Netherlands Enterprise Agency

Borssele Wind Farm Zone

Wind Farm Sites I and II

Project and Site Description

Version 3, April 2016

>> *Sustainable. Agricultural. Innovative. International.*

Contents

Revisions made (compared to version 2, August 2015):

- Figures, tables and the legal framework
- Wind Farm Site Decisions BWFS I and II
- Amendments of the Electricity Act 1998
- Compensation scheme for offshore grid (Table 11)
- Development framework for the offshore grid (formerly 'draft scenario')
- Metocean campaign
- Appendix A & B are combined to Appendix A 'Applicable Law'
- Appendix A 'Applicable Law'

Foreword

We are at the very beginning to bring the Borssele Wind Farm Zone to the market. After two years of preparation the first subsidy and permit tender for Wind farm Sites I and II of the Borssele Wind Farm Zone can start. This tender for two wind farms of 350 MW each is a result of the Energy Agreement for Sustainable Growth and a first step in the roadmap towards 4,500 MW offshore wind power in the Netherlands.

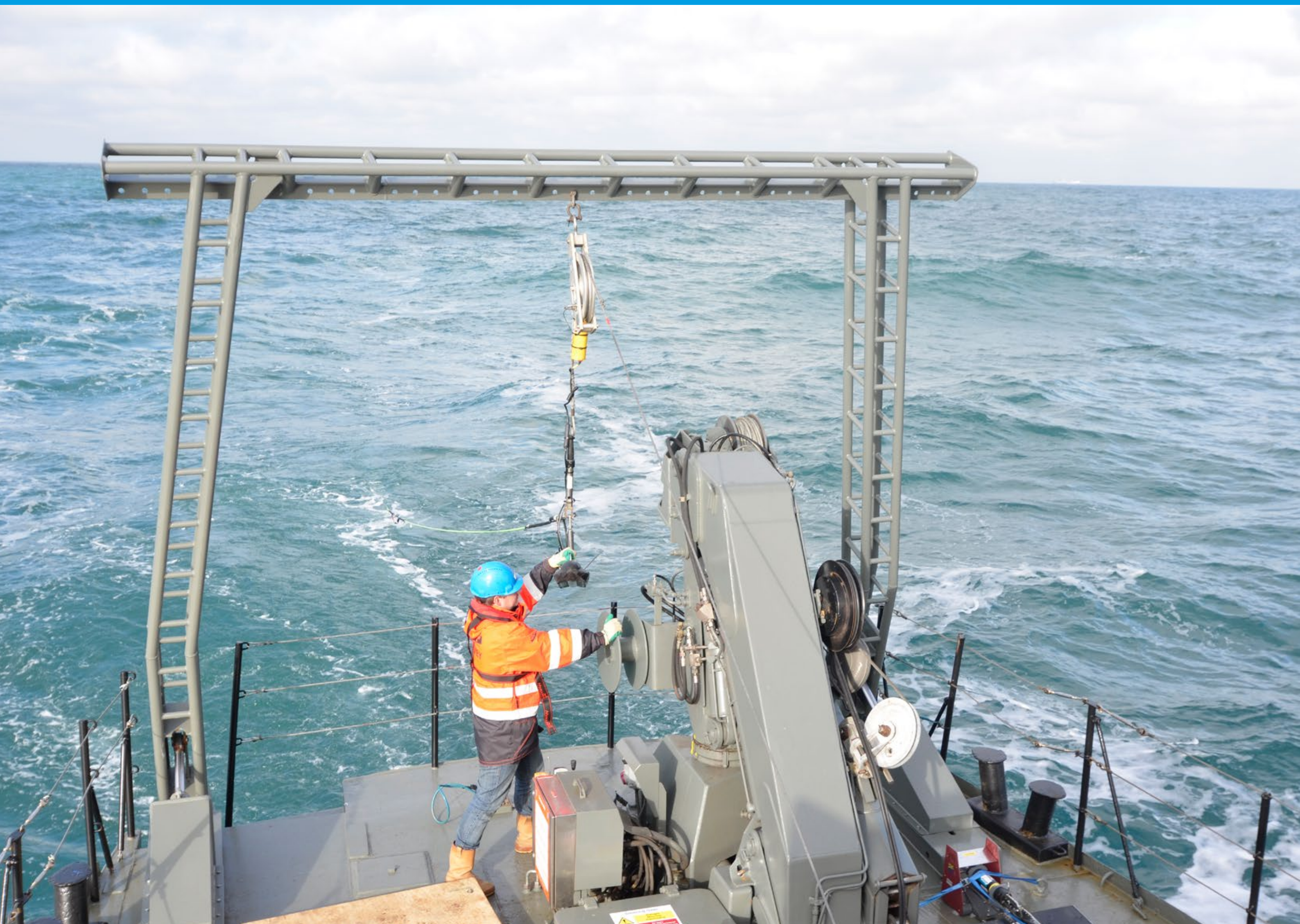
The Netherlands can rely on excellent conditions for offshore wind energy. The North Sea can accommodate large wind farms, has a high wind resource, shallow waters and easy access to a number of well-equipped ports. Moreover, the Netherlands has a strong offshore industry, that is already having a 25% market share in the growing European offshore wind energy market.

Investing in offshore wind energy means investing in reducing import of fossil fuels, investing in securing the country's energy supply, investing in keeping energy costs under control and investing in new jobs. Moreover the use of wind energy will contribute in a significant way to the CO_2 reduction ambitions and therefore forms a significant pillar under the Energy Agreement for Sustainable Growth, concluded between the government and social organisations, as well as one of the ways to fulfil the long term targets for 2050 as agreed on in the Paris climate conference 2015.

The roadmap towards 4,500 MW offshore wind power goes hand in hand with the condition that cost must go down with 40%. The government has actively contributed in this cost reduction by introducing a stable market framework. Under this new framework, the government is responsible for grants, project consents and grid connection.
To facilitate companies in preparing competitive bids, RVO.nl provided the relevant site data regarding the physical conditions of the wind farm sites. TenneT is already ahead with the cost price reduction coming from a standardised series of substations that connect the wind farms with the transmission system on shore.

