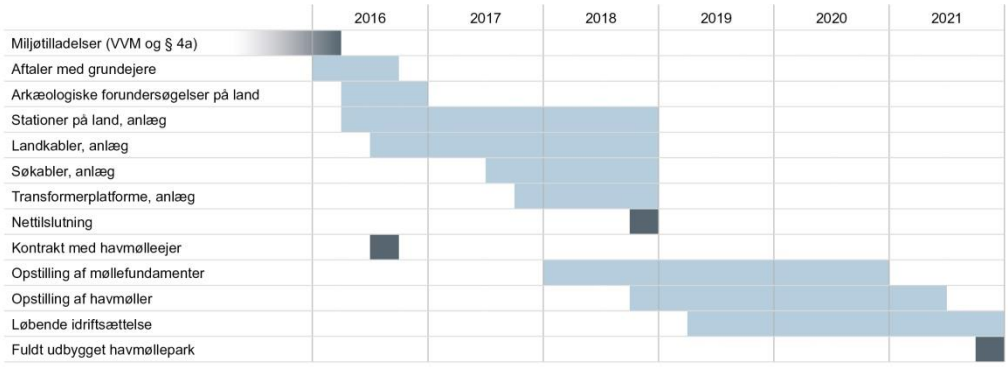

Figure 2-13. Time table for the onshore and offshore construction and the operation of Kriegers Flak Offshore Wind Farm after the EIA permit has been granted.

3 What will the project look like?

The project will include offshore wind turbines, offshore substation platforms, cables below the seabed, underground cables onshore and substations onshore.

The visible components of the project will be the offshore wind turbines, the offshore substation platforms, the onshore substations, and to a lesser extent the underground cable which will be indirectly visible because no trees may be planted over the cable when it is routed through a wooded area.

3.1 Onshore Facilities

A number of visualisations of the new high voltage substation have been produced in order to show the impact on the landscape when the substation is operational.

The project proposal (proposal A) is to locate the new substation at Tolstrup Gårde. The landscape surrounding the area for the new substation Tolstrup Gårde is an agricultural landscape with several hedgerows. The area is defined by transportation infrastructure in the form of Vordingborgvej, the railway and the South Motorway. Across from the road from the site is a property with several large farm buildings and to the west in the municipality of Faxe a political decision has been made to erect three wind turbines which will be 149 m. tall and will also be visible from the area. The substation will stand out visually in the local landscape – particularly during the first years following construction. In order to visually screen the substation, the project will include planting vegetation. Once the vegetation has grown tall, the 28 m tall lightning rod will be the primary visible part of the substation which will give the impression of a landscape characterised by technical facilities.

Figure 3-1 shows a photo of the area at Tolstrup Gårde as it appears today. Figure 3-2 is a visualisation showing what it will look like once the vegetation has grown tall. The visualisation is from conditions during winter, when there are no leaves on the trees, and when the substation should be the most visible. The visualisation was made from the intersection of Vordingborgvej and Slimmingevej.

Figure 3-1. The location of the substation as seen from the east at the intersection of Slimmingevej and Vordingborgvej, as the area appears today. The landscape is defined by open areas and woods towards the horizon.

Figure 3-2. Substation Tolstrup Gårde after a number of years. The trees are shown without leaves and the tallest trees in this view are approximately 15 m. The trees will have grown up and the vegetation will increasingly screen, also during the winter. Lightning arresters are seen above the vegetation.

In the alternative solution (proposal B), the new substation will be located in Bjæverskov Vest adjacent to the existing substation Bjæverskov. The landscape surrounding the area for the new substation is dominated by the existing substation Bjæverskov, including substantial overhead high voltage power lines and extensive transportation infrastructure in the form of roads and a nearby motorway. Similar to the existing substation, the lower parts of the new substation will be screened by establishing a belt of vegetation. The photo used in the visualisation was taken from the south at a residential property located behind the existing substation (Figure 3-3). At Bjæverskov, the primary visual impact on the landscape will continue to be the existing overhead power lines to the existing substation which dominate the landscape visually (Figure 3-4).

Figure 3-3. Photo showing the view across a field at Gummersmarkvej 17, as it appears today. The existing overhead power lines which connect to the existing substation are seen in the center of the photo.

Figure 3-4. Visualisation of a new substation close to Gummersmarkvej 17, directly adjacent to the existing substation Bjæverskov with fully grown vegetation during the winter with no leaves on the trees.

Expansions of the existing high voltage substations, substation Bjæverskov, substation Ishøj, and substation Hovegård, will entail minor technical changes. These expansions will mainly be seen as an increased number of lightning rod in landscapes which are also currently characterised by overhead power lines to and from the substations

The onshore cable will be underground along the entire cable route and will not be visible. However small markers will indicate where the underground cable is, in order to protect it from excavation. The markers will typically be located on the side of the road or in property boundaries. The markers will not impact the human experience of larger cultural environments, church surroundings, or other areas which may have a visual, cultural, and historical value. An example of a marker is shown in Figure 3-5.

Figure 3-5. An example of a marker indicating a cable buried underground.

If the cable must cross protected stone walls and earth dikes, horizontal directional drilling may be used to bury the cable under the wall. In those places where a decision is made to dig through an earth dike, the soil will be replaced and the terrain will be re-established so that the appearance of the dike is returned to its original appearance with time; leaving no trace that it has been excavated through the dike.

There may be a need to route the underground cable through a wooded area in a few places in which case trees must be cut down in the cable corridor. Since deep tree roots may harm the cable, no trees may be planted on top of the cable after it is installed. However, shrubs and other plants that do not have deep roots may be planted. This will result in areas with tall trees where a visible corridor along the cable will be planted with shorter and more sparse vegetation. Figure 3-6 shows an example of a wooded area where trees have been cut down due to an underground cable.

Overall, the impact of the underground cable on the landscape will be negligible. There will be a negligible to minor impact in the areas surrounding the existing substations which will be expanded. Whether the new substation is located in Tolstrup Gårde or Bjæverskov Vest, the visual impact will be moderate. The impact will be localised and over time, when the vegetation grows tall, the impact will be moderate to minor.

Figure 3-6. An example of a wooded area where trees have been cut down. A marker is just visible in the centre of the image.

3.2 The Offshore Wind Farm

Kriegers Flak Offshore Wind Farm will cover a large area off the coast of Møn. Consequently, the offshore wind farm may potentially impact the coastal landscapes in areas indirectly where the wind turbines are visible and people whose views include the offshore wind farm. The closest residential properties are on Møn and the distance from there to the offshore wind farm is approximately 16 km. The impact will differ during the day and the hours of darkness, among other things because of the required marking lights on the wind turbines. The size and number of turbines and the site layout will also determine how the wind turbines will impact the coastal landscape and the people in it.

The offshore wind turbines are located so far from the shore that the view of the sea from the shore will not change significantly. The impact will be greatest at Møns Klint, were the distance to the offshore wind farm is about 16 km and the shoreline is high above the sea level. The impact assessment shows that the impact on the experiential value of the landscape and the people whose views will include the offshore wind farm will be moderate. The turbines will hardly be visible in any other coastal landscapes and it follows that the impact on those landscapes and people will be minor. Figure 3-7 and Figure 3-8 show visualisations of the view from Møns Klint in very clear weather for 3 MW and 10 MW wind turbine site layouts respectively.

The visualisations have been reduced significantly from their original size (A3), and the images in this report are only provided as an approximation and cannot be considered to accurately depict the visual impact off the offshore wind farm.

Figure 3-7. Visualisation of the view of Kriegers Flak Offshore Wind Farm with 3 MW offshore wind turbines from Møns Klint, in very clear weather. The photo is taken from the highest point on Møn, Dronningespiret, which is 128 m above sea level. (Photo: Hasløv & Kjærsgaard).

Figure 3-8. Visualisation of the view from Møns Klint of Kriegers Flak Offshore Wind Farm with 10 MW offshore wind turbines, in very clear weather. The photo was taken at the highest point on Møn, Dronningespiret, which is 128 meter above sea level. (Photo: Hasløv & Kjærsgaard).

4 The Impact of the Offshore Wind Farm on People

Kriegers Flak Offshore Wind Farm may impact people who live close to the installations, who travel in the area frequently, or who use the area recreationally. It may also impact those business sectors that currently use the area – examples include commercial fishing and agriculture. The facilities may limit the areas available to those industries today for fishing, farming etc.

The installations may impact people, industries, and local communities both short and long term. Consequently it has been an important aspect of the planning of Kriegers Flak Offshore Wind Farm to determine where to locate the offshore wind farm and how to design and layout it in order to minimise negative impacts on people. During the planning, investigation, and the detailed planning of the cable corridor, the impact on nearby residential properties, agricultural properties and industrial areas have been – and will continue to be – carefully considered.

Assessment of the impacts on people and local communities included impacts of noise, land use, magnetic fields, and the appearance of the offshore and onshore facilities have been considered.

When assessing the impacts on people it is important to make a distinction between temporary impacts which are felt during construction only and permanent impacts which will be felt as long as the facility exists.

4.1 Onshore Facilities

The onshore cables are underground cables and as such will not be visible for people who live or travel in the areas surrounding the cables. Landowners who own the land above the cables will be subjected to restrictions in their future land use around the underground cables through an easement (servitut). The easement will be approximately 7 m wide in case of one cable system is laid and approximately 15 m wide in case of two parallel cable systems. Inside the easement belt no structures must be built, no trees with deep roots must be planted, and other activities that might harm the cable or impede servicing the cable are not allowed. Usual farming operations are allowed and farmers may continue to farm their land over the cables as they do currently.

The new high voltage substation will require an area of about 5 ha. which is comparable to about 10 soccer fields. The expansions of the three existing substations will required no additional areas.

During the construction phase, those people who live and travel close to the future cable facilities will see and hear the construction work. Construction of the cable will require a working area surrounding the cable trench. The working area will be approximately 25 m wide and while construction is ongoing it will be characterised by excavated dirt, machinery, and steel plates. Adjacent to the working area there will also be storage areas for sand and cables as well as facilities for construction workers. Overall, the working area will disturb the landscape and noise from machinery will occur. In addition the working area may temporarily become a barrier (typically for a week or so), because the working area cannot be crossed while work is ongoing. An example might be at the cable land fall on the beach by Rødvig. For a cable length of approximately 1 km the surrounding areas will be impacted for a period of about three to five weeks.

4.2 Noise

Driving monopile foundations into the seabed is expected to be the most significant source of noise during the offshore construction phase. However, calculations show that the noise will not be heard onshore due to the large distance to the offshore wind farm (more than 15 km). Noise from the offshore wind turbines and noise originating from the operation of the offshore wind farm will also be at a level which is not audible on land and is far below the noise limits currently in force.

Onshore, noise impacts may be felt during the installation of the underground cable. This noise will stem from excavators and other types of heavy equipment. Only residents living closer than 15 km from the working area will experience nuisance as a result of noise. The potential noise impact will be temporary (three to five weeks) and will occur during the daytime with very few exceptions.

The expansions of the existing onshore substations will be completed in about eight months, whereas the construction of a new substation will take 12 to18 months. The construction noise will not be continuous. The noise will only be heard close to the substations and noisy work will only be done during the daytime.

Overall, the noise impact on the surroundings from construction of the onshore facilities connected to the offshore wind farm will be low.

The noise impact once the new technical installations at the onshore substations are in operation has been calculated. These calculations have been supplemented with relevant measurements of the current noise levels of the three existing substations (substation Bjæverskov, substation Ishøj and substation Hovegård). The

assessment of potential noise impacts shows that the additional noise from the new technical installations in itself will not exceed the noise limits recommended by the Danish Environmental Protection Agency (Miljøstyrelsen) in the areas surrounding the substations. The additional noise impact of the new technical installations is significantly below the noise limits at all three substations.

At substation Hovegård the cumulative noise impact of the substation will be unchanged following the construction of Kriegers Flak Offshore Wind Farm. However, the current noise impact of the substation already exceeds the noise limits recommended by the Danish Environmental Protection Agency (Miljøstyrelsen) in the areas surrounding the substation. This will continue to be the case when the new technical installations are in operation unless the noise from the existing facility is reduced.

Energinet.dk considers it very important to reduce the current noise level at substation Hovegård and is already developing plans including both renovation and expansion of the substation. The goal is to ensure a technically as well as economically robust solution which will also conform to the recommend noise limits. Energinet.dk expects to have a plan ready during fall 2015 and to implement the plan immediately.

4.3 Magnetic Fields Generated by the Cables

Magnetic fields are found where ever electrical currents are found. Magnetic fields are present every day in our homes, work places and in public spaces. The fields are found both near power transmission facilities, electrical installations, and ordinary household appliances.

Figure 4-1 shows an overview of magnetic fields from several well-known electrical appliances.

For the facilities included in the onshore part of the Kriegers Flak Offshore Wind Farm project, the magnetic fields are described in further detail in the background report regarding people, health and derived socioeconomic effects. The size of a magnetic field depends on the construction of the facility and the voltage. In addition, all magnetic fields diminish quickly as distance to the source increases. Magnetic fields are measured in micro tesla, abbreviated as μT, and is usually measured at a height of one meter above the terrain.

