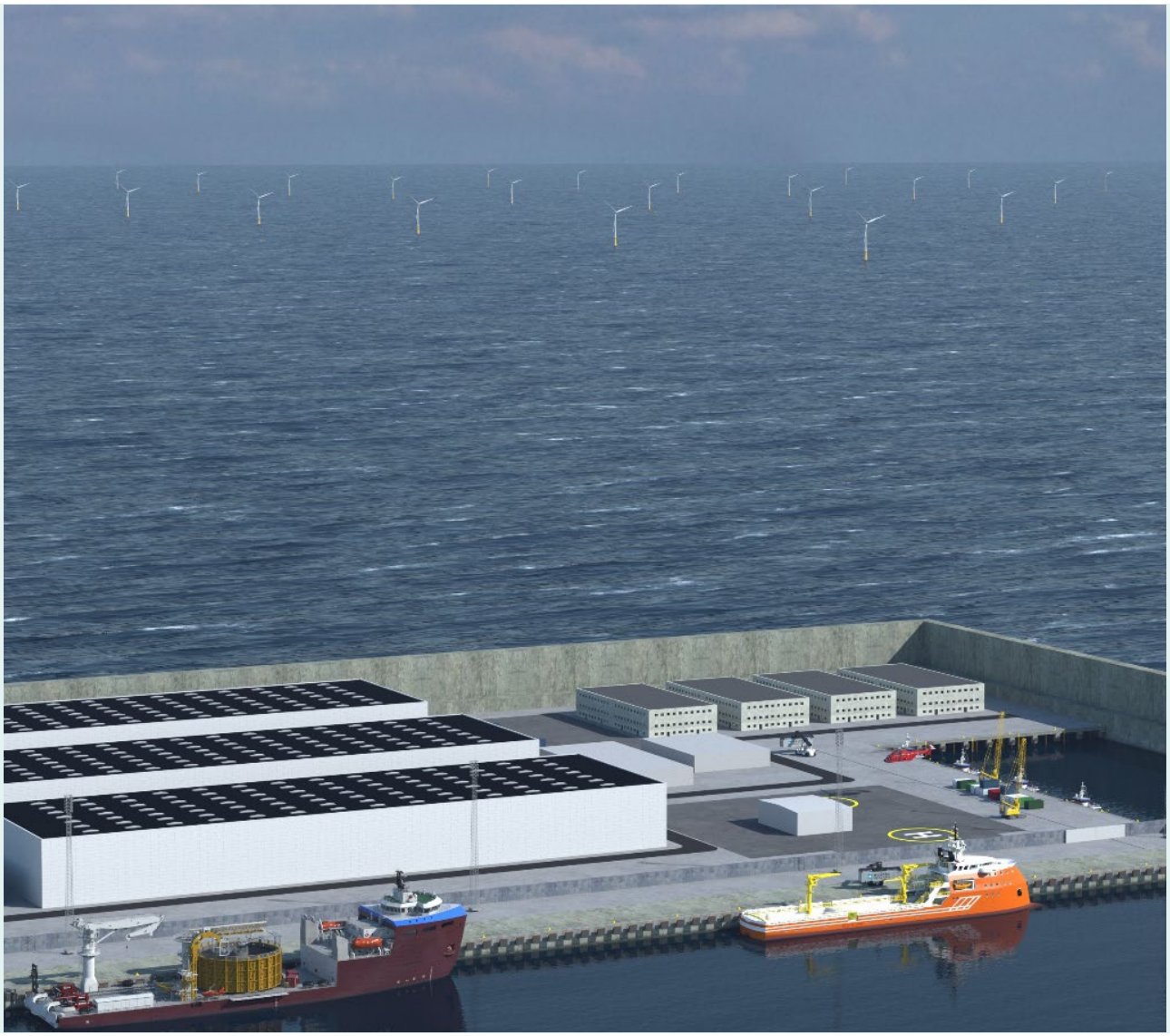

Energy Island North Sea

Scope Report – Birds Field Surveys

Energinet

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1 Project introduction and background

With the Climate Agreement for Energy and Industry of the 22nd of June 2020, the majority of the Danish Parliament decided that Denmark will become the first country in the world to develop two energy islands. One of the islands will be located in the North Sea ("Energioe Nordsoen") with a capacity of 3 GW offshore wind surrounding the island. This island can be further scaled up to allow for grid connection of up to 10 GW offshore wind on the island. It is expected that Energioe Nordsoen will be in full operation by 2033.