Now it is time for the market to contribute to the cost price reduction. In the subsidy and permit tenders the lowest bid in €/kWh will be awarded. That company will receive a permit to build and operate the wind farm and granted the associated subsidy. We hope that developers can bid well below the cap price set for the tender.

1. Objectives and reading guide



1.1 Objectives

This Project and Site Description (PSD) is designed to help any party with an interest in participating in the planned SDE+ grant and permit tender for Borssele Wind Farm Sites I and II (BWFS I and II) in the Borssele Wind Farm Zone (BWFZ) in the Netherlands. This document summarises:

- A description of the site, surroundings and characteristics of BWFS I and II.
- All data collected by the Netherlands Enterprise Agency (RVO.nl) regarding the physical environment of the Borssele area.
- A selection of constraints, technical requirements and grant related issues that are deemed to be most relevant for development of the Borssele area.
- The process for the SDE+ grant, permit and the legal framework.

This document has been produced for information purposes only and is not intended to replace any legal or formally communicated rules, regulation or requirements. More information on the site studies, including all reports and other deliverables mentioned in this PSD, can be found at ***offshorewind.rvo.nl***

1.2 Reading guide

The PSD presents an overview of all relevant information for parties interested in preparing a bid for the SDE+ grant and permit to build and operate the wind farms. This version replaces version 2 (August 2015) of the PSD.
This PSD covers the following aspects in the different chapters:

- Chapter 1: Objectives and reading guide.
- Chapter 2: Background - a general introduction to the history and current state of Dutch offshore wind development, including an outline of the process and approach towards the rollout of offshore wind.
- Chapter 3: Borssele Wind Farm Site I and II - site description - general information on the BWFZ, the location, surroundings, its bathymetry (submarine topography), existing cable and pipeline infrastructure, nearby Belgian wind farms and TenneT grid connection system.
- Chapter 4: Site Data - a summary of all the studies and measuring campaigns performed to date on the BWFZ, covering the following:
    - o Morphodynamic characteristics
    - o Archaeological assessment
    - o UXO risk assessment
    - o Geophysical survey
    - o Geotechnical survey
    - o Metocean characteristics
    - o Metocean measurement campaign
    - o Wind resource assessment
- Chapter 5: Legal framework - an overview of the legal framework that is and will be implemented to facilitate the Dutch offshore wind programme rollout.
- Chapter 6: Specific requirements - an overview of the most relevant design parameters, coordinates, and SDE+ grant and permit requirements found in the various acts, decrees, ministerial orders and Wind Farm Site Decisions, described in chapters 3 and 5.
  This overview is not complete and does not replace any legal documents, but it aims to provide information that is relevant to prepare a tender bid by May 2016 (see key dates in chapter 7).
- Chapter 7: Final steps preparing your bid - an overview of the process for granting a subsidy and permit for BWFS I and II.
- Chapter 8: Applicable documents.

This PSD contains two appendices, which can be found as separate documents;

- Appendix A: Applicable Law.
- Appendix B: Summary of Environmental Impact Assessment.

2. *Background*

2.1 Offshore wind farms in the Netherlands

The Netherlands' existing offshore wind farms and those currently under construction have a combined capacity of approximately 1,000 MW. The first three wind farms built in the North Sea are the Offshore Wind Farm Egmond aan Zee (OWEZ, 2006), the Princess Amalia Wind Farm (2008) and Luchterduinen Wind Farm (2015).

The 108 MW Offshore Wind Farm Egmond aan Zee lies 10-18 km off the coast and comprises 36 Vestas 3 MW turbines. It is owned by NoordzeeWind, a joint venture between energy company Nuon and energy supplier Shell. Energy Company Eneco owns the 120 MW Princess Amalia Wind Farm, located outside the 12 mile nautical zone, 23 km off the coast. It consists of 60 Vestas 2 MW turbines. The 129 MW Luchterduinen wind farm is a project of Eneco and Mitsubishi Corporation. Comprising 43 Vestas 3 MW turbines, it is located 23 km off the coast.

One other offshore project is currently under construction - the 600 MW Gemini offshore wind farm. Expected to be fully operational in 2016, it will consist of 150 Siemens 4 MW turbines installed across two locations (Buitengaats and Zee-Energie) 85 km off the coast. Northland Power, Siemens, Van Oord and HVC are the main shareholders in the project.

2.2 The roadmap towards 4,500 MW offshore wind power

In 2013 more than 40 organisations laid the foundations for a robust, future-proof energy and climate policy for the Netherlands by approving the Energy Agreement for Sustainable Growth (Energieakkoord voor Duurzame Groei, September 6th 2013) [1]. An important part of this agreement includes scaling up of offshore wind power development. In September 2014 the Minister of Economic Affairs presented a road map [2] to parliament, outlining how the Government plans to achieve its offshore wind goals in accordance with the timeline agreed upon in the Energy Agreement.

The road map sets out a schedule of tenders offering 700 MW of development each year in the period 2015 - 2019, under the condition that the cost of offshore wind power will decrease by 40% in 2024, compared to 2014.

The Dutch Government has developed a systematic framework under which Offshore Wind Farm Zones are designated. Any location outside these Wind Farm Zones are not eligible to receive a permit. Within the designated Wind Farm Zones the government decides the specific sites where wind farms can be constructed using a so-called Wind Farm Site Decision ('Kavelbesluit'). This contains conditions for building and operating a wind farm on a specific site. The Dutch Government provides all relevant site data and Dutch transmission system operator TenneT is responsible for grid connection.

Winners of the site development tenders will be granted a permit to build a wind farm according to the Offshore Wind Energy Act (Wet windenergie op zee), a SDE+ grant and offered a grid connection to the main land. The Government provides site data, which can be used for the preparation of bids for these tenders. This system is expected to contribute to cost savings.