	Afstand 3 cm	Afstand 1 m
Vaskemaskine	0,8 -50	0,01 - 0,15
Ovn	1 - 50	0,01 - 0,04
Støvsuger	200 - 800	0,13 - 2
Hårtørrer	6 - 2000	0,01 - 0,03
Tv m. billedrør	2,5 - 50	0,01 - 0,15
Radio, (transportabel)	16 - 56	< 0,01

Figure 4-1. Overview of magnetic fields generated by several ordinary electrical appliances, measured in micro tesla, µT given in distances 3 cm and 1 m from the following sources: Washing machine (vaskemaskine), Oven (ovn), Vacuum cleaner (støvsuger), Hair drier (hårtørrer), Television with picture tube (TV m. billedrør) and transportable radio (radio, transportable).

Since the 1970s, research has been made to identify potential harmful impacts of magnetic fields. The focus of the majority of this research has been the risk of childhood cancers. In addition, a number of other health impacts have been studied. Based on national and international research findings – the latest from the WHO in 2007 – the Danish health authorities implemented the so-called precautionary principle in 1993. The precautionary principle is defined as follows:

'New houses and new children's institutions should not be erected close to existing high-voltage installations. New high-voltage installations should not be constructed close to existing houses and children's institutions.

The concept 'close to' cannot be defined in general but must be determined in the specific situation based on an assessment of the actual level of exposure.'

The publication, 'Guidelines for Applying the Precautionary Approach' gives an examination value of 0,4 µT as an annual average.

Magnetic fields at the cable facilities for the Kriegers Flak project have been calculated based on the expected average current intensity in the cables. The mag-

netic field graphs for individual parts of the cable route are available in the background report on people, health, and derived socioeconomic impacts.

The precautionary principle as prescribed by the Danish Health and Medicines Authority (Sundhedsstyrelsen) should be applied in planning the cable route. It is expected that the cable route can be planned in such a manner that the magnetic field of the cable is kept below the examination value near any homes that may be adjacent to the project. It is emphasised that this value as described is not a scientifically established health related limit but simply a reference point used to determine when the size of magnetic fields should be examined and mitigation measures investigated.

4.4 Societal Impacts of the Offshore Wind Farm

For the purpose of this Environmental Statement, impacts on society have been delimited to socioeconomic impacts resulting from environmental impacts such as impacts on the earning potential of the population stemming from the expected environmental impact of the offshore wind farm.

The most important socioeconomic impact will be the impact on commercial fishing. Both the area on Kriegers Flak and the offshore cable corridor to Rødvig are currently fished commercially. The most important forms of fishing are trawl fishing, netting, and pound net. (Figure 4-2 shows a photo of pound net fishing).

Cod is the most important commercial fishing species for the area. The total annual loss to Danish cod fishing is expected to be around 85 tons as a result of the project. In addition, a smaller loss is expected for other species, in particular flatfish. Possibly, the loss may be recovered by fishing in other areas; however, those likely do not provide the favourable fishing conditions comparable to the investigated are on Kriegers Flak.

Assessments shows, that there will be a major impact on fishing during the construction phase and a moderate impact during the operational phase because fishing in the area will be limited. The impact will be greatest on Kriegers Flak because trawling routes that pass through the central and eastern part of the wind farm area will become unusable. The impact may be reduced to a minor impact if special provisions are made for fishing, such as allowing fishing during the construction phase in those parts of the cable corridor not under construction at the time and by allowing fishing over the offshore transmission cables during the operational phase. These are all well-known measures which are used in other comparable projects. A final determination of the extent of and need for mitigation measures for commercial fishing cannot be made until the future concession holder of the offshore wind farm has planned the project in more detail.

Figure 4-2. Pound net fishing (photo: BioApp and Krog Consult).

Several types of recreational and hobby fishing take place from the coast of Stevns, along the coast and on Kriegers Flak. The area between Stevns and Kriegers Flak is also used for fishing. Ship wrecks in the area are considered good fishing spots for recreational fishermen and the area between Sjælland, Bornholm, Møn and Rügen is attractive for trolling fishing, particularly fishing for salmon. Trolling fishing for sea trout along Stevns Klint has also been attractive for many years. An analysis shows that the area will continue to be attractive for recreational fishing for sea trout and salmon among other species. The good, well-known fishing spots by Kriegers Flak will still be available to trolling fishing and if it should become necessary to remove ship wrecks during the construction of the offshore wind farm there will still be many well suited fishing spots in the area.

In general, the project will have a positive impact on employment in the area because construction and operation of the offshore wind farm will create jobs. These activities are expected to generate jobs equal to about 160 man years during the construction phase and about 140 man years annually when the wind turbines are in operation.

Potential impacts on tourism and recreational interests may be caused by the fact that the offshore wind farm will be visible from the shore. People have widely varying opinions on offshore wind turbines ranging from very negative to positive opinions. However, no environmentally derived socioeconomic impacts on tourism or recreation are expected.

The area for sand extraction 'Kriegers Flak' has been reserved natural resource extraction for the construction of the Fehmarn Belt fixed link. The offshore wind farm will not be located in this area and thus it is not expected to have any socio-economic impact on the extraction of natural resources from the area.

Finally, the offshore wind farm may have an impact on the ferry operations between Trelleborg and Rostock/Travemünde, because it may cause a longer ferry route to be necessary.

The environmental impacts of onshore construction related to the underground cables and substations cause only few and very limited socioeconomic impacts. The investigated area onshore involves two raw material excavation areas. One such area is located by Lille Dalby and is only covered in proposal B's northern route. The other area is located by Store Salby and in this location the cable will be routed around the raw material excavation area. When the cable is laid, farmers will be compensated for their losses and may resume farming once the cable has been laid.

5 Animal and Plant Life

Animal and plant life has been investigated onshore and offshore and potential impacts have been assessed. The offshore investigations have included plants and animals on the seabed, fish, marine mammals, and birds. The onshore investigations have covered conservation areas, plants, amphibians, reptiles, bats and more.

The area investigated offshore is located in an area of the Baltic Sea with abundant bird life and good conditions for several fish species. The area is also somewhat significant for porpoise and seal populations. The offshore investigated area is located in a part of the Baltic Sea where birds are thriving. The area is also somewhat important to porpoises and seals and conditions are good for populations of several species of fish.

Particularly relevant to the investigations are those species and habitat types which are covered by international conservation efforts such as Natura 2000-areas and Annex IV-species.

The descriptions and assessments of matters pertaining to plant and animal life are based partially on existing knowledge and partially on a number of extensive field investigations, which have been carried out for this project.

5.1 Natura 2000

Natura 2000 is an EU wide network of nature protection areas. It is comprised of Special Areas of Conservation (SAC) designated under the European Habitats Directive, and also incorporates Special Protection Areas (SPAs) which are designated under the Birds Directive. For each Natura 2000 area there is a list - the so-called designation basis – which lists habitat types and species which that particular area was chosen to conserve. The purpose of the Natura 2000 network is to ensure favourable conservation status for those species and habitats, which are included in the designation basis.

Onshore Natura 2000 areas

Figure 5-1 shows that the cable installation will cross Natura 2000 area Køge Å (no. 148). The project will not directly impact any other Natura 2000 areas onshore, however, Natura 2000 areas Vasby Mose and Sengeløse Mose (no. 140) and Gammel Havdrup Mose (no. 150) are all located within a distance of two kilometres from the project area. A decision has already been made to utilise so-called horizontal directional drilling when crossing Køge Å and the nature areas surrounding the stream in order to avoid impacting the stream and the designation basis of the area. Horizontal directional drilling means that a hole is drilled

underneath the area to be crossed, a plastic tube is inserted and the cables are pulled through this tube. As a result the stream, the stream bed and brinks and the plant and animal life are not disturbed during the construction nor during the operational phase. At Vasby Mose and Sengeløse Mose thorough investigations of soil conditions will be completed before determining the cable route and where and how streams going into the Natura 2000 area will be crossed.

Figure 5-1. Natura 2000 areas onshore and along the coast (in olive green colour) and the project area (in red colour).

If horizontal directional drilling is used when crossing the Køge Å Natura 2000 area, no significant impact on the species and habitat types which caused Køge Å to be chosen as a Natura 2000 area will arise.

No other onshore Natura 2000 areas will be impacted significantly by the project because they are located so far from the construction sites that no species or habitat types listed in the designation bases for those areas will be impacted.

Offshore Natura 2000 areas

The investigated cable corridor to Rødvig cuts a corner off Natura 2000 area no. 206, 'Stevns Rev'. The final route for the offshore transmission cables has not been determined, however, the offshore transmission cables will be placed inside a cable corridor which veers south around the Natura 2000 area. Natura 2000 area 'Stevns Rev' is shown in Figure 5-2, and Figure 5-3 shows a proposed cable route south of the Natura 2000 area.

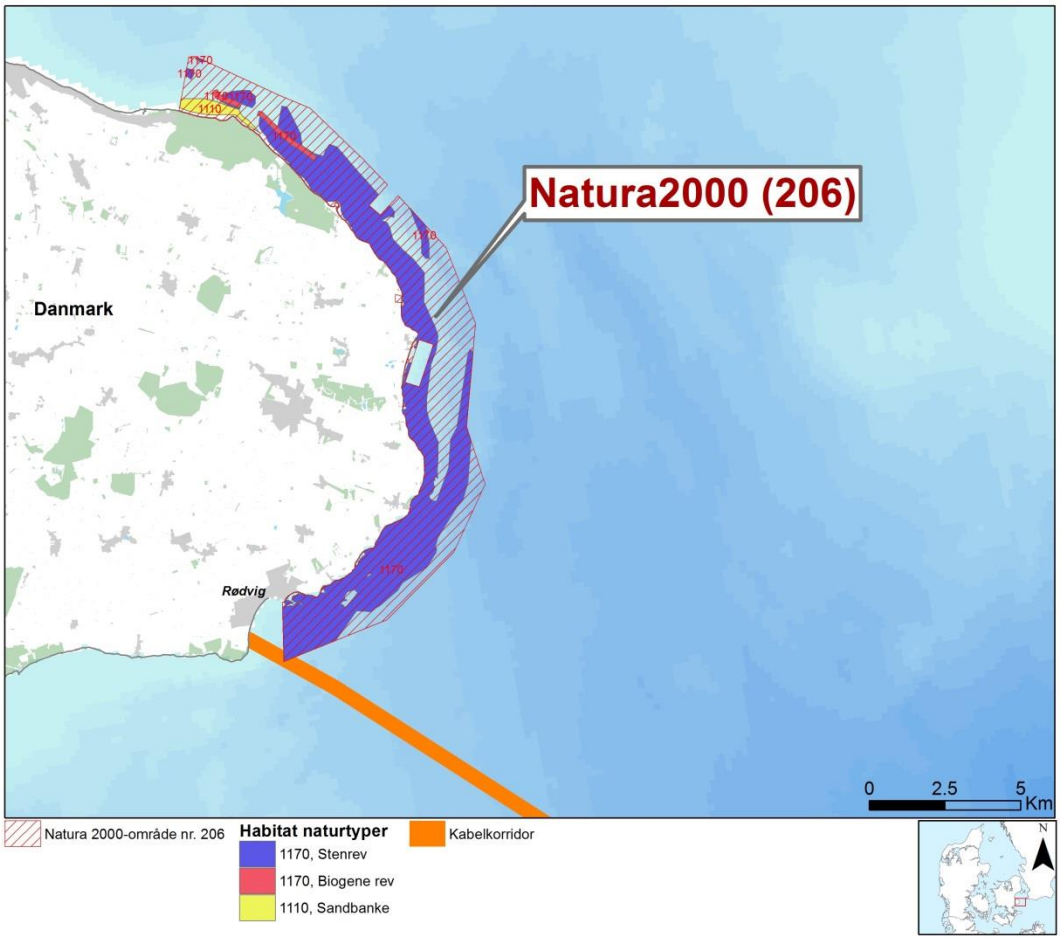

Figure 5-2. Natura 2000 area no. 206 'Stevns Rev' which encompasses habitat types 1110 (sandbank) and 1170 (reef). The cable corridor (shown in orange) passes the southern tip of the Natura 2000 area.

Adjacent to the Natura 2000 area the distance between the offshore transmission cables will be a little more than 200 meters so that sufficient distance to the Natura 2000 area is kept to ensure that the construction will not impact the Natura 2000 area. The designation basis for Stevns Rev lists the habitat types 'sandbanks which are slightly covered by sea water all the time' and 'reefs'.