The Danish Energy Agency (DEA) has ordered Energinet to initiate the Strategical Environmental Assessment (SEA) and associated technical reports based on field studies including field studies of birds within the investigation area for the planned energy island area and export cable as well as the area around the island. The field studies will be the foundation in the baseline descriptions of presence and densities of birds in the following bird impact assessment as part of the EIA for Energioe Nordsoen.

This report includes a detailed description for the bird field surveys including aerial field surveys for resting birds, radar studies for flying and migrating birds and visual observations with laser-optics to determine species flight height within and around the investigation area for Energoe Nordsoen.

2 Expected birds in the investigation area for Energy Island North Sea

The investigation area in the North Sea (Energioe Nordsoen) consists of tidal, exposed, saline waters 25-60 m deep and is the most oceanic waters in Denmark. Therefore, the North Sea bird species are characteristic of the open sea and the distribution data collection will concentrate on marine species such as Razorbills *Alca torda*, Common Guillemots *Uria aalge*, Black-legged Kittiwakes *Rissa tridactyla*, Northern Gannets *Morus bassanus* and Northern Fulmars *Fulmarus glacialis*. Red-throated Divers *Gavia stellata*, although slightly less "marine", are listed on the Birds Directive Annex I and are present in the area, so will be included as a priority in surveys (Petersen, Sterup, & Nielsen, 2019). There is only one survey covering present bird distributions in the whole danish part of the North Sea (Petersen, Sterup, & Nielsen, 2019) and this survey is just one fly-thru of the area. The data from the survey will be included in the assessments but as the survey only cover the spring it does not represent the full-year distributions in the North Sea. Therefore, the surveys for Energioe Nordsoen will be designed as if no surveys have been conducted in the area.

2.1 Surveys, data collation and analysis design - Birds

The data collection for birds is divided into three parts:

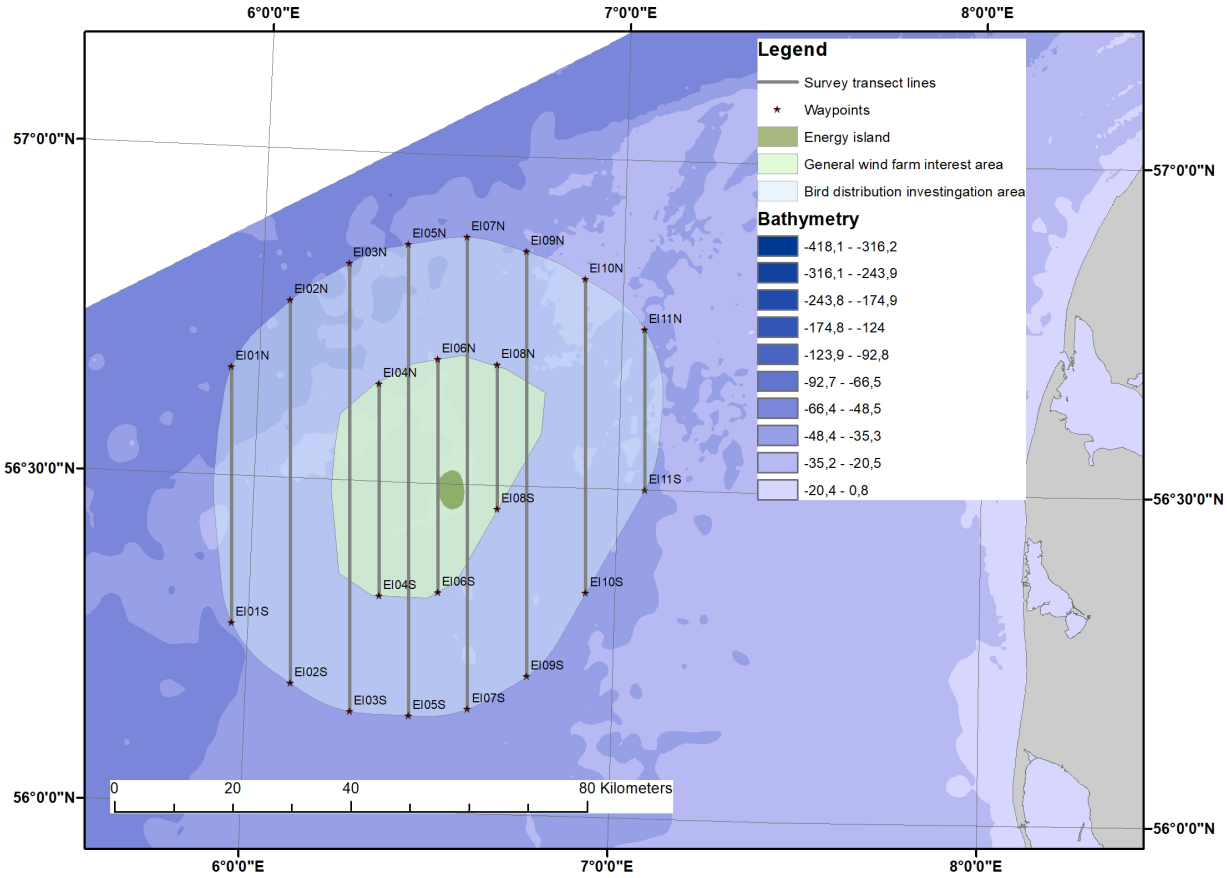
- Conduction of aerial bird surveys in and around (20 km) the OWF area (from January 2022 to November 2023) to quantify the abundance, distribution, and trends of relevant birds at sea.
- Conduction of boat-based observations of birds with special focus on species flight height and behaviour (incl. feeding ecology) within the survey area from November 2021 to November 2023.
- Deployment of vertical radar systems near the investigation area for up to two years (January 2022 to January 2023) with continuous data collection through all seasons to study the migratory behaviour of water and land birds. The radar will also collect data on the flight heights of the bird species present in the area for longer periods of time.

2.1.1 Aerial bird surveys

The aerial surveys will consist of six annual surveys, in each of the following months: January, March, April, July, September and November. This will provide seasonal (within–year) variation in species distribution and abundance. By repeating the surveys over another season, the between-year variation will also be covered and a total of 12 aerial surveys of the area will be completed. In this way, it is possible to take account of abnormal years and the seasonal variation will be more robust.

The survey method is line transect, that is all birds are counted within predefined transect bands along a predefined transect line and is later corrected for the detectability of birds in the different transect bands. The survey will be conducted from a high winged, twin-engine Partenavia P-68 V aircraft, designed for general reconnaissance purposes, flying at an altitude of 76 m (250 feet) and with a cruising speed of approximately 185 km/t (100 knots). All aircraft and pilots will be commercially licensed. The surveys will be conducted along pre-defined transect lines. Coordinates of transect end-points will be entered as waypoints into the GPS of the aircraft for navigation. The transect lines will be arranged at 5 km interval in and around the project area, but with a 10 km spacing in a 20 km buffer zone around the project area. All transect lines have been arranged in a north-south direction, which gains the benefit of optimal light conditions during surveys. Overall, this transect layout will benefit the resulting data set more than an east-west orientation of the transect lines, that would be perpendicular to depth contours of the area. The transect lines have a total length of 595 km, covering a total survey area of 4,813 km^2 (Figure 1).