2.3 Wind Farm Zones

The Government has decided that two Offshore Wind Farm Zones will be used for the deployment of the 3,500 MW of new offshore wind power as agreed upon in the Energy Agreement: Borssele (1,400 MW) and Hollandse Kust (zuid: 1,400 MW and noord: 700 MW). Figure 1 shows a schematic representation of these Wind Farm Zones and the planned timetable for related tenders to be issued.

The tender timetable for this rollout will follow the schedule below. To ensure the required cost reduction for offshore wind, the government has introduced a price cap on projects for each wind farm site.

In 2016, tenders to develop the BWFZ will be issued under the subsidy programme Stimulation of Sustainable Energy Production (SDE+, or Stimulering Duurzame Energieproductie). The remainder of this PSD provides information on the projects and site data for the first tender round which is planned to close in May 2016 (see key dates in chapter 7). This tender round comprises two wind farm sites of 350 MW[1] each: BWFS I and BWFS II.

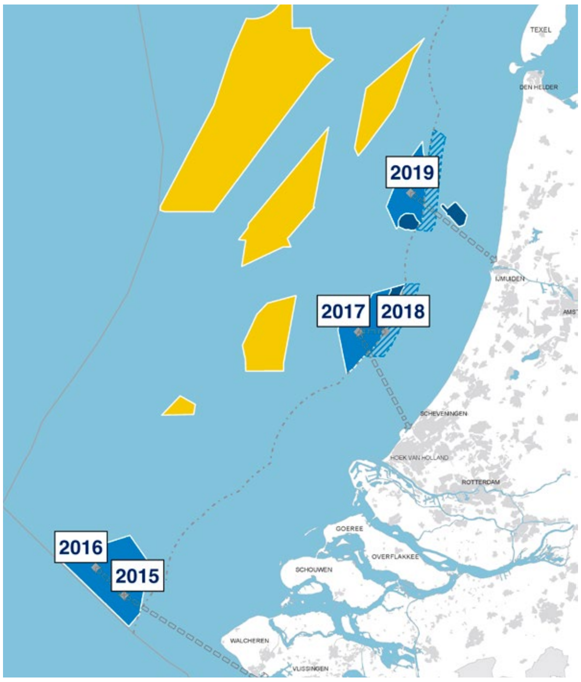


Figure 1. Tender timetable for the Dutch offshore wind rollout. Wind Farm Zones to be tendered are marked light blue, realised wind farms in dark blue, future Wind Farm Zones in yellow.

Table 1: Tender timetable and price cap SDE+.

Year	Power[1]	Wind Farm Zone	Price cap (eurocent/kWh)
2015	700 MW	Borssele Wind Farm Zone, wind farm site I and II	12.400
2016	700 MW	Borssele Wind Farm Zone, wind farm sites IV, III & V	11.975
2017	700 MW	Wind Farm Zone Hollandse Kust (Zuid)	10.750
2018	700 MW	Wind Farm Zone Hollandse Kust (Zuid)	10.325
2019	700 MW	Wind Farm Zone Hollandse Kust (Noord)	10.000

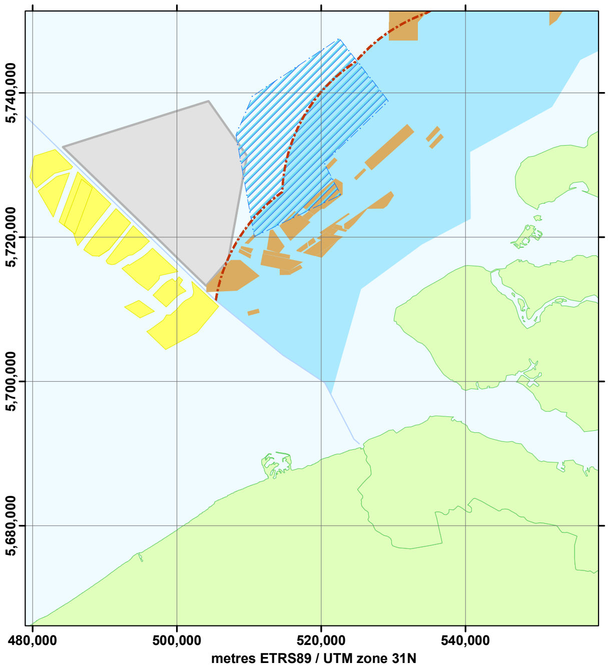
1) Depending on the type of turbine, an operator is allowed to install 342-380 MW per site (See chapter 6 for more information). For the sake of simplicity, the remainder of this PSD assumes a fixed capacity of 350 MW.

3. Borssele Wind Farm Site I and II – site description

3.1 General description of the Borssele Wind Farm Zone

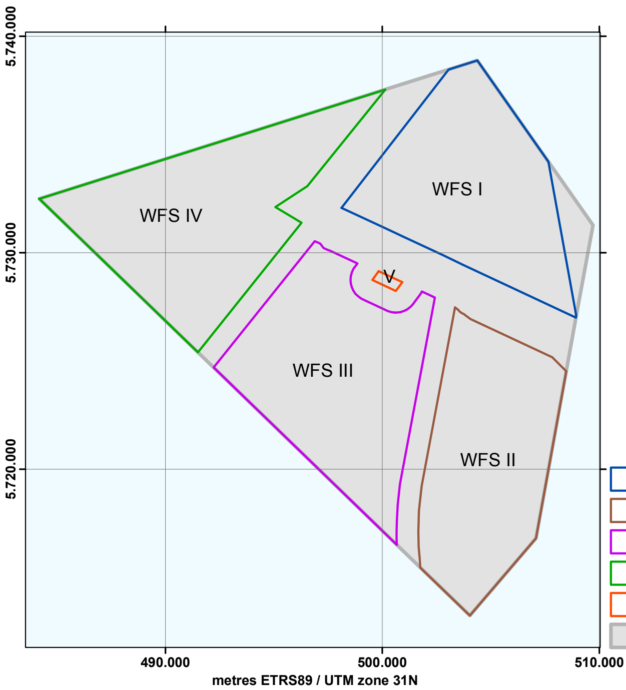
The BWFZ, shown in figure 2, is located at the southern border of the Netherlands Exclusive Economic Zone (EEZ); 0.5 km from the Belgium EEZ. The zone borders a sand extraction area in the southeast and a piloting area in the east. Anchoring areas and a shipping corridor are located at the north side of the zone. The Belgian dedicated offshore wind zone is located directly to the southwest.