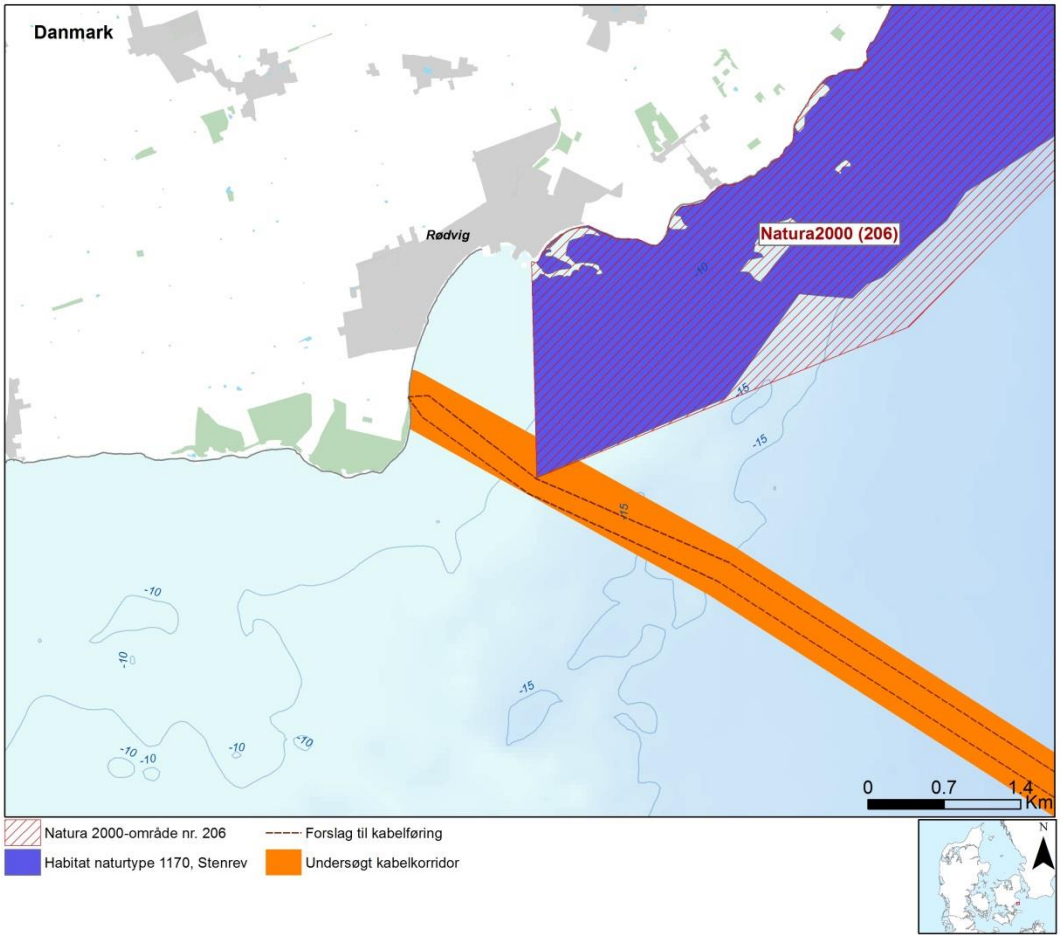

Figure 5-3. The investigated cable corridor (orange) cuts a corner of Natura 2000 area no. 206 (blue); however the cable route for the offshore transmission cables will not impact the Natura 2000 area. The investigated corridor is 500 m wide and shown in orange in this figure, with suggested cable lines shown as lines.

An assessment was carried out to determine whether the offshore transmission cables alone or cumulating with other plans and projects might have a significant impact on the Natura 2000 area. The primary goal for the area is to ensure that Stevns Rev has good water quality, diverse marine vegetation and is a good habitat for the general benthic and fish species.

The assessment shows that the Natura 2000 area will not be impacted significantly by installation of the offshore transmission cables. In addition, there are no other projects or plans which might have a cumulative impact related to the offshore transmission cable landfall.

An assessment has also been undertaken to determine which of the protected bird species that are listed on the designation basis of relevant bird conservation areas which may potentially be impacted by Kriegers Flak Offshore Wind Farm.

Common crane is listed in the designation bases of a number of Special Protection Area (SPA) along the migratory route of Common cranes. An estimated 84,000 Common cranes use a migration route crossing the Arkona Basin, where the Kriegers Flak Offshore Wind Farm will be located.

A Natura 2000 impact assessment concerning the impact on Common crane has been prepared and shows that the construction, operation, and decommissioning of Kriegers Flak Offshore Wind Farm on its own will not harm or impact the conservation goals for migrating Common cranes listed in the designation bases for relevant bird conservation areas.

However, the Natura 2000 area impact assessment must also consider other existing, permitted, and potential future offshore wind farms in the area surrounding Kriegers Flak Offshore Wind Farm. These projects are at differing stages of planning, which has been accounted for when analysing the impact from Kriegers Flak Offshore Wind Farm combined with other offshore wind farms. The planned offshore wind farm projects are Danish, German, and Swedish.

Overall, the assessment shows that Kriegers Flak Offshore Wind Farm on its own or in concert with other offshore wind turbine projects will not harm or impact the conservation goals for migrating Common cranes listed in the designation bases for the relevant bird Natura 2000 areas.

5.2 Birds

The project may impact migratory birds passing through the area during spring and fall migrations between breeding areas and areas where they stay for the remainder of the year as well as staging sea birds that rest and feed on the shallow sand bank, Kriegers Flak. The area is particularly important for birds migrating between Sweden and Germany.

Several migratory bird species are protected by the EU Bird Directive. This includes among others Common crane and several raptor species. Common crane are also listed on the Danish 'red list' as 'not endangered'. Several species of sea birds that use the area are also protected by the Bird Directive and listed in international conventions. These include among others: Long-tailed duck, Common scoter and Velvet scoter.

Migratory Birds

For migratory birds there is a risk of collision with the offshore wind turbines if the migratory route passes through the offshore wind farm. The offshore wind farm may also functionally become a barrier that the birds have to fly over or

around. Common crane and several raptor species are considered most vulnerable to such impacts.

Common cranes in Northern and Western Europe are part of a population which winters on the Iberian Peninsula and in the northern part of Morocco. These cranes breed in Sweden, Norway, or Finland and a part of the population migrates across the Arkona Basin, which is an area west of Bornholm in which Kriegers Flak Offshore Wind Farm will be located. During the spring and fall migration of the Common cranes, there is a risk of collision between cranes and offshore wind turbines which may potentially impact the overall Common crane population. The annual mortality caused by collisions with offshore wind turbines has been estimated and assessed for its impact on the overall Common crane population. The collision risk is mainly determined by the flight altitude and avoidance behaviours exhibited by the cranes when they encounter the offshore wind farm. The avoidance behaviours of Common cranes were investigated during spring 2015 and the risk of collision between Common cranes and offshore wind turbines has been estimated based on this investigation. The sustainability of the Common crane population relative to the mortality introduced by the offshore wind farms was then estimated and the assessment shows that the impact off collisions with the offshore wind turbines on the Common crane population is minor.

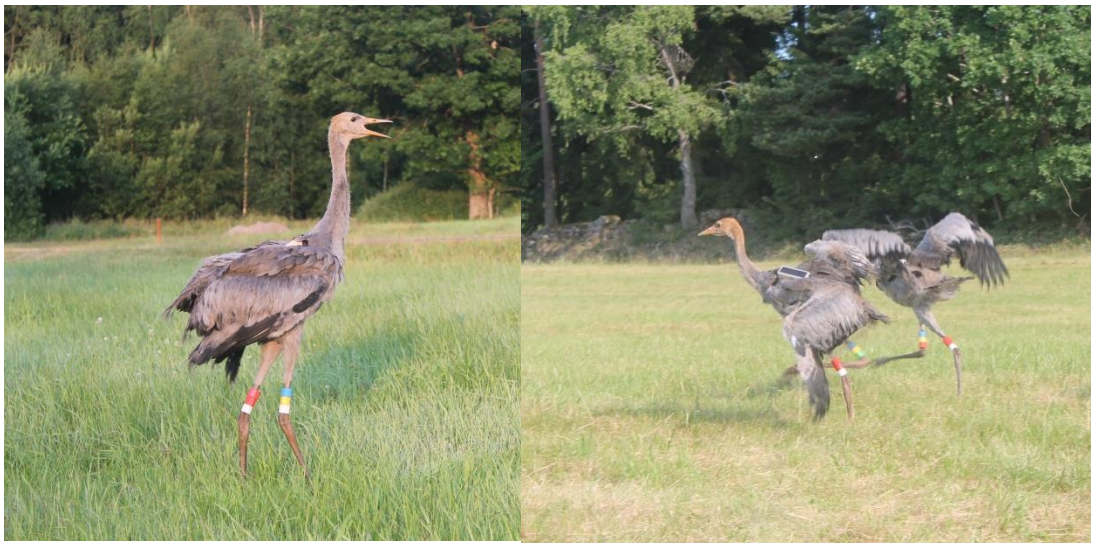

Figure 5-4. Young specimens of Common crane that have been tagged with satellite transmitters. (Photo: Thomas W. Johansen).

The most important raptor species that migrate across the sea to and from southern Sweden are Red kite, Osprey, Hen harrier and Common kestrel, which are assumed to cross the south western part of the Baltic Sea. The flight altitudes of raptors vary widely but previous investigations have shown that almost all raptors cross the central part of the Baltic Sea at heights of less than 150 meter. The only impact relevant for migrating raptors is the risk of colliding with the offshore

wind turbines. However, this impact is estimated to be insignificant because the raptors fly beneath the rotors of the offshore wind turbines when they pass through the offshore wind farm and thus the risk of colliding with the offshore wind turbines is low.

Sea Birds

An offshore wind farm can negatively impact sea birds because of changes to or loss of habitat and by disturbing or displacing birds from the area. The investigations and assessment of impacts on wintering sea birds have focused on sea ducks, which are estimated to be the most vulnerable to the impact of an offshore wind farm on Kriegers Flak.

Long-tailed ducks are considered the most abundant sea bird on Kriegers Flak and may be found there between November and May. Other species such as Common scoter and Velvet scoter are also found in the area but not in similarly significant numbers.

Figure 5-5 is a photo of a Long-tailed duck. This is the sea bird species that will be impacted the most by the offshore wind farm. An estimated less than 1 percent of the Long-tailed duck population will be displaced from their feeding areas. However, the impact is estimated to be moderate for the overall Long-tailed duck population because this impact will continue for many years which will increase its significance as opposed to a more short term, temporary impact on the birds.

Figure 5-5. Long-tailed duck is one of the bird species which are registered on Kriegers Flak. (Photo: Stefan Pfützke, www.green-lens.de).

5.3 Migrating Bats

The project may impact bats that migrate across the Baltic Sea if they cross Kriegers Flak. Analysis of bat sounds identified four species of bats in the area surrounding Kriegers Flak: Nathusius' pipistrelle, Common noctule, Parti-coloured bat and Serotine bat. All four species are found in large parts of Denmark and all are listed as 'not endangered' on the Danish red list. However, all bats are covered by international protection as they are included in Annex IV of the EU Habitat Directive. For this reason, the project may not damage or destroy areas where bats breed or rest. In other words, the offshore wind farm may not impact bats negatively.

The most significant impact of offshore wind turbines on bats is collision with rotor blades when the turbines are in operation. This may happen if they are attracted to insects which accumulate around the rotor blades due to the lights on the offshore wind turbines among other things. The impact of collision risk during the operational phase is estimated to be minor to moderate.

All four species found are common in Denmark and all four species enjoy a favourable conservation status. It is assessed that the estimated small number of deaths due to collision will not impact bat populations. Consequently, mitigation measures are not necessary and it is assessed that the ecological functionality of the area is not negatively impacted by the project.

Figure 5-6 shows a bat detector which was used to record bat sounds during the environmental impact assessment investigations.

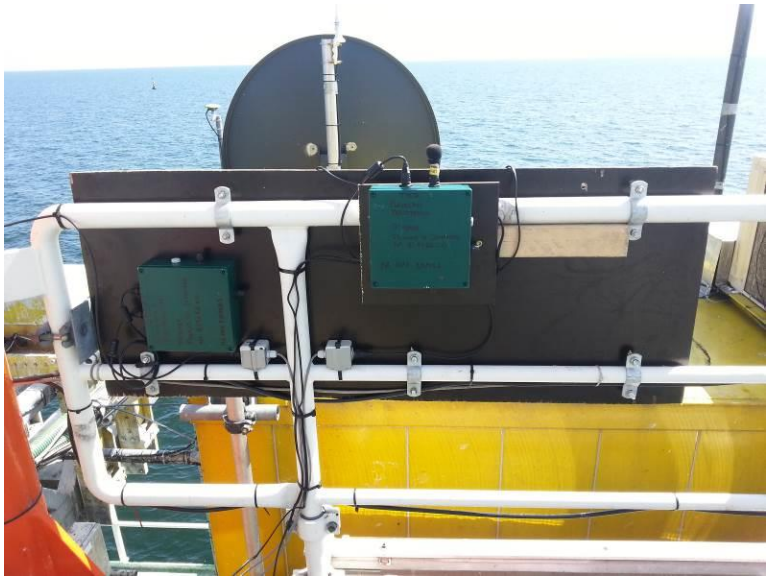

Figure 5-6. Bat sounds were recorded using a bat detector which was mounted to a measuring mast about 2 km southeast of the area on Kriegers Flak where the offshore wind farm is expected to be located. (Photo: DHI/DCE).

5.4 Marine Mammals

The Baltic Sea is home to several species of marine mammals including seals and porpoises. Porpoises live their entire lives in the water whereas seals breed and rest onshore.

Harbour porpoises are the most common whale species in Denmark and may be seen year-round in Danish waters. The area where the offshore wind farm is expected to be located must be considered of minor importance to Harbour porpoises because few Harbour porpoises are assumed to be in the area.