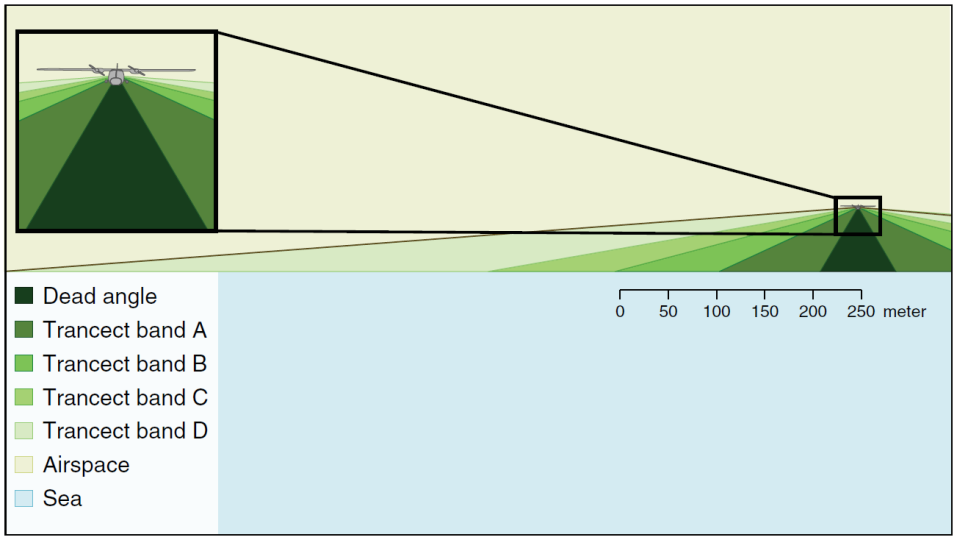
A buffer zone of 20 km around the general wind farm interest area was chosen in order to obtain data on red-throated diver out to a distance beyond described distributional effects from offshore wind farms (Mendel, et al., 2019). A 10 km spacing of transect lines in the buffer zone was chosen because the avian community in this study area is less clustered than it is in for instance inner Danish waters (Durinck, Skov, Jensen, & Pihl, 1994; Petersen, Sterup, & Nielsen, 2019; Skov, Mortensen, & Tuhuteru, 2020).



During surveys, two observers will cover and count all observations of birds and marine mammals on each side of the aircraft following standard Distance Sampling line transect survey methods. Only highly trained, experienced observers, familiar with species identification will be used. All observations will be continuously recorded onto dictaphones, each record providing information on species, number (cluster size), behaviour, transect band and exact observation time. Observations will be assigned to transect bands, which are determined by using an inclinometer (set at predetermined angles of 4°, 10°, 25° and 60° below the horizontal measured abeam of flight direction), and thus define four bands on each side of the aircraft. Beneath the aircraft, a band of 44 m on each side of the flight track line cannot be observed. Transect widths so defined during the aerial surveys are shown in Figure 2.

Each discrete avian record is then assigned to a precise position *post hoc* based on the trace in time and space (longitude, latitude, altitude and time) provided by the on-board computer logging flight track data from a differential GPS at five-second intervals. The majority of observations are considered to be accurate to within four seconds. With a flight speed of 185 km/h the positional accuracy on the longitudinal axis will within 206 m. In a few circumstances with high bird densities, grouping of observations in periods of up to 10 seconds may occur, leading to an accuracy of observation positioning of up to 515 m.

Behaviour of observed birds is also recorded, classified according to the activities: sitting (on the water), diving, flushing or flying.



As the survey results are highly sensitive to weather conditions, surveys will not be carried out when wind speed exceeds 6 m/s, because detectability of birds on the sea surface will be reduced. Low visibility or glare can also reduce detectability. In cases of unavoidably severe glare, observations from one side of the aircraft will temporarily be discontinued.