Figure 2. The Borssele Wind Farm Zone and surrounding areas.



The BWFZ of approximately 344 km² (235 km² excluding maintenance and safety zones) is located 22.2 km from shore (12 nautical miles) and is sub-divided into five sites. Water depth is approximately 16-38 m. In total, approximately 1,400 MW offshore wind capacity is planned in the zone.

Figure 3. The Borssele Wind Farm Zone including the safety zones.



3.2 Layout and coordinates of BWFS I and II

BWFS I is 64.8 km² in size and has an effective area for development of 49.1 km². Due to existing pipelines and cables that cross the site, it has been subdivided into 4 parcels (25.2 km², 17.8 km², 2.1 km², and 4.1 km²). BWFS II does not have cables or pipelines crossing this site; it consists of one parcel with an effective area of 63.5 km². The surface areas referred to above exclude the locations of safety zones, export cables and TenneT's grid connection system including its safety and maintenance zones.

Figure 4 shows the boundaries of BWFS I and II. The coordinates of the boundaries, maintenance zones, infield cable corridor and safety zones are given in § 6.1. The cable entry zone to Substation Alpha and the coordinates of Substation Alpha and Beta are shown in § 3.7 of this document. All coordinates tables are published in the ***Memo Boundaries and Coordinates*** (February 2016).

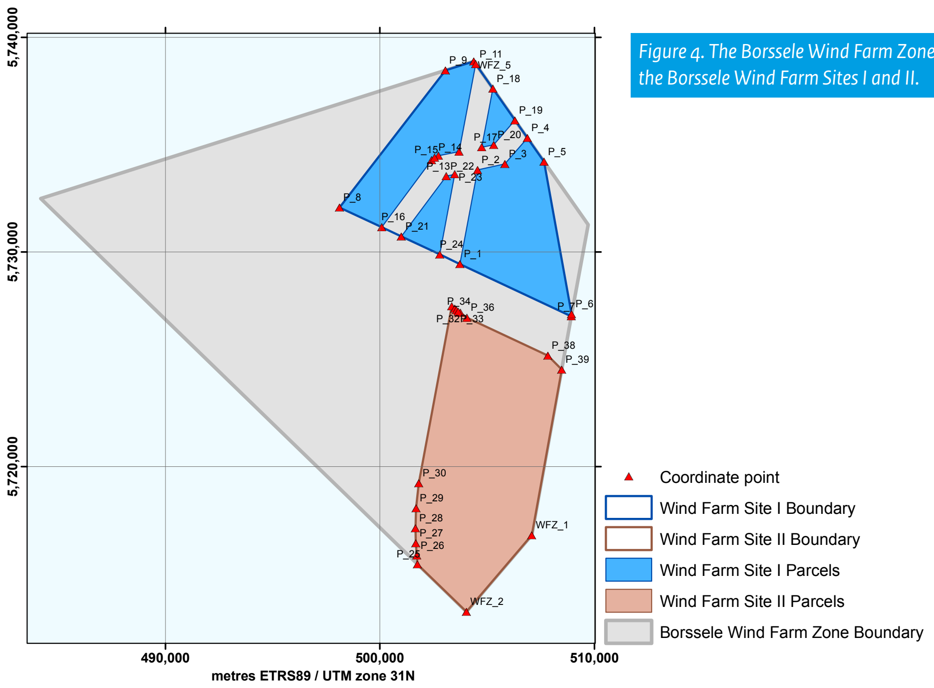


Figure 4. The Borssele Wind Farm Zone and the corner coordinates of the Borssele Wind Farm Sites I and II.

The basic bathymetry of BWFS I and II is shown in figure 5. More detailed bathymetry, morphodynamical and metocean information relating to the BWFZ is provided in the following chapters.

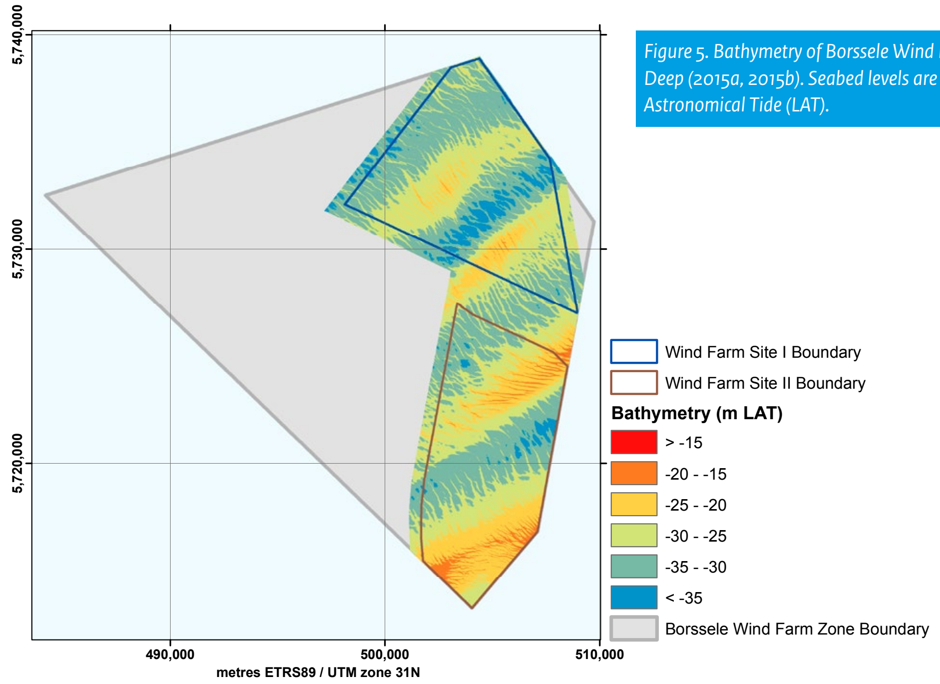


Figure 5. Bathymetry of Borssele Wind Farm Sites I and II as recorded by Deep (2015a, 2015b). Seabed levels are given in metres relative to Lowest Astronomical Tide (LAT).