The Harbour porpoise is an internationally protected species and is listed in Annex II and IV of the EU Habitat Directive. The listing means that breeding and staging areas may not be damaged or destroyed by the project and that their ecological functionality may not be impacted. Harbour porpoises are also protected by the Bonn Convention which aims to protect wild animal species that regularly cross borders.

The Harbour seal is the most common species of seal in Denmark while Grey seals are less common. The two seal species live in coastal areas in particular where food such as fish, squid, and crustaceans is abundant.

Both Harbour seals and Grey seals are protected internationally because they are listed in Annexes II and V of the EU Habitat Directive.

To investigate the extent to which Harbour porpoises and seals use Kriegers Flak, literature and results of previously completed investigations have been compiled. In addition 10 Harbour seals and five Grey seals were tagged with GPS transmitters and observed for a period of time. Figure 5-7 shows the areas where Harbour seals stay during spring, summer, fall and winter seasons.

If monopile foundations are chosen the pile driving will produce very loud noise levels that are capable of inflicting both temporary and permanent hearing damage in seals and porpoises close to the noise source. In addition the noise may cause behavioural changes, particularly in porpoises. Consequently, it is necessary to scare the marine mammals away from the area before pile driving begins. This can be done using so-called pingers that emit noises which seals avoid, leading them to leave the area. The pile driving itself is then begun slowly with less force and more time between each blow than during the final face of the pile driving. This will also give the animals more opportunities to leave the area while the noise level is still insufficient to inflict hearing damage.

Based on calculations regarding the noise propagation from construction activities and the potential for hearing damage in seals and porpoises, it is deemed necessary to reduce noise levels by 16 dB compared to the worst case scenario to ensure that seals and porpoises do not sustain permanent hearing loss. The worst case scenario is driving monopile foundations for 10 MW offshore wind turbines,

and the noise level must be reduced by 16 dB from the noise level produced in this scenario. This environmental impact assessment is based on a 16 dB reduction in noise the level which is considered a conservative basis. The future concession holder of the offshore wind farm will have the opportunity to choose the noise reduction method in order to meet this requirement.

The requirements to scare marine mammals into leaving the area and to implement noise reduction will ensure that no animals suffer permanent hearing loss. Impacts which may lead to behavioural changes in porpoises are estimated to be moderate and the impacts leading to temporary hearing loss are estimated to be minor to moderate.

For seals, impacts related to temporary hearing loss are considered insignificant to minor. If a type of foundation other than the monopile foundation type is chosen, marine mammals will experience no hearing damage related to the construction of the foundations.

Apart from the underwater noise, only minor impacts on marine mammals are expected in the area. The introduction of a new hard substrate in the form of foundations and scour protection will have a positive effect because the new reef structures may attract fish and other animals of prey.

The condition and development of the Harbour porpoise population in the area must be assumed to be identical with or without the offshore wind farm and it follows that the ecological functionality of the porpoise population will not be affected.

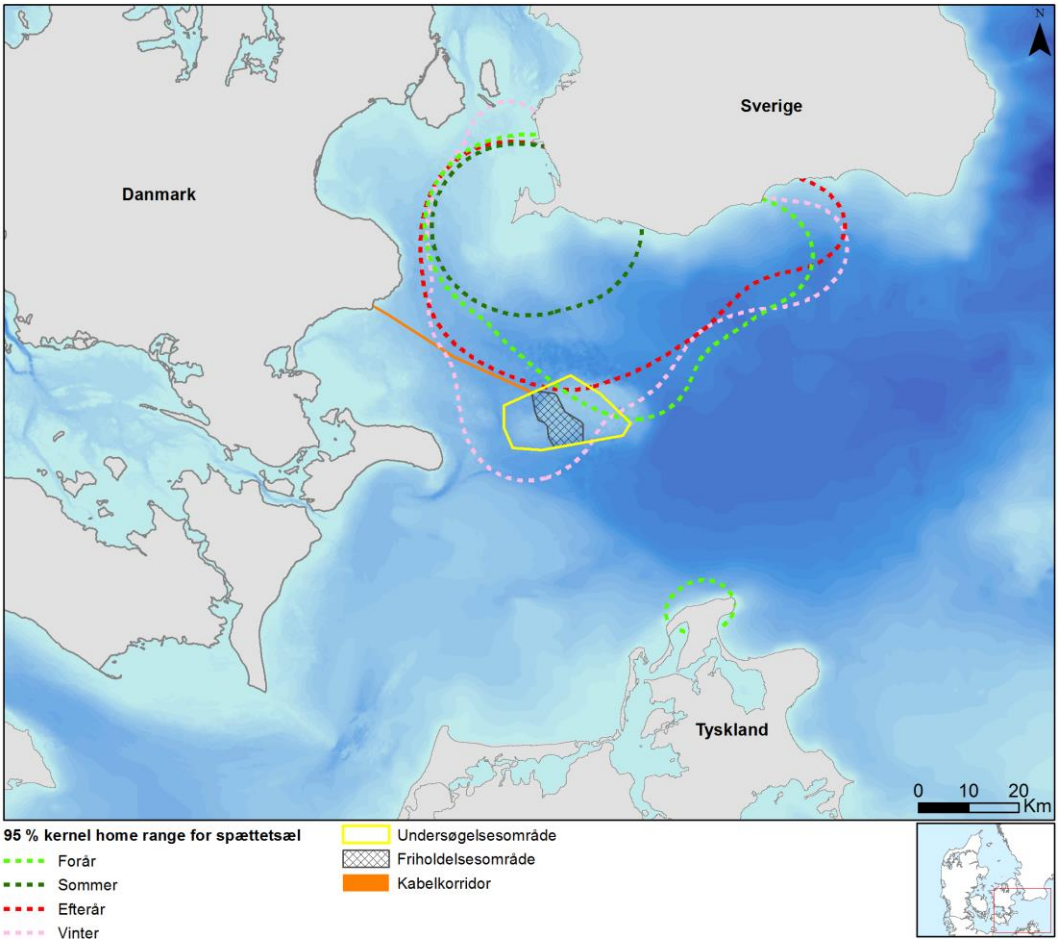

Figure 5-7. By GPS tagging 10 Harbour seals it was possible to follow their movement. This figure shows where Harbour seals were most common during the spring (light green), summer (dark green), fall (red) and winter (purple) seasons. The dotted lines show the areas where 95 percent of the animals are expected to be during the four seasons. The project area is shown as yellow (wind farm site) and orange (offshore transmission cable), with the restriction area shown in hatched signature.

5.5 Benthic plant and animal life

The offshore wind turbines will result in a certain amount of resistance to the ocean currents in the area and this may impact both the salinity and current and wave conditions which are among the most important conditions for life in the ocean. Modelling shows that changes in these conditions will be very limited and of no consequence to the benthic plant and animal life.

During the construction phase, the seabed may be impacted by the construction of the offshore wind turbine foundations and inter array cables. This may result in sediment spill and dispersion of sediment from the seabed which may impact animals and plants in the ocean for example with dispersed sediment settling on top of animals living on or imbedded in the seabed. This will decrease the ability

of the animals to breathe and eat. Sediment in the water can also change the light conditions by shading aquatic plants and seaweed and impeding growth.

The seabed on Kriegers Flak consists of sand, rock, and mixed materials and the animal life on the seabed is characterised by species which are adapted to this type of habitat. Animal life is dominated by species that live imbedded in the seabed such as Baltic clam and Sand gaper. In those parts of the investigated area on Kriegers Flak where there are rocks on the seabed, the rocks are covered in abundant growths of Blue mussel, and there is an abundance of species present because the mussel banks are great habitats for other animals. Due to the great depth of the water there is not much light on the seabed and consequently largely no vegetation in the area. The organisms living in the area are common in Danish waters and they are adapted to large variations in the sediment content of the water and to periods of high sediment concentrations for example due to storms. The sediment impact during the construction phase is estimated to be limited and there will not be any significant impacts on animals or plants in the area.

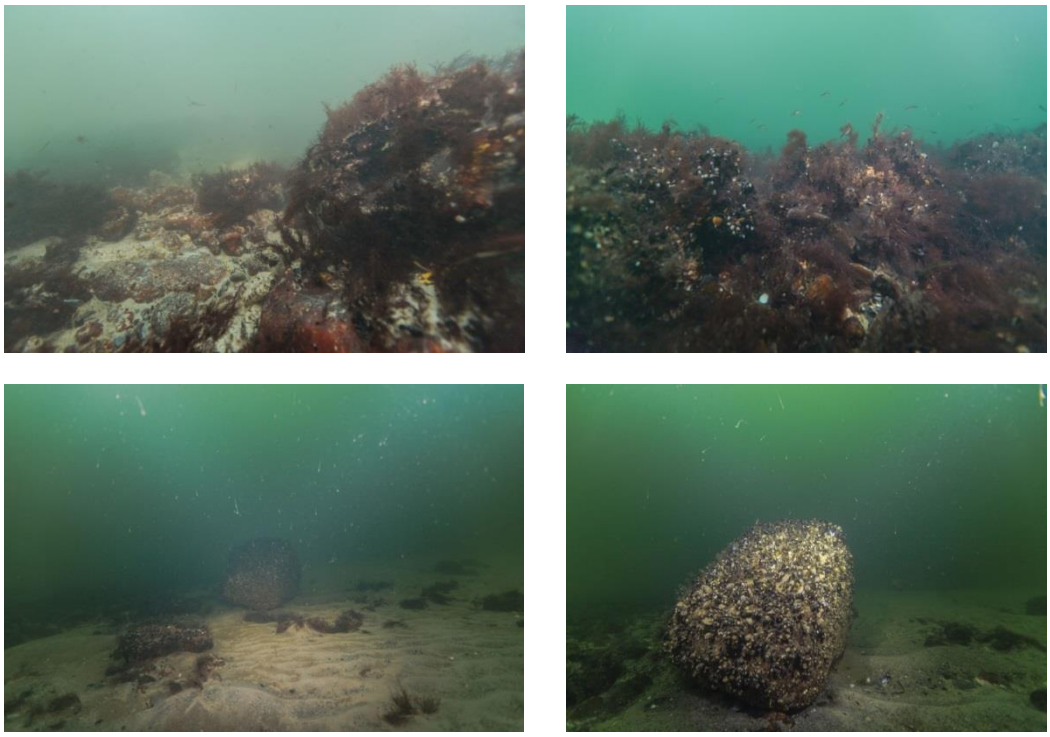

Figure 5-8. Photos of stone reefs near the coast by Rødvig. The top two photos show rocks with growths of seaweed and photos below show a sand bottom with scattered rocks on which mussels are growing. (Photo: Marilim).

A small area in the cable corridor, closest to the cable landfall, is a stone reef where plants and animals are more vulnerable to disturbances caused by sediment dispersal during the construction phase. However, it is expected that a natural seabed community will re-establish itself on the reef within a few years. Figure 5-8 shows photos from the reef close to the coast by Rødvig. The construction

of the turbine foundations and scour protection around the foundations will replace the natural seabed with new hard structures made of concrete, iron, and rock which are reminiscent of a natural reef and can host the same type of plant and animal community as a natural reef.

5.6 Fish

Seabed conditions also significantly influence which fish can live in the area. Many fish, in particular flatfish, are linked to particular seabed types. Species which are abundant, ecologically very significant, and/or important for the fishing industry are called 'key species'. Key species on Kriegers Flak include Cod, Whiting, Flounder, Plaice, Turbot, Herring, Sprat, Sand lance and Eel. Fish investigations show that Kriegers Flak is unlikely to be an important spawning area for Cod. On the other hand, the area has a certain significance as a growth area for small Cod. Figure 5-9 shows some of the fish that were caught during the investigation on Kriegers Flak.

During the construction phase, short periods of physical disturbance of the seabed will occur, including dispersal of sediment. Due to the combination of the short term nature of the impact, the relatively low increase in concentration and the small size of the affected area, there will be no impact on fish.

During construction, underwater noise from driving monopile foundations may have a short term impact on the fish community. Based on the planned number of wind turbine foundations the total period of pile driving noise will be limited to less than 210 days during the construction phase. The fish have ample opportunity to leave the construction area and find other suitable places to live while the noise is ongoing and consequently it is estimated that fish will experience only a minor impact due to underwater noise.

The impact on fish and fish communities may potentially be positive because there will be food and shelter for fish on the new reef-like structures. However, the overall character of the fish community will not change because the turbine foundations and scour protection cover a very limited area and because hard bottom areas already exist on Kriegers Flak.

Around the inter array cables between the wind turbines and around the offshore transmission cables, an electromagnetic field will be created. The intensity of the field will quickly decline with increasing distance to the cables, and it is estimated that it will not impact the ability of fish to navigate.

Figure 5-9. Fish caught on Kriegers Flak. Shown in the image are Herring, Cod, Eel, Flounder and Shore crab. (Photo: BioApp and Krog Consult).

5.7 Onshore Conservation Interests

The onshore project area is dominated by intensively cultivated farm land. There are also areas with more abundant natural features such as sea shore, grassland, bogs, meadows, deciduous woods, protected wooded areas, streams, and ponds. While conducting onshore conservation investigations, several special areas of focus have been identified where a large number of protected habitat types or wooded areas is located centrally in the project area. Furthermore, the substations have also been designated as focus areas. The focus areas are shown in Figure 5-10. The project already incorporates a requirement that these focus areas will be crossed using horizontal directional drilling. This will result in no impacts to the conservation interests by the project.