Upon completion of surveys, track data will be secured on a GIS platform. Observations will be transcribed to a database, followed by geo-referencing observations into an ArcView point theme, using a purpose made GIS based tool. These data in combination form the input for the actual data analysis part, described below.

2.1.2 Boat-based surveys

To obtain species-specific information on flight behaviour and altitudes, densities and species composition from the investigation area, one bird observer will participate in all boat trips into the investigation area. The observer will use laser range finder to obtain species-specific flight altitudes. In addition, every hour the observer will perform a 360-degree scan of birds present around the vessel. All individuals will be assigned to appropriate activities, i.e. foraging, resting, feeding on water, flying, etc.

Information on the proportion of birds flying relative to birds on the water surface will be obtained. This will enable estimation of the proportion of birds flying relative to the densities obtained from the aerial surveys in the investigation area. In combination with the flight altitudes, this will enable estimation of collision risk with wind turbines and other structures for individual species.

The boat-based investigations will cover approx. 41 days from November 2021-November 2023 and take place during other ship-based surveys (benthos, marine mammals and fish) to minimize expenses for ship hire. The observer will on average have 12 hours per field day for observations and therefore this will constitute approx. 696 observation hours.

2.1.3 Radar survey

The field activities will be distributed over the period from December 2021-December 2023. There is focus on the migration periods in April-May and October and on obtaining data on gannet, kittiwake, razorbill, guillemot, fulmar, gulls, divers, terns and skuas. However, it is important to mention that the methodology will allow to obtain data from other species present in the area and therefore potentially affected by the Energy Island North Sea.

Due to the absence of fixed installations in the investigation area, a fixed observation point on a drilling platform Siri Field will be established, which is the closest possible position to the investigation area. This area shares a bird community of staging and wintering birds similar to the investigation area and is therefore representative to this (Durinck, Skov, Jensen, & Pihl, 1994; Petersen, Sterup, & Nielsen, 2019; Skov, Mortensen, & Tuhuteru, 2020). Regarding the broad-fronted nocturnal migration, it is expected that these two areas to be fully overlapping with regard to species composition and migration volumes.

At the fixed point, a vertical radar will operate automatically throughout the study period from December 2021-December 2023 providing two sets of data:

1. The altitude distribution of birds flying in the area day and night
2. The relative volume/movement intensity of flying birds in the vertical plane.

The vertical radar will therefore provide data on bird activity diurnally, which also means that it will be possible to assess the volume of nocturnal migration at different altitudes, including the movements at the sweep area of turbines, during migration periods. It is essential to emphasise that radar provides no information about the avian species involved in tracked movements, and their altitude distributions, unless combined with visual observations. The information will therefore be calibrated from the vertical radar relative to the investigation area using the visual observations obtained from the boat-based observations in the investigation area. This is possible as the bird community of staging and wintering birds are similar between the two areas. The information from the calibration will be used to estimate the general density and altitude distribution to be used in the collision model.

The vertical radar will sample the majority of the time, except for periods with precipitation. The radar range will be set to 1,852 m - the maximum distance over which birds can be detected without compromising the conspicuousness of bird echoes. The data will be collected on the basis of an automated minute-by-minute screen-dump system archiving the echoes detected by the radar.

3 Technical report

The technical report on birds will comprise the following information:

- Non-technical summary
- A thorough method description including a description of all relevant project and model assumptions (specification of wind turbines, Energy Island size and chape where relevant and other relevant parameters).
- A description of baseline situation of avifauna in the North Sea based on literature and surveys conducted as described above.
- Sensitivity analysis of impacts on birds and possible cumulative and transboundary impacts as a result of the collected bird data, with detailed description of the models used.

- Proposals for measures to mitigate adverse impacts, as appropriate
- Identification of possible data and knowledge gaps of importance for the future environmental assessment to be conducted by the future concession holder
- Proposal for a monitoring programme to supplement the baseline surveys, as appropriate.