3.3 Existing infrastructure

Several operational cables and pipelines cross the Wind Farm Zone. Figure 6 shows the operational cables and pipelines crossing the zone.

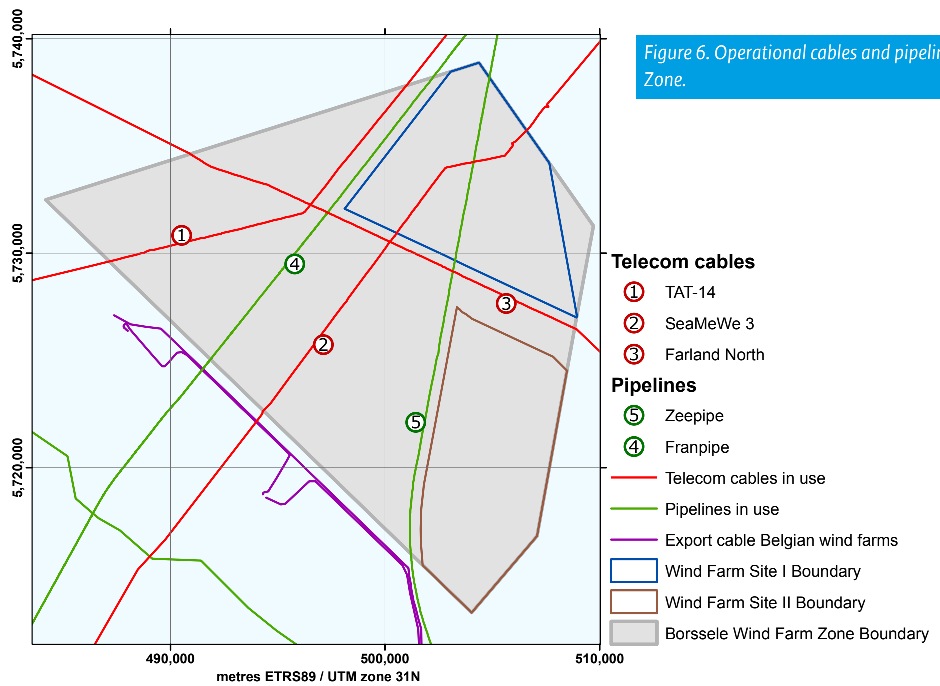


Figure 6. Operational cables and pipelines in the Borssele Wind Farm Zone.

A description of the different cables and pipelines in use can be found in table 2.

Table 2. Description of pipelines and cables with current status 'in use' in the BWFZ.

Name	Description
TAT-14	Transatlantic telecommunications cable - does not border or cross WFS I or II
Franpipe	Natural gas pipeline from a Norwegian gas field to France
SeaMeWe 3	Segmented telecommunications cable between Western Europe and South East Asia
Farland North	Telecommunications cable between the UK and the Netherlands
Zeepipe	Natural gas pipeline from a Norwegian gas field to Zeebrugge (Belgium)

Netherlands Enterprise Agency (RVO.nl) has investigated the feasibility of relocating some of the telecom cables in the area. The investigation concluded it is not feasible to relocate these cables from the perspective of planning, cost and risks of relocation. Therefore, this process has not been pursued further.

Several abandoned cables and/or pipelines also run through the Borssele area. An overview of these can be found at the GIS files at: ***offshorewind.rvo.nl***.

3.4 Nearby Belgian Wind Farms

The Dutch Belgian border is located immediately south of the BWFZ. The Belgian dedicated offshore wind zone is directly opposite this border - this is where several Belgian Wind Farms are operational or under development (table 3).
This information is subject to change, with the latest information available from the Belgian Authorities [26]. If you apply for subsidy and permit you will be requested to use the coordinates of the Belgian Wind Farms operational on July 1st of 2015 (Appendix A).

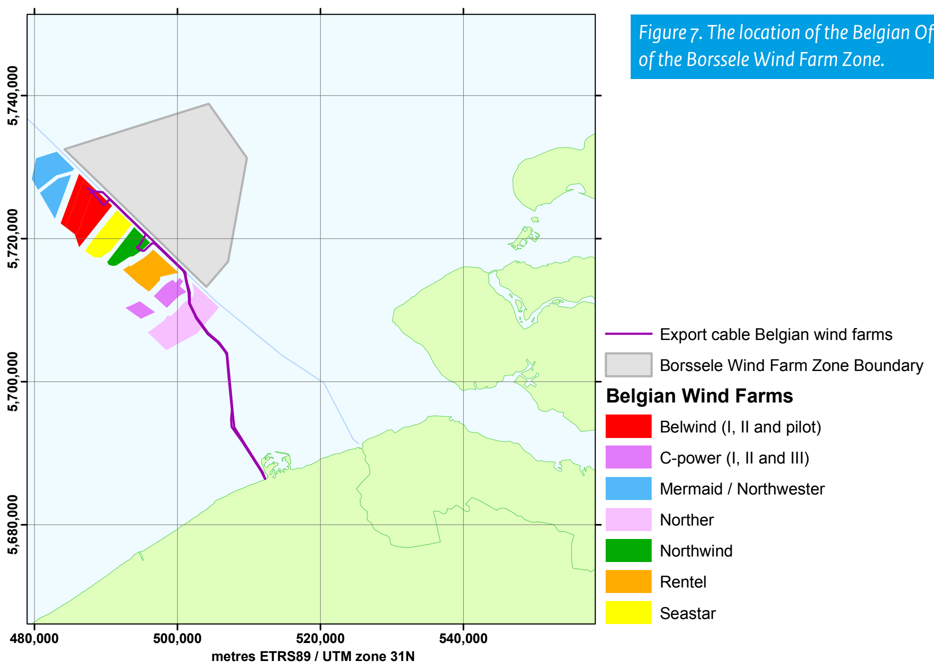


Figure 7. The location of the Belgian Offshore Wind Farms directly south of the Borssele Wind Farm Zone.