In addition, a number of ponds and lakes in the project area are considered suitable habitats for amphibians and are protected by Annex IV of the Habitat Directive. As an integrated part of the project, these habitat areas have been avoided when determining the likely cable route in the project area.

Figure 5-10 Focus areas (green circles) for conservation for proposal A and proposal B are shown. At each of the focus areas, possibilities have been investigated for horizontal directional drilling and/or adjusting the cable route to completely avoid conservation interests. These measures are already incorporated in the project design. The following nature types are present at each focus area: At landfall (ilandføring): Coastline, stream and meadow, Karise: meadow, bog and stream, Tolstrup Gårde: meadow and protected wooded area, Tågerød Skov: protected wooded area and stream, Åshøje Overdrev og Krageskov: protected wooded area, stream and bog, Regnemark: grassland, meadow, bog, pond, protected wooded area and stream, and protected site, stream, pond and grassland, Sengeløse: meadow, bog, pond and stream.

Areas with multiple ponds where amphibians may breed, feed or rest and which are wholly or partially inside the project area have also received special attention when investigating the impact of the project on conservation interests. Because wandering amphibians often seek food, breed, and rest in such areas, special attention must be paid to wandering amphibians, when installing the cable.

Onshore Protected Species

In the project area the following protected amphibians which are listed in Annex IV of the Habitat Directive may be found:

- Moor frog
- Agile frog
- Common spadefoot
- Great crested newt

Ponds where amphibians may breed, feed, and rest have been investigated. In addition to ponds, a number of stone and earth walls, sandy and sun exposed areas as well as hedges and old trees were studied, because those are used by sand lizard and bats respectively to breed, feed and rest.

All ponds which are protected by section 3 of the Danish Protection of Nature Act and where Annex IV protected amphibians have been registered previously, as well as ponds which are considered suitable habitat for amphibians, will be avoided when the final route of cable trench for the onshore cable is determined. In addition, protected streams, including the Køge Å habitat area will be crossed using horizontal directional drilling. This method will also be used should it be necessary to cross other habitats protected by section 3 of the Danish Protection of Nature. Using the horizontal directional drilling construction method, will protect the habitats and the wild animals and plants in them from disturbances such as excavation, traffic etc. Once the cable facilities are in operation, there will be no impacts on the habitats, animals or plants along the cable route.

Protected wooded areas will be crossed using horizontal directional drilling if there is vegetation worthy conservation, while cable will be laid in wooded areas which cannot be avoided by excavation of a trench. In protected wooded areas, particularly valuable old trees and other features will be avoided, as agreed upon with the property owner.

Neither proposal A nor proposal B significantly impact conservation interests onshore.

6 Other Environmental Issues

In addition to people, plants and animals, there are a number of ways in which the project may impact the environment. Therefore, other concerns have been investigated as a part of the environmental impact assessment.

Among other things, it has been investigated whether the project will impact the climate, whether the project will impact air quality, whether the project will impact existing soil pollution or cause new soil pollution, and whether the project will impact the state of surface water (lakes and streams) and ground water. Other concerns such as archaeological concerns, impacts on cultural heritage, and the consumption of materials and production of waste have also been investigated.

6.1 Climate and Air Quality

During the operational phase, the power produced by the offshore wind farm will replace power generated by power plants using fossil fuels.

Emissions of CO_2 and other acidic gasses (primarily nitrous gasses, NO_x, which contain nitrogen and oxygen) will be reduced significantly as compared to conventional power production and thus the operation of the offshore wind farm will contribute positively to impeding acidification and global warming.

Emissions of CO_2 during the manufacturing and erection of the offshore wind turbines and the associated onshore facilities are small, when compared to the CO_2-improvement generated by the power production of the offshore wind farm. When evaluated in light of the future average power production in Denmark as projected by the Danish Energy Agency, the implementation of the project will result in an overall reduction in CO_2 emissions of 11,324,000 tons over the 30 year lifespan of the offshore wind farm. Implementation of the project ensures a long term reduction in CO_2 emissions and supports the energy policy goal that Denmark's energy supply and transportation be based on renewable energy by 2050.

Air pollution emissions from the machines used in onshore construction will not affect the air quality locally in a way that impacts public health.

6.2 Soil Pollution

Heavy civil construction can potentially affect existing pollution, for example by draining existing pollution or when soil is moved around in and around the cable

trench. Construction may also occasion new soil pollution (e.g. an oil spill from heavy equipment).

Overall, the potential impact on existing soil pollution and the risk of new soil pollution onshore are negligible or minor. The risk of laying the cables in polluted soil is very small, because the project already avoids known soil pollution sites and incorporates spill prevention in the project plan.

6.3 Natural Resources and Materials

Materials and natural resources for Kriegers Flak Offshore Wind Farm and the associated onshore facilities will almost exclusively be needed during the construction phase. Large amounts of metals, steel, sand, gravel, and rock will be needed. In order to limit the use of natural resources and other materials, recycled materials will be used to the extent possible.

Sediment excavated on the seabed

Depending on the type of offshore wind turbine and foundation, it may be necessary to excavate large amounts of seabed materials during the construction phase. If possible, the excavated materials must be reused e.g. as ballast material for gravity foundations. The remaining material is expected to be placed at a so-called “dumping site” which is an area on the seabed approved by the competent authorities for sediment disposal. The future concession holder of the offshore wind farm will be responsible for obtaining a permit to reuse and/or dump the excavated material.

6.4 Waste

Waste is primarily produced during the construction and decommissioning phases. Waste for the construction phase will include i.e. cable scrap, sanitary waste from vessels, daily sanitation, combustible waste, oil and chemical waste as well as construction waste. The waste will be disposed in accordance with governmental regulations for industrial waste. This will ensure that the large majority of the project materials are reused and will also limit the environmental impact of the waste produced during the construction phase.

Prior to decommissioning the offshore wind farm and the associated facilities offshore and onshore, a detailed plan must be made for waste handling. At this stage, conforming to the relevant requirements as set forth in municipal regulations for industrial waste will ensure that the large majority of the materials for the project are reused. In addition, the general trend toward increasing reuse of materials is expected to further contribute to ensuring that the majority of the materials can be reused, when the offshore wind turbines are decommissioned.

6.5 Surface Water and Ground Water

When underground cables are laid there will be only a few impacts on the ground water. If problems arise, such as e.g. ferruginous deposits to the water may be filtered through a sand filter. If other issues concerning surface water or ground water occur, horizontal directional drilling may be used during construction. Once a cable has been laid underground, it will not impact the ground water.

At the substations, technical solutions have been incorporated into the project to protect the ground water from oil and metal pollution. All larger streams with constant and adequate water levels will be crossed using horizontal directional drilling to minimise the likelihood of spreading sand and mud. This will also be the case during the decommissioning phase and cables are expected to be removed without any excavation near streams. Consequently, the overall the impact will be negligible.

6.6 Archaeological Interests

The project also includes investigations of archaeological interests both on land and on the seabed.

Onshore Archaeology

Museum Southeast Denmark, Roskilde Museum and Kroppedal Museum have collaborated and conducted an archaeological analysis based on archives, databases, old maps, aerial photos and other sources.

The analysis concludes that numerous burial mounds, settlements, and other archaeological finds are to be expected in the investigated area. As an example, the investigation identified burial mounds on Stevns which were not previously known.

To the extent possible, the proposed cable route in the project area has been directed around areas which the museums deem highly likely to yield archaeological finds. The analysis is also the basis for further efforts to avoid or protect onshore archaeological and cultural heritage sites.

A number of archaeological focus areas are found in the area including among others the Viking castle Borgring close to Køge Å, where the museums have already identified a need to conduct preliminary archaeological investigations.

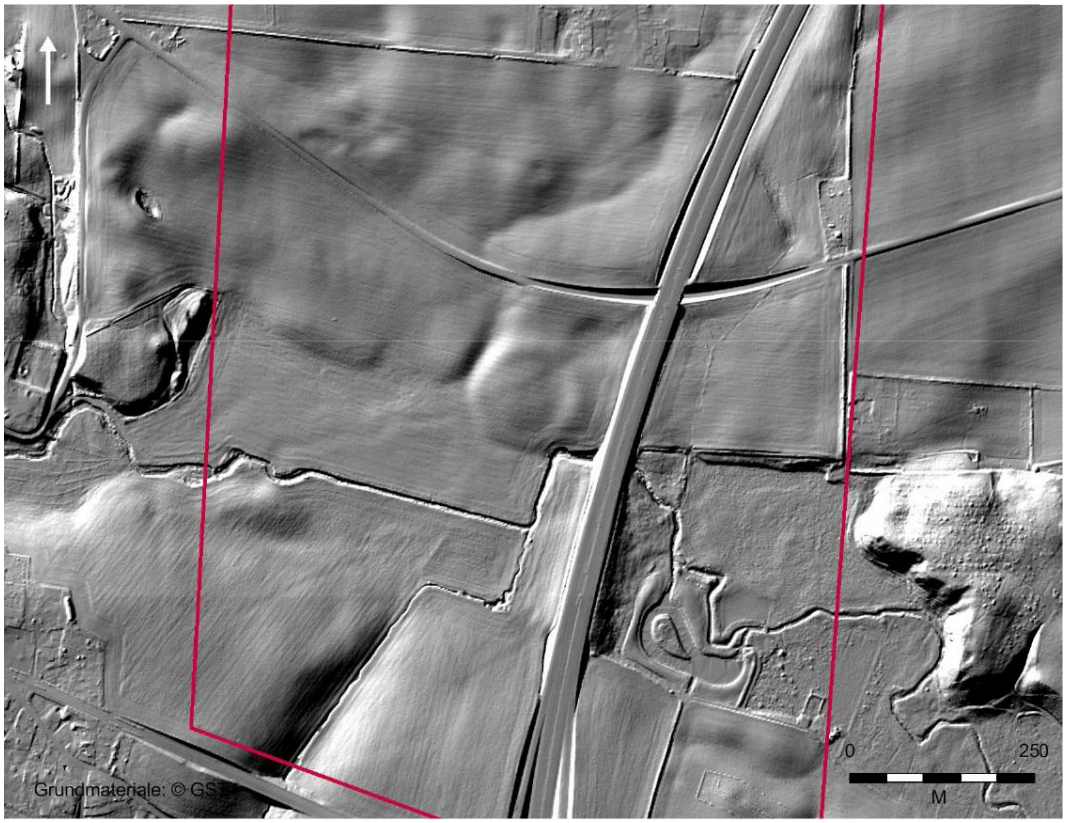

Figure 6-1. Borgring by Køge Å is shown on a relief map in the middle of this figure, the read lines mark the area for the onshore facility associated with Kriegers Flak Offshore Wind Farm. The cable will not be routed through Borgring.

Where it is impossible to avoid areas with a high likelihood of archaeological finds, the museums will conduct so-called test digs or search ditches. This will typically take place six to eight weeks before excavation for the cable begins. The museums may also chose to supervise the excavation of the top soil by the contractors. If archaeologists discover any archaeological finds, they may stop excavation and proceed to an archaeological dig. Alternatively, the cable may be relocated, if this results in no impact to the archaeological and cultural heritage interests.

Marine Archaeology

Construction of offshore wind turbine foundations and cables will entail excavation and other activities which may potentially harm archaeological sites on the seabed. Therefore, the Viking Ship Museum (Vikingeskibsmuseet) has conducted a number of preliminary marine archaeological investigations in the seabed on Kriegers Flak and in the cable corridor for the offshore transmission cables. The investigations have focused particularly on shipwrecks and other manmade objects in the seabed as well as on potential stone-age settlements. A number of the identified objects are protected by the Danish Museum Act (Museumsloven). In two areas close to where the offshore transmission cables will be laid in the seabed, signs of settlements from the early stone-age have been found.

The project is most at risk of affecting archaeological finds on the seabed during the construction phase. However, the construction activities will only impact archaeological sites if they are located exactly where the seabed is disturbed by the construction activities. In light of this, offshore wind turbines and cables cannot be placed in areas with potential archaeological finds. If the future concession holder of the offshore wind farm wishes to place offshore wind turbines or cables in areas containing archaeological sites or potential archaeological sites, further investigation is required and the Danish Agency for Culture (Kulturstyrelsen) must be consulted prior to construction commencing.

Additionally, in regard to the manmade objects which are covered by the Museums Act (Museumsloven), an agreement has been made with the Danish Agency for Culture. The agreement requires that zones with a radius of 100 to 200 m surrounding the objects will be kept free from construction. If these zones are properly observed, the impact on the archaeological sites will be negligible.

If construction works are executed in those areas of the offshore transmission cable corridor where there are signs of stone-age settlements, a further analysis will be carried out to evaluate the possibility of further investigating the areas prior to commencement of construction works. Further investigations will give a better picture of whether there may be stone-age settlements near the coast. If actual or potential stone-age settlements are determined within the project area, suitable mitigation measures must be implemented to reduce the impact on those stone age settlements. Following this procedure, the impact on these areas is deemed to be minor.