Table 3. Characteristics of the Belgian wind farms.

Name	Hub-height / rotor diameter [m]	Turbine type	Individual turbine rating [MW]	No. of turbines	Total capacity [MW]	Status
Belwind I	76/90	Vestas 90	3	55	165	Fully commissioned
Belwind II	72/112	Vestas 112	3.3	50	165	Under development
Belwind-Pilot	100/150	Haliade	6	1	6	Fully commissioned
Northwind	84/112	Vestas 112	3	72	216	Fully commissioned
C-Power I	94/126	Senvion 5M	5	6	30	Fully commissioned
C-Power II	95/126	Senvion 6.2M	6.15	24	147,6	Fully commissioned
C-Power III	95/126	Senvion 6.2M	6.15	24	147,6	Fully commissioned
Rentel	106/154	Siemens SWT-7.0-154	7	42	294	Under development
Seastar	?/?	ND	4-10	41-62	246	Consent received
Norther	?/150	ND	6-8	44-48	350	Consent received
Mermaid	?/?	ND	3.3-10	24-80	266	Consent received
Northwester 2	?/?	ND	3-10	22-70	224	Early planning

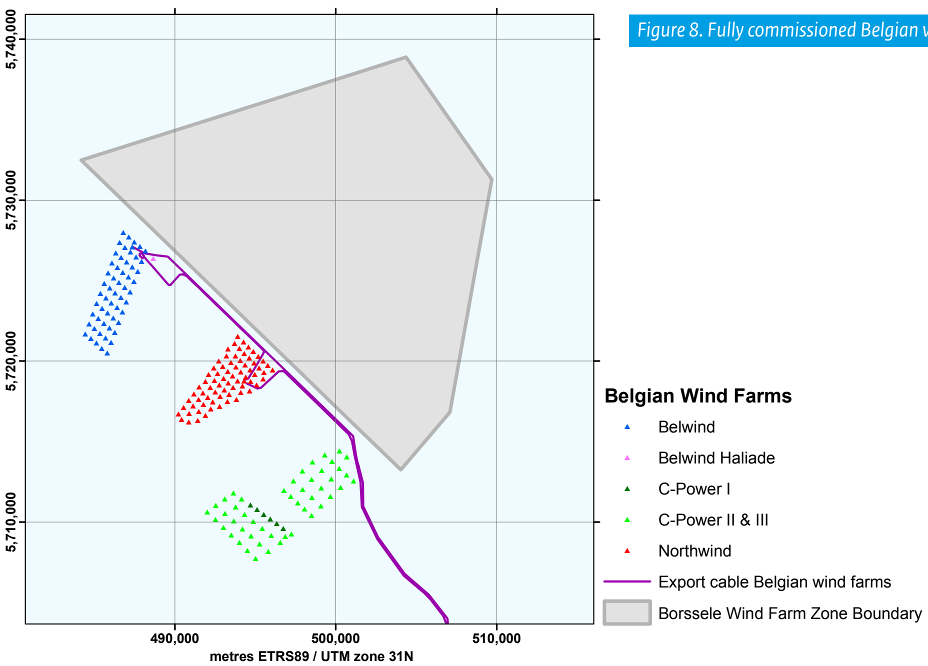


Figure 8. Fully commissioned Belgian wind farms.

3.5 Exclusion zones

Between the Belgian Wind Farm Zone and BWFZ, a safety zone of 500 m is in place on both sides of the border (table in § 6.1). To the east, the zone is bordered by the 12 mile zone and the pilotage zone 'Steenbank'. Pipelines and cables, plus their maintenance zones (500 m on both sides of the pipes/cables) are excluded from the different parcels (table in § 6.1). Due to the overlap of the BWFZ with the pilotage zone, a 500 m safety corridor has been set between the pilotage zone and BWFS I. Turbine blades are not allowed outside the BWFS boundaries. Between BWFS I and II, a shipping corridor also runs from east to west, as shown in figure 9. Vessels up to 45 m will be allowed to cross this corridor. Under the National Water Plan 2 [13] vessels up to 24 m will be allowed to cross the entire BWFZ.

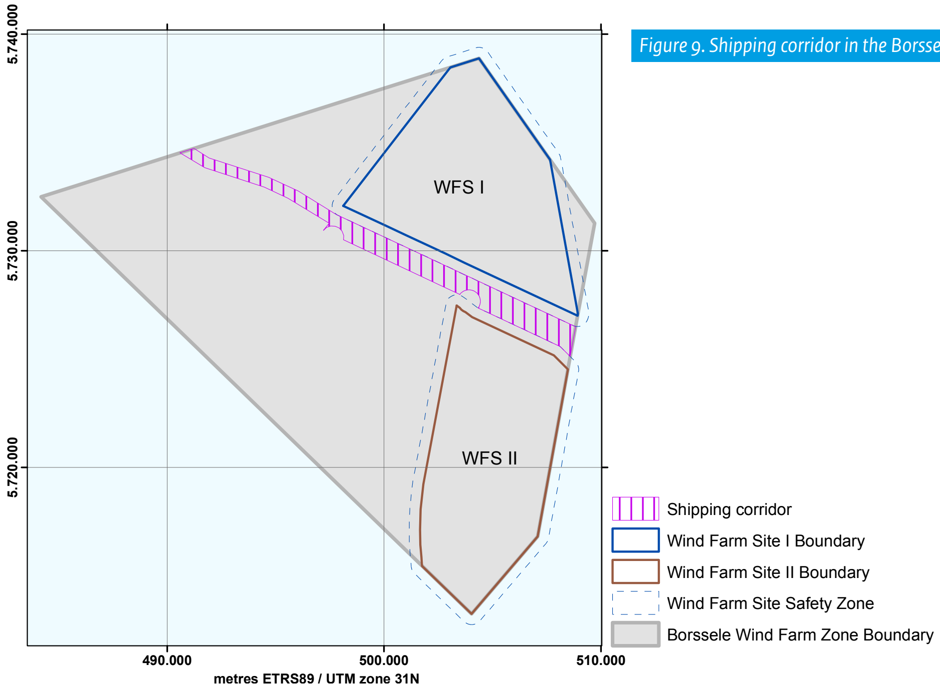


Figure 9. Shipping corridor in the Borssele Wind Farm Zone.