Both on Kriegers Flak and in the cable corridor for the offshore transmission cables, construction activities must be stopped if archaeological objects or sites are found. Any find must be reported to the Danish Agency for Culture which will then decide what should be done with the archaeological find.

7 Infrastructure

7.1 Radar Installations

The offshore wind farm may interfere with radar signals used for a variety of purposes. These might include coastal radar systems used to track aircraft and ships, or radars on board ships which are used to avoid collisions with other ships or objects such as offshore wind turbines.

Danish, Swedish, and perhaps German radar installations may potentially be affected by the offshore wind turbines. The impact will probably be greatest at the Danish military radar installation on Møn, where the offshore wind farm will appear as a blind spot where low altitude aircraft may disappear from the radar screen when they fly over or near the offshore wind farm. The offshore wind farm may also reduce the ability of coastal radar systems to detect ships.

It is assessed that – as a consequence of Kriegers Flak Offshore Wind Farm – there will be a need to renovate or adjust the current Danish coastal radar installations. New radar installations, so-called gap fillers, must be implemented, or the existing radar installations must be replaced in order to reduce the impact to an acceptable level. No mitigation measures are expected to be required for German and Swedish radar installations. However, the impact on the coastal radar system cannot be properly assessed until the future concession holder has planned the project in more detail including the choice of offshore wind turbine size and type as well as the site layout. Subsequently, the future concession holder of the offshore wind farm will be required to agree upon potential renovations with the owners of the radar installations.

Any impact on radars on board ships are expected to be minor.

7.2 Aviation

Aviation may utilise either visual navigation or instrumental navigation. During visual navigation the pilot is primarily navigating using reference points on the ground which are visible from the cockpit, while instrumental navigation is done using technical equipment such as a GPS.

In accordance with the regulations for visual navigation, no flights are allow at altitudes of less than 150 m. Therefore 3 MW offshore wind turbines, which are lower than 150 m, will not limit the airspace for small or large aircraft. However, the offshore wind farm will limit the airspace for visual navigation if offshore turbines taller than 150 m are erected. This might include 10 MW offshore wind turbines which have a maximum height of 220 m.

Visual navigation in the area is not expected to any great extent and the offshore wind farm will not limit the airspace for instrumental navigation since there are no approach slopes for airports in the area and therefore the aircraft will be flying at altitudes above 220. However, the minimum flight altitude will be increased regardless of the height of the offshore wind turbines. The impact on aviation is estimated to be minor no matter which type of offshore wind turbines are selected.

7.3 Navigation

An important ferry route between Sweden and Germany passes through the waters surrounding Kriegers Flak. The same is true for some of the most important navigational routes through the Baltic Sea which are used by large merchant vessels as well as passenger and cargo ferries.

Calculations show that the risk of collision with the wind turbines in Kriegers Flak Offshore Wind Farm by ships under power as well as by drifting ships is low. Statistically, there will be a collision once every 72 years, which equals less than half of one collision during the lifespan of the offshore wind farm. For comparison, it has been calculated that statistically there will be a collision between a ship and an offshore wind turbine once every 50 years at the German offshore wind farm Baltic II.

Potential collisions will most likely produce only minor damage to ships, offshore wind turbines, or offshore substation platforms. Only in very rare instances a collision would result in more extensive damage or the loss of human life. Therefore, the impact on navigation is assessed to be minor.

Since traffic patterns may have changed since data for the navigation analysis was collected, the analysis should be updated with new data once the final site layout of the offshore wind farm is known. In addition, further investigation of the impacts on the current search and rescue services should be conducted once the final site layout is known so that search and rescue missions in the area may be planned based on the navigation conditions between the offshore wind turbines.

8 Cumulative impacts

Environmental impacts from other projects may add to the environmental impacts of Kriegers Flak Offshore Wind Farm. An assessment of the cumulative environmental impacts can provide an overall assessment of the environmental impact of the project as it relates to the ability of the area to remain sustainable.

An assessment has been completed for each topic of environmental concern to determine which other planned projects may enhance the environmental impacts identified for Kriegers Flak Offshore Wind farm. Some of these projects are still in the planning stage, while others have already been permitted. These projects are at differing stages of construction, this being planned and permitted, or still in the planning stage. Therefore the assessments below involve with some degree of uncertainty.

8.1 Birds

Migrating cranes may collide with offshore wind turbines. As described above, the impact on Common cranes caused by Kriegers Flak Offshore Wind Farm is expected to be minor. However, a number of other German, Swedish, and Danish offshore wind turbine projects are planned in the area surrounding Kriegers Flak. Considering only Kriegers Flak Offshore Wind Farm, Baltic I, Baltic II, and the four (Swedish and German) projects which have already been permitted, the impact on migrating Common cranes from collision with the offshore wind turbines will be moderate. If all planned and existing offshore wind turbine projects are included in the assessment of Kriegers Flak Offshore Wind Farm, the impact will be significant.

8.2 Marine Mammals

Significant cumulative impacts on marine mammals during the construction phase cannot be ruled out, if monopile foundations are driven into the seabed on Kriegers Flak and at one or more of the nearby German offshore wind farms simultaneously. If that is the case, special consideration must be given to planning these activities in order to reduce the noise impact on marine mammals. Using other types of foundations than monopile foundations, will result in no additional cumulative impacts on marine mammals, because the construction of other types of foundations does not produce noise levels capable of causing hearing loss in Harbour porpoises and seals.

8.3 Commercial Fishing

During the construction and operational phases periodic access limitations and reduced manoeuvrability will impact commercial fishing. Limiting the fisheries in Kriegers Flak Offshore Wind Farm, the German offshore wind farm Baltic II and a potential Swedish offshore wind farm, as well as natural resource extraction on Kriegers Flak will significantly impact Danish fishing interests. Among other things, important trawl routes for Danish fishing will be blocked. The impact on fishing may be reduced if special consideration is given to fishing, for example by removing the limitations on fishing activities during the construction phase in those parts of the cable corridor or the offshore wind farm where there is no work being done or by allowing fishing above the offshore transmission cables during the operational phase. All of these measures are well-known and have been implemented for other similar projects. The exact extent and need for mitigation measures for fishing cannot be determined until the future concession holder of the offshore wind farm has planned the project in more detail.

8.4 Onshore Projects Impacts

The likelihood that other projects' that environmental impacts will add to the environmental impact of the onshore facilities is very low. The impact from the onshore facilities will mainly be concentrated during the construction phase. An investigation has been completed to identify any planned projects where construction is expected to occur during the same time frame as the construction of onshore facilities associated with Kriegers Flak Offshore Wind Farm. Cumulative impacts are found mainly when activity occurs during the same time frame and impact the same geographical area.

There are three infrastructure projects which may happen nearby and during the same time as the construction of the onshore facilities for Kriegers Flak Offshore Wind Farm. Those three projects are the expansion of the Frederikssund Motorway furthest to the north, the electrification of the railway between Køge Nord and Næstved, and the construction of a new railway from København to Ringsted. All three projects are shown in Figure 8-1.

By working closely with the other project owners and planning construction in detail the potential cumulative impacts may be avoided.

However, laying cable on the southern cable route at Regnemark in the alternative project (proposal B) would be a technical challenge so close to the future railway from København to Ringsted because there is a lack of space. If proposal B with the southern route at Regnemark is selected, the space will be so limited that the cable must be routed through an old wood and it cannot be ruled out that a home may need to be expropriated.

Figure 8-1. Overview of the identified construction projects which may potentially amplify the environmental impacts of the construction of the onshore facilities for Kriegers Flak Offshore Wind Farm (red line). The yellow lines show the new railroad from København to Ringsted, the blue line shows the electrification project on the Køge Nord to Næstved railroad, and the purple line shows the expansion of the Frederikssund Motorway.

8.5 Other Environmental Issues

No other planned projects which might enhance the 'other environmental concerns' assessed in this report have been identified. However, it is assumed that an assessment will be made as to whether there will be a need to adjust or renovate radar installations, add additional radar installations (so-called gap fillers) , or completely replace existing radar installations to avoid a cumulative effect on radar installations if several projects are implemented. However, the impact on the coastal radar system cannot be properly assessed until the future concession holder of the offshore wind farm has planned the project in more detail including the choice of offshore wind turbine size and type as well as the site layout. When planning is complete, the future concession holder of the offshore wind farm will be required to agree upon potential renovations with the owners of the radar installations.

9 Comparison of the two proposals for onshore facilities

Two alternatives for the onshore facilities have been investigated: The project proposal (Proposal A) includes a substation at Tolstrup Gårde and the alternative (proposal B) includes a substation located at Bjæverskov Vest. Both of the proposals investigated can be implemented without significant impacts on the environment. Among other things, this is due to the fact that environmental considerations have already been incorporated into the project such as e.g. utilising horizontal directional drilling under Køge Å. Additionally, during the environmental impact assessment, technical and environmental conditions have been considered when proposing the project area and subsequently possible cable routes in order to accommodate environmental interests to the extent possible e.g. when crossing woods and streams as well as when in close proximity to residential properties and areas. Thus, the proposed project design identifies the most suitable locations for both the cable route and the new substation as well as technical solutions to ensure that significant environmental impacts are avoided during the construction phase.

However, when examined closely, there are minor differences between the environmental impacts of the two proposed substation locations as well as the alternative routes proposed for short parts of the cable route. This section will describe and compare those differences in environmental impacts. The comparison will focus partly on the differences in environmental impacts caused by either substation location, and partly on the two entirely different cable routes depending on the choice of location for the substation.

The environmental impacts of the cable route from landfall at Rødvig on Stevns to Tolstrup Gårde and the cable route from Store Salby to substation Ishøj and substation Hovegård respectively will be identical for both proposals. These portions of the cable route are identical in both proposals and account for 2/3 of the total cable route.

9.1 Environmental Impacts of a New Substation at Tolstrup Gårde or at Bjæverskov Vest Respectively

The choice of substation location is the singularly most important factor determining the design of the onshore facilities. The project proposal with a new sub-

station located at Tolstrup Gårde requires a certain cable route, whereas the alternative with a new substation located at Bjæverskov Vest will require a significantly different cable route between Tolstrup Gårde and Store Salby. Therefore, the differences in the environmental impacts of the two substation locations are examined first.

Zoning and Conservation Issues

Both substation locations are in areas of no significant landscape interest and neither impacts area is appointed in the municipality plans as areas zoned containing landscape interests or valuable cultural environments. At Tolstrup Gårde the forest building line surrounding the eastern part of Sonnerup Byskov which is located right by the South Motorway will be affected. However, landscape assessments show that establishment of the substations will not significantly impact the experience the landscape of Sonnerup Byskov since the existing Motorway and railway already follow the eastern edge of the woods. The appearance and impact of the substation on the open landscape is limited to a few locations in the vicinity of the substation because the landscape in the area is characterised by enclosed landscape spaces as well as hedgerows, wooded areas, roads, and railway. In addition to the forest building line the zoning requirements are as follows:

- A new substation at Tolstrup Gårde (proposal A) will be located inside a transportation corridor intended for primary infrastructure and technical installations as designated in the zoning plan (Fingerplanen) for the Greater Copenhagen area.
- A new substation at Bjæverskov Vest (proposal B) will be located immediately to the south of the transportation corridor and in an area which is municipally zoned for industrial uses in logistics and transportation.

No other specific designations or protected areas are found within the boundary of either proposed substation locations. Both substation locations are outside the near coastal zone and as such no conflicts with the public interests in coastal landscape interests exist. Neither location presents a significant zoning conflict in regards to the overall zoning. The municipality of Køge is expected to enact local and municipal zoning for either location (but not both) once the final location has been selected.

Landscape

The assessment shows that the new substation will moderately impact the landscape experience locally whether the Tolstrup Gårde location or the Bjæverskov Vest location is chosen. However, the greatest impact on the landscape will be caused by locating the new substation in the open landscape areas (Tolstrup Gårde) rather than adjacent to an existing substation and an area zoned for industrial use (Bjæverskov Vest). As shown in the illustrations in Figure 9-1 and Figure 9-2, both of the new substation locations are close to infrastructure such as a motorway and a railway. Tolstrup Gårde is located inside a transportation

corridor, while Bjæverskov Vest is located in an area zoned for industrial use and immediately to the south of the transportation corridor. This indicates a certain equivalence in that the two locations are already zoned for uses such as e.g. a new substation or other technical installation/industrial use.

The design of both substations incorporates a vegetation belt surrounding the substation which will reduce the impact on the landscape as the vegetation matures.

Figure 9-1. Left: Illustration showing a new substation at Tolstrup Gårde (proposal A). Right: A new substation at Bjæverskov is outlined in red on the photo of the current substation. In the area surrounding the substation location at Tolstrup Gårde there is a motorway, a railway, and an agricultural implement rental company, while the substation location at Bjæverskov is to just south of a motorway, adjacent to the existing substation and on the edge of an industrial area.

Noise

A new substation at Tolstrup Gårde (the project proposal, proposal A) will not generate noise levels above those recommended by the Danish Environmental Protection Agency (Miljøstyrelsen). The noise generated by the substation will be considerably lower than existing noise limits.