3.6 TenneT offshore grid connection system

The planned Borssele Alpha and Beta Offshore Substations are shown in figure 10. Infield cables from the wind farms will connect directly to these stations. Borssele Alpha will transform the power of BWFS I and II from 66 kV to 220 kV and transport the electricity to shore. Borssele Beta will do the same for BWFS III, IV and V. Table in § 6.1 shows the border coordinates of the infield cable corridor.

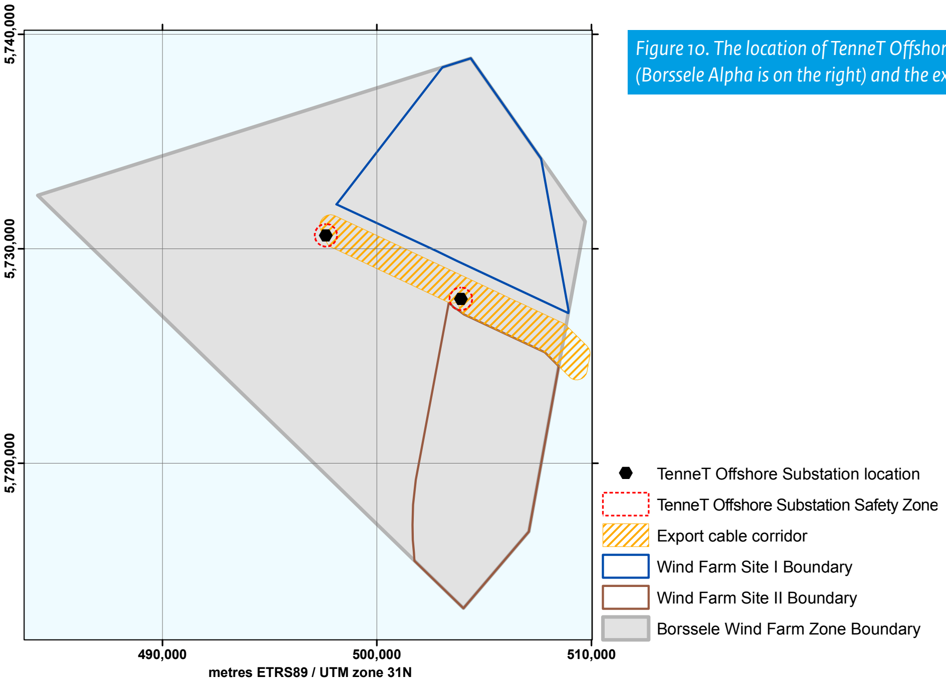


Figure 10. The location of TenneT Offshore Substations Alpha and Beta (Borssele Alpha is on the right) and the export cable corridor.

Draft spatial plan and draft licenses for Grid Connection System Borssele are published under the ***‘Rijkscoördinatieregeling’***.

Table 4. Coordinates BWFZ Substations Alpha and Beta by TenneT.

	Geographic coordinates (ETRS89)		UTM (ETRS89, zone 31)	
TenneT platform	**Degrees N**	**Degrees E**	**Easting**	**Northing**
Alpha	51,69992	3,056708	503919,0	5727666
Beta	51,72652	2,965551	497620,7	5730622

3.7 Cable Entry Zone

The cable entry zone from BWFS I and from BWFS II towards TenneT Offshore Substation Alpha is shown in figure 11 and bordered by the coordinates provided in § 6.1.

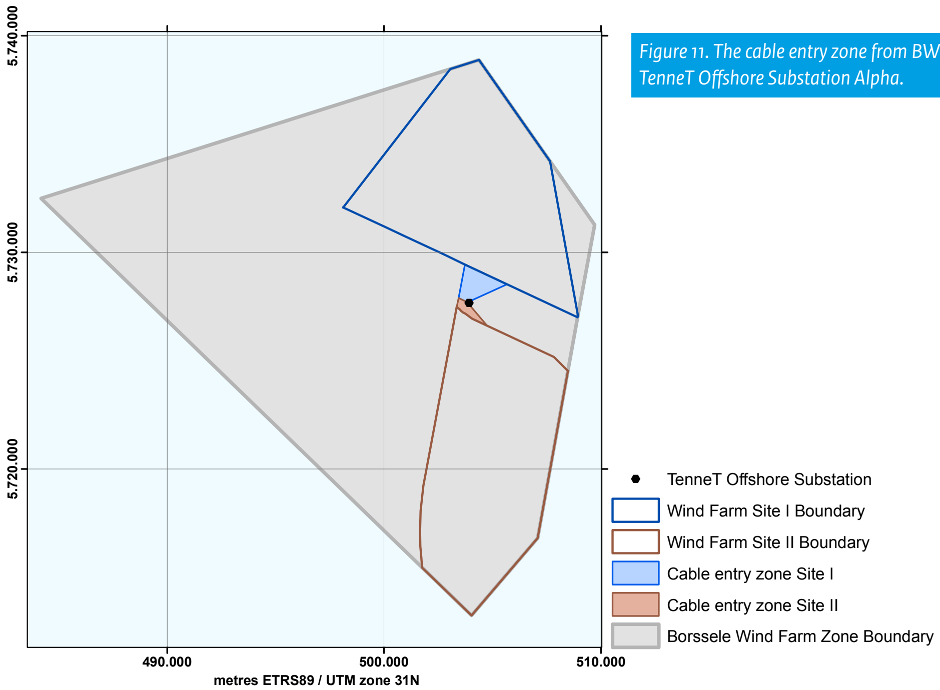


Figure 11. The cable entry zone from BWFS I and from BWFS II towards TenneT Offshore Substation Alpha.