Considered on its own, a new substation at Bjæverskov Vest (the alternative, proposal B) will also generate noise levels below those instructed by the Danish Environmental Protection Agency (Miljøstyrelsen). The existing substation at Bjæverskov, which is immediately adjacent to the potential new substation, currently conforms to the noise limits recommended by the Danish Environmental Protection Agency (Miljøstyrelsen). The combined noise contributions of both substations will impact one residential property with noise exceeding the recommended noise limits. Consequently, the negative noise impact will be slightly larger if proposal B is chosen rather than proposal A.

People and Communities

Proposal B entails a larger negative impact on people and communities than pro-

posal A due to the noise levels during the operational phase, but the difference in impact is minor. The substations will not conflict with outdoor recreational activities in the construction and operational phases and there is no difference in the impact of proposal A and proposal B in this regard.

Which Substation Location is Best for the Environment?

The environmental impact of establishing a new substation is limited, regardless of which location is chosen. Both of the investigated sites are suitable in so far as environmental impacts are concerned and the differences are minor – and insignificant. The impacts on the surroundings are largely equivalent, whether the substation is located at Tolstrup Gårde or at Bjæverskov Vest, but the Tolstrup Gårde location will have a greater impact on the landscape, because the substation would be located in the open landscape. However, one residential property will be impacted by noise levels above the recommended limits at Bjæverskov Vest, while no such impact exists at the Tolstrup Gårde location. Based on the zoning of the areas as a transportation corridor and an industrial area respectively, it is difficult to point to any significant environmental differences which would suggest one location over the other.

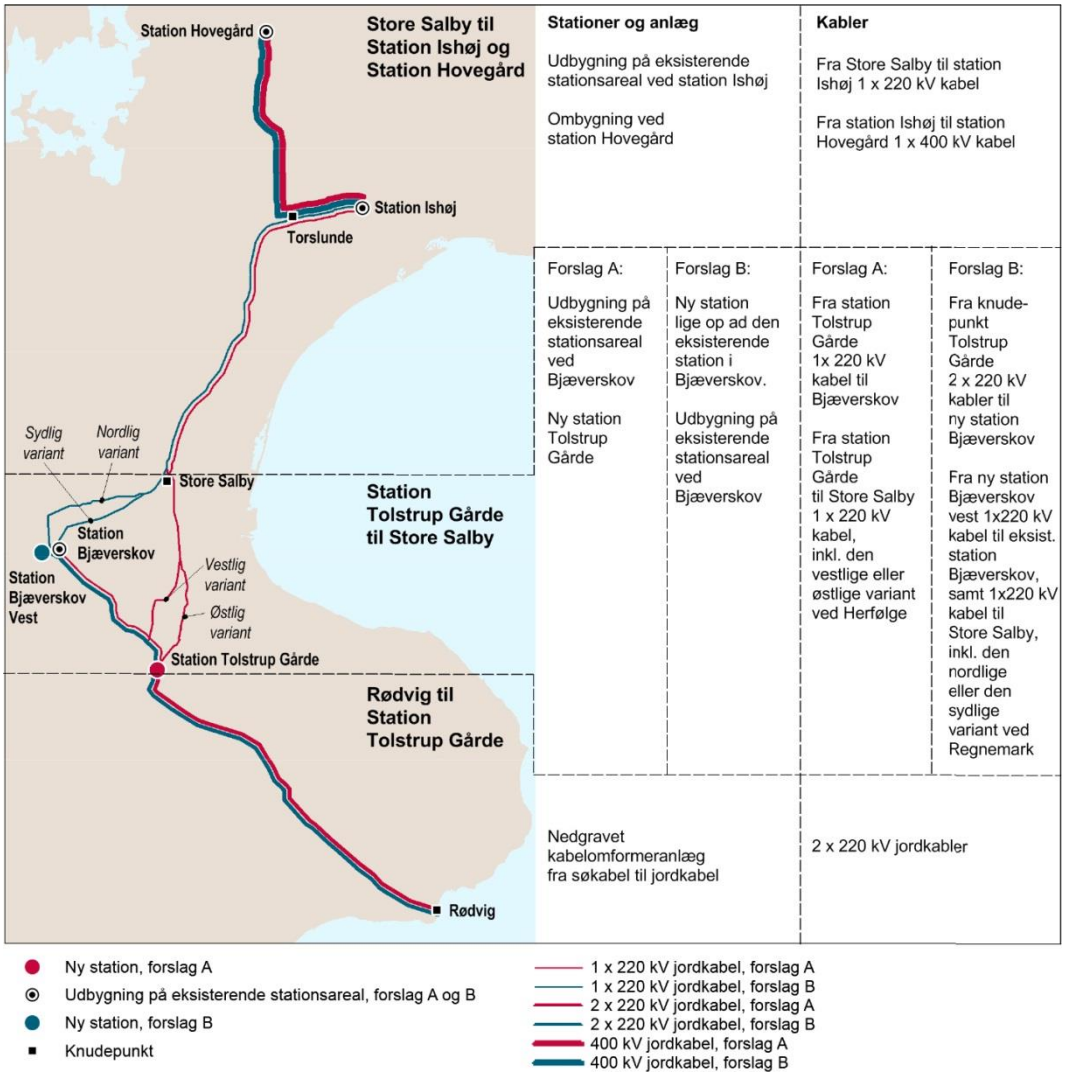

Figure 9-2. Overview of the two proposals for the onshore facilities See Figure 2-7 and Figure 2-11 for further explanation.

9.2 Comparison of the Environmental Impacts of the Cable Route between Tolstrup Gårde and Store Salby

Between the two junctions at Tolstrup Gårde and Store Salby the cable route will change depending on which substation location is selected. The two potential cable routes will result in different environmental impacts which will be described in this section.

If the Tolstrup Gårde substation location is selected, the cable route to the junction in Store Salby will be approximately 14 km long, while a substation located at Bjæverskov Vest will result in a cable route about 20 km in length. Two variations are presented for a part of each of the proposed cable routes. All else being equal, a longer cable route will result in a greater impact on the environment during the

construction, operational, and decommissioning phases, however, other factors also contribute to the extent of the impact on the environment complicating the analysis.

If a new substation is located at Bjæverskov Vest, two parallel high voltage cables must be laid the entire way from Tolstrup Gårde to Bjæverskov. This may result in a wider construction area and a wider easement area. If a new substation is located at Tolstrup Gårde, only one of the two high voltage cables must be laid from Tolstrup Gårde to Bjæverskov , while the other cable will turn north to substation Ishøj. This may present a challenge where the cable passes by Tågerød wood/the village of Druestrup as there is very little space for the two parallel high voltage cables while keeping a suitable distance to the edge of a characteristic wood and to residential properties in Druestrup. A possible technical solution might be to lay the cables closer together in the limited area but this would result in a loss of transmission capacity throughout the transmission cable from the offshore wind farm to Bjæverskov.

Zoning and Conservation Considerations

The eastern route in proposal A will impact an area zone for mixed residential and business use in Herfølge. If this route is selected, implementation will be challenging due to the current zoning. As far as natural resources are concerned, the 0.5 km of the northern route in proposal B will impact a natural resource area at Ravneshave.

Nature

Proposal A (the project proposal) will cross more protected wooded areas than the alternative, proposal B. These areas will be crossed either using horizontal directional drilling or by detailed planning of the cable route in cooperation with the land owners to avoid valuable vegetation. Should proposal B and the southern route be chosen, this will represent a significant construction challenge. This route crosses a protected wooded area and it is not known if it is technically possible to complete a 0.5 km long horizontal directional drilling in such a way that the conservation area and its valuable old trees are not impacted.

The project area in proposal B's southern cable route will cross the only hedgerow which may potentially be a connecting line for bats protected by Annex IV. The northern cable route in proposal B crosses Køge Å three times while both routes in Proposal A and the southern route in proposal B cross Køge Å once. In addition both proposal A and B cross Køge Ås. Options for minimising the impact of the cable route were explored including horizontal directional drilling, narrowing the cable route, and adjusting the cable route to avoid protected areas and habitat for Annex IV species whenever possible. Based on a precautionary approach proposal A is recommended with regards to Natura 2000 interests. Proposal B's southern cable route can also be recommended if the precautionary approach is only applied to Køge Å, however, it presents technical challenges which may result in impacts on protected areas as described above.

Proposal A and proposal B will cross 59 and 56 sites respectively where Annex IV species have been registered or which are deemed potentially suitable habitat for amphibians.

All of these sites will either be avoided during the construction or they will be crossed using horizontal directional drilling. Thus the ecological functionality of these sites for Annex IV species will not be significantly impacted negatively.

The only hedgerow considered suitable as a rest area or dispersal corridor for bats is impacted by proposal B. The hedgerow will be crossed using horizontal directional drilling. There are no potentially suitable hedgerows in the project area in proposal A. Therefore the impact of the project on hedgerows will be insignificant.

The Natura 2000 assessment of both proposals shows that the project will not significantly impact habitat area Køge Å or any other Natura 2000 areas. Presuming that the mitigation measures incorporated into the project are implemented, the overall physical impacts on the environment will be less significant both for proposal A and for proposal B with the northern cable route.

Landscape

Both proposals A and B will disturb landscape elements resulting in a minor impact on the landscape. Proposal A will cross several wooded areas as well as Køge Å between Tolstrup Gårde and Store Salby Proposal B will cross Køge Ådal up to three times (northern cable route), a wood (southern cable route), and also the conservation area surrounding Vittenbjerg Ås between Bjæverskov and Store Salby. As a starting point, cables will be laid through wooded areas using horizontal directional drilling and thus construction will not affect the edges of the wooded areas or the human experience of the landscape.

Surface Water and Ground Water

As far as ground water and surface water impacts are concerned, the most suitable cable routes are the western route at Herfølge in proposal A and the southern route at Regnemark in Proposal B, because these cable routes cross the fewest conflict areas. The least suitable cable route in this respect is the northern cable route at Regnemark in proposal B.

The western cable route at Herfølge in proposal A and the southern cable route at Regnemark in Proposal B cross the fewest streams and the fewest areas with wet organic soil. Therefore these cable routes are recommended due to the lowest number of potential conflicts.

The northern cable route at Regnemark in proposal B crosses the most streams, the most area with wet organic soil and about 2 km of the route is through an area with permeable sedimentation near the surface and where the ground water level is near the surface. In addition, this cable route crosses Natura 2000 area Køge Å

three times resulting in a greater risk of impacting Køge Å as compared to the southern route.

Soil Pollution, Raw Materials and Waste
A comparison of the two proposals and the cable route variations shows that the western cable route in Proposal A is the option with the fewest known soil pollution sites in the project area (11 sites). Options for minimising the impact of the cable corridor were explored; including narrowing the cable corridor and adjusting the cable route to avoid known soil pollution sites.

Overall, there is no substantial difference between proposals A and B as regards to the use of raw materials and the production of waste

Cultural History and Archaeological Cultural Heritage
It is highly likely that archaeological sites will be encountered during construction onshore. However, the extent and importance (locally, nationally, and internationally) of such finds is very difficult to assess until the preliminary archaeological investigation has been completed. Therefore no basis exists upon which to compare the impacts of proposal A and proposal B respectively.

Noise, Air Quality, Climate, People and Communities
There are no significant differences in the environmental impacts of the two proposals and cable route variations as regards noise, air quality, climate, and the health and wellbeing of the people.

Cumulative Impacts
Construction of the new railway from København to Ringsted will present concrete challenges to implantation of the southern cable route at Regnemark in Proposal B. To accommodate area limitations, the cable route would need to be altered resulting in impacts to an old protected wooded area and a potential need to expropriate a residential property in Spanager. Therefore this cable route is not recommended.

Which Cable Route is Best for the Environment?
Based on the above comparison of the environmental impacts of the onshore facilities between Tolstrup Gårde and Store Salby in proposals A and B, the assessment concludes that there are minor differences in the degree of conflict, but that these differences are not significant enough to justify eliminating either proposal. However, the southern cable route in proposal B cannot be recommended. Due to the future railway between København and Ringsted, space is limited in the area and as a result the cable route cannot be tailored to the area to the extent possible in other areas of the project and this results in conflicts with a protected wooded area and one residential property.

9.3 Recommendations

The comparison of the middle third of the cable routes from Tolstrup Gårde to Store Salby which is contained in the municipality of Køge shows that there is no significant difference in the overall impact on the environment. This makes it difficult to determine which proposal will have the least negative impact on the environment because the differences between them are marginal.

Both proposals can be implemented with no significant impact on the environment, which is the main objective of the environmental impact assessment. However, it should be noted that the eastern cable route at Herfølge in proposal A may not be feasible because it involves an area which is zoned for mixed residential and industrial use. The southern cable route at Regnemark in proposal B would also present significant challenges due to the overlap of the project area and another infrastructure construction project (København - Ringsted railway). The technical accommodations required may potentially lead to impacts on a wooded area and a residential property which might have to be expropriated. For these reasons, this cable route cannot be recommended.

The differences of degree between proposals A and B may be summarised as follows:

- The project proposal (proposal A) as compared to the alternative (proposal B) will impact the human experience of the landscape slightly more when the locations for the new substations are compared.
- In Proposal A, the substation site is located in a untouched, open landscape and in the transportation corridor, while the substation is located in an industrial area and is immediately to the south of the transportation corridor.
- Compared to proposal A, proposal B will have a greater impact on people and communities due to the noise level at the substations in the operational phase.
- Compared to proposal A, proposal B will have a greater impact on air quality and climate because the cable route will be longer.
- Proposal A crosses more protected wooded areas than proposal B, but the southern cable route in proposal B will result in a conflict with preservation worthy trees because horizontal directional drilling may not be possible.
- Proposal B's northern cable route at Regnemark crosses habitat area Køge Å three times compared to one crossing in proposal A and one crossing for the southern cable route in proposal B. As a result, the potential risk of negatively impacting the habitat area is larger.

- Proposal B's northern cable route at Regnemark crosses a natural resource area for a distance of 0.5 km.
- In regard to soil pollution, proposal B is less attractive than proposal A. Proposal A's western cable route at Herfølge is the option with the fewest known soil pollution sites across the project area (11 sites as opposed to 12 or 14 for the other cable routes).
- The impact on outdoor recreation activities is different for proposals A and B since proposal A crosses the recreational trails a long Køge Å once while proposal B crosses the trails three times. However, the impact is temporary and insignificant and only occur during the construction phase.

Based on the above comparison of the very small differences there are no significant zoning and environmental factors which might justify recommending one of the proposals as superior to the other. Both proposals are reasonable from an environmental point of view, and the incorporated mitigation measures ensure that no significant impact on the environment will occur. For a discussion of the technical differences between the two proposals, please refer to part 4 of the Environmental Statement: The Onshore Environment.

The substation at Tolstrup Gårde is placed in the open land, although close to other infrastructure in the shape of the Køge-Næstved railway and the South Motorway. In the ES report an alternative location of the substation is investigated, located in an industrial area of an urban area development plan in Bjæverskov West in connection with the present high tension substation in Bjæverskov West.

It can be concluded that both investigated proposals for location of a new high voltage substation can be implemented without significant impact on the environment. Both substation locations will only involve moderate scenic impact – especially during the first years, until the vegetation surrounding the substation has reached a notable size. Energinet.dk has calculated the cost of locating the substation in Tolstrup Gårde to be 65 million DKK lower than the location in Bjæverskov West, as the substation in Tolstrup Gårde – amongst others – will result in a shorter cable route and thus less loss of energy from the offshore wind farm to the substation. Furthermore location of the new substation at Tolstrup Gårde will imply, that the onshore cable installation will contribute to an improvement of the Zealandic power grid.

In case of an emergency incident (breakdown, cataclysm, emergency incident), where the entire substation of Bjæverskov is disconnected, power from Kriegers Flak Offshore Wind Farm and the new Germany-connection via Kriegers Flak will be able to be transmitted to Ishøj substation. In case of an emergency incident, where station Tolstrup Gårde is disconnected, the Kriegers Flak Offshore Wind Farm and the new Germany-connection will not be in operation, while the existing KONTEK-connection to Germany- and Jutland-Fuenen-connection will still

be in use. If the new substation is located in Bjæverskov the sturdiness of the power grid in Eastern Denmark will not be improved. The connections to Kriegers Flak Wind Farm, the new Germany-connection and the KONTEK-connection to Germany cannot be used in situations, where the entire Bjæverskov substation is disconnected. Furthermore power cannot be transmitted from the Jutland-Fuenen connection to the metropolitan area.

Based on an overall assessment of environmental, technical and socioeconomic advantages and disadvantages a location of the new high voltage substation at Tolstrup Gård southwest of Herfølge is recommended.

10 Transboundary Environmental Impacts

Kriegers Flak Offshore Wind Farm may impact the environment across borders in Sweden and Germany.

One area where the impact will extend across borders is the overall populations of sea birds and/or migratory birds. The risk of environmental impacts across borders is primarily related to the cumulative collision risk estimated for migrating Common cranes. The assessment concludes that the operation of Kriegers Flak Offshore Wind Farm, Baltic I, Baltic II and four permitted projects (one Swedish and three German), will moderately impact Common cranes. If all planned and existing offshore wind turbine projects are considered together with Kriegers Flak Offshore Wind Farm, the impact on migrating Common cranes will be significant. However, there is great uncertainty whether the German offshore wind farm Arcadis Ost 1 and the Swedish Kriegers Flak II can be realised.

A Natura 2000 area impact assessment (Appropriate Assessment) with respect to Natura 2000 sites designated for migratory Common Crane in the Baltic region has also been undertaken. This assessment has also considered other existing, permitted, and potential future offshore wind farms in the area surrounding Kriegers Flak Offshore Wind Farm. The planned offshore wind farm projects are Danish, German, and Swedish. The projects are at differing stages of planning, which has been accounted for when analysing the impact from Kriegers Flak Offshore Wind Farm combined with other offshore wind farms. Overall, the Natura 2000 assessment shows that Kriegers Flak Offshore Wind Farm on its own or in concert with other offshore wind turbine projects will not harm or impact the conservation goals for migrating Common cranes listed in the designation bases for the relevant Natura 2000 areas.

Noise from driving monopile foundations may lead to cross border impacts on marine mammals if several offshore wind farms with monopile foundations are under construction simultaneously. If monopile foundations are chosen the pile driving will produce very loud noise levels that are capable of inflicting temporary and permanent hearing damage in seals and porpoises close to the noise source and the noise may cause behavioural changes, particularly in porpoises.

Based on calculations regarding the noise propagation from construction activities and the potential for hearing damage in seals and porpoises, it is deemed necessary to reduce noise levels by 16 dB compared to the worst case scenario (10 MW wind turbines) to ensure that seals and porpoises do not sustain permanent hearing loss. If monopile foundations are chosen it is therefore assumed that

scaring away porpoises and seals as well as further reducing the noise level by 16 dB as compared to the worst case scenario will be implemented. The future concession holder of the offshore wind farm will have the opportunity to choose the noise reduction method in order to meet this requirement.

If the future concession holder of the wind farm chooses to use monopile foundations, this will necessitate a separate assessment of options to reduce the impact and the resulting cross border effects. Very little is known about offshore migration routes of bats. The investigation of bats on Kriegers Flak demonstrated that e.g. Nathusius' pipistrelle passes through the area and that another species, Common noctule probably migrates from Germany via Kriegers Flak. The possibility exists that migrating bats will be affected across borders. However, bat populations will likely not experience a significant impact and the projects will not impact the breeding or resting areas of bats negatively.

Swedish and German radar installations are not expected to be impacted. However, concrete impacts can only be assessed once the future concession holder of the offshore wind fam has planned the project in more detail including the choice of wind turbine size and the site layout. Subsequently it will be the responsibility of the future concession holder of the offshore wind farm to secure agreements covering potential renovations of the radar installations with owners.

Swedish and German vessels fish on Kriegers Flak to a smaller extent, and Kriegers Flak Offshore Wind Farm is expected to have minor impacts on Swedish and German commercial fishing.

The coastal landscape and residential property on the south coast of Sweden, where there will be a view of Kriegers Flak Offshore Wind Farm will experience a minor impact.

For all other topics covered in the Environmental Statement, no impacts are expected to cross the borders to Sweden and Germany.

11 How will the Environmental Impacts be Mitigated?

An important goal of an Environmental Statement is to identify solutions so that significant environmental impacts caused by a project may be reduced, compensated for, or completely avoided. Among other things, environmental impact assessments are used to identify all the negative impacts a project may have upon the environment in a broad sense.

Once the negative impacts have been identified, the next step is to minimise, avoid or compensate for them. In this project, a variety of negative impacts onshore are avoided by 'environmentally optimising the project before it is implemented. For example such impacts include excavations of streams which are avoided by requiring that the contractor utilise horizontal directional drilling as the method of construction. In other areas, the cable route has been relocated so that it goes around protected areas such as ponds. In some cases, it is not possible to avoid the impact and in those cases specific construction methods or particular designs are incorporated into the project in order to reduce the impact. An example of this is the cooperation with the archaeological museums who will provide test digs and supervise excavation.

When the offshore wind farm is permitted, requirements for the construction of the project will be specified and whether or not additional measures must be implemented to reduce or avoid potential environmental impacts.

In general, mitigation measures have been proposed in the environmental impact assessment when significant environmental impacts have been identified. Where environmental impacts will be moderate, a discussion of whether there is a need to implement measures to reduce or avoid the impact is presented. Table 11-1 shows measures which will reduce the environmental impacts.

Table 11-1. Measures to reduce environmental impacts.

Subject	Impact	Measures to reduce environmental impacts
Migrating cranes	Collision with offshore wind turbines (cumulative effect with other offshore wind farms)	There are no mitigation measures capable of mitigating the cumulative effect on migrating Common cranes. However, it will likely reduce the collision risk if the offshore wind turbines are erected in rows aligned with the direction of the migration corridor.
Marine mammals	Noise impact from driving monopile foundations	Scaring away porpoises and seals as well as further reducing the noise level by 16 dB as compared to the worst case scenario assumed in the assessment.
Radar installations	Radar signal disturbance	Adjustments, renovation, construction of new radio installations (so-called gap fillers) or replacing existing radar installations to reduce the impact.
Commercial fishing	Limiting fishing	Special consideration of fishing e.g. by allowing fishing in the offshore wind farm and in the offshore transmission cable corridor once the offshore wind turbines are in operation.
Landscape	Impacts in wooded areas	The cable route may be adjusted and curbed to a certain extent to reduce the visual impact of the easement belt.
Landscape	Visual impact around new substation	The new substation will moderately impact the local area. The project already incorporates a vegetation belt surrounding the substation and no further measures can reduce the visual impact. This is true for both substation locations investigated.
Noise	Existing noise at substation Hovegård	During the environmental impact assessment it was discovered that substation Hovegard currently exceeds the recommended noise level. Based on this finding, Energinet.dk will renovate the substation in order to reduce the noise. This will happen in close cooperation with the municipality of Egedal.
Amphibians on land	Avoid impacts on amphibians during the breeding season	It may be necessary to put up newt fence, if the cable trench will remain open for a longer period of time and the construction is carried out during the breeding or migration periods.

12 Conclusion

An environmental impact assessment of the construction, operation, and decommissioning of Kriegers Flak Offshore Wind Farm and its associated onshore facilities has been completed. The environmental impacts are strongly correlated with the construction activities.

During construction offshore, driving monopile foundations into the seabed will produce a significant noise impact in the form of permanent as well as temporary hearing loss particularly in porpoises Therefore it will be necessary to scare the animals away from the area prior to commencing the pile driving activities and additional measures will be required to reduce the noise impact.

As regards birds in the area, the displacement of Long-tailed duck from their feeding areas will result in a moderate impact. There is also a risk that migrating Common cranes may collide with offshore wind turbines. As described above, the impact on Common cranes resulting from Kriegers Flak Offshore Wind Farm will be minor. However, a number of other offshore wind farm projects are planned in the area around Kriegers flak. If Krieges Flak is considered together with Baltic I, Baltic II and the four permitted projects (one Swedish and three German), the cumulative impact on migrating Common cranes will be moderate. If all planned and existing offshore wind turbine projects are included, the impact on Common crane will be significant.

Limitations on commercial fishing is expected to significantly impact fishing during construction and moderately impact fishing during the operational phase. However, the impact may be reduced by introducing measures which will accommodate fishing, as has already been done in similar projects.

Kriegers Flak Wind Farm is assessed to cause major impact on Danish coastal radar plants. It will thus be necessary to initiate mitigation measures at the existing radar plants. The more specific details of this subject must be clarified and coordinated between the future wind farm concession holder, the Defence and relevant authorities.

The environmental impacts caused by the onshore facilities associated with Kriegers Flak Offshore Wind Farm are particularly related to the construction activities. This is the case when it comes to visual impacts around work and storage areas. In addition, noise from heavy equipment will be a fact during construction and at a few sites a short term barrier effect will be felt from the working area surrounding the cable trench. Many of the potentially significant impacts of construction have been avoided as a part of the environmental optimisation including the decision to cross nature areas and larger streams using horizontal directional drilling.

During the operational phase there will be no significant environmental impacts onshore. The most substantial impact will be the visual impact of the new substation and in areas where trees cannot be re-establish over the cable. It is emphasized, that both proposals for the onshore facilities fulfil the goal of implementing the project without significant negative environmental impacts. Based on economic and technical considerations, Tolstrup Gårde is identified as the most suitable location for the new high voltage substation

Coastal landscapes and residential properties with a view of the offshore wind farm will experience a moderate impact. The closest residential properties are located approximately 16 km away.

For all other environmental or nature issues the assessment has identified only negligible or minor impacts.

Relative to the projected average power production in Denmark as provided by the Danish Energy Agency (Energistyrelsen), the implementation of the project will result in a total reduction of 11,324,000 tons CO_2 emissions over the 30 year life span of the wind farm. Implementation of the project will ensure a long term reduction in CO_2 emissions and will contribute to reaching the energy policy goal that Denmark's energy supply and transportation will be based on renewable energy by 2050.

Energistyrelsen
Amaliegade 44
1256 København K

www.ens.dk

Miljø- og Fødevareministeriet
Naturstyrelsen

Naturstyrelsen
Haraldsgade 53
2100 København Ø

www.nst.dk