TenneT
Taking power further
BORSSELE ALPHA
BORSSELE ALPHA

4. Site data

The Netherlands Enterprise Agency (RVO.nl) is responsible for collecting site information that companies require to prepare bids for the SDE+ subsidy and permit tenders for the BWFZ. The site information package should be of sufficient detail and quality to be used as input for, as an example, front end engineering design studies. A detailed overview of the approach, procurement of the studies and quality assurance can be found in § 4.10.

For studies relevant for foundation, infield cables and wind turbine design, a certifying authority (DNV GL) reviewed the reports and provided a statement of compliance (metocean, morphodynamics, geophysical survey, and geotechnical survey) to assure that the results were acquired in compliance with the DNV-OSJ101 and/or other applicable industry standards. Where applicable, these statements of compliance are added to the report.

In the following paragraphs the scope and results of the studies are summarised:

- 4.1 Geological desk study
- 4.2 Morphodynamical desk study
- 4.3 Archaeological assessment
- 4.4 Unexploded ordnance (UXO) assessment
- 4.5 Geophysical survey
- 4.6 Geotechnical survey
- 4.7 Meteorological and oceanographic (Metocean) desk study
- 4.8 Meteorological and oceanographic (Metocean) measurement campaign
- 4.9 Wind resource assessment

4.1 Geological desk study

This study was the starting point for several other studies. However, more in depth geophysical and geotechnical site investigations have since been conducted and so the desk study is not described further in this PSD.

4.2 Morphodynamical desk study

4.2.1 Introduction

This study assesses the seabed dynamics at the BWFZ and is designed to:

1. Improve understanding of the seabed morphology at the BWFZ.
2. Improve understanding of the seabed morphodynamics at the BWFZ over the consent period for the BWFS (30 years, including building and decommissioning).
3. Determine the design reference minimum and maximum seabed levels at the BWFZ and help predict potential seabed level changes over the consent period for the offshore wind farms.

4.2.2 Supplier

Research institute Deltares performed an initial morphodynamical desk study for the BWFZ [4] using existing data. Based on the geophysical survey [5], the institute provided an update of this study [6], specifically aimed at the BWFS I and II. Deltares has previously conducted similar studies for other offshore wind farms, including Princess Amalia, Butendiek, Luchterduinen, Nordergrunde and Belwind. The Belwind project is adjacent to the BWFZ, on the Belgian side of the border.
Therefore, Deltares has developed in depth knowledge of the morphology of this specific part of the North Sea.
DNV GL performed a review of both studies and issued a Statement of Compliance for both.

4.2.3 Results

The studies consisted of two phases: One of the deliverables of this survey is a high resolution bathymetrical dataset that has been used to update the morphodynamical desk study.

- Phase 1: desk study (December 2014 [4]) prior to the geophysical survey (April 2015 [5]);
- Phase 2: update of the report of phase 1 based on the findings from the geophysical study. This report (June 2015 [6]) superseeds the report from phase 1.

The high resolution bathymetrical dataset from the 2015 geophysical survey was in the second phase (June 2015 [6]) also assessed alongside the 2000 and 2010 bathymetry data to provide an indepth insight into the seabed morphodynamics at the site. The site is characterised as highly dynamic, consisting of static, shore-parallel sand banks overlaid with dynamic shore-perpendicular sand waves. Within the area, opposing migration directions were found, as shown in figure 12.

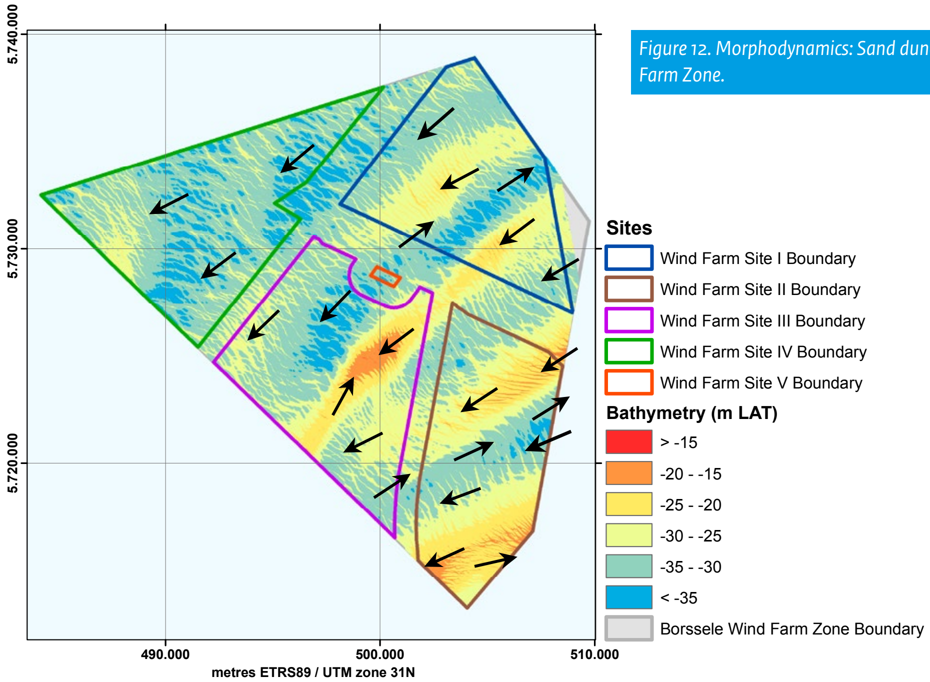


Figure 12. Morphodynamics: Sand dune movement in the Borssele Wind Farm Zone.

Sand wave characteristics were determined for the combined area of BWFS I and II as well as for the individual sites by means of consistent tracking of crest and through points of individual sand waves from various transects of 1750 m equally distributed throughout the BWFZ. The sand waves have a typical length of 230 m, height of 4 m and migration speeds in the order of -1.7 m/y (in NE-direction) to 3.2 m/y (in the governing SW-direction).

Next, the minimum reference seabed level (RSBL) and maximum seabed level (MSBL) were determined, indicating the predicted lowest and highest seabed levels during the period 2015-2046 in the Borssele area, as shown in figure 13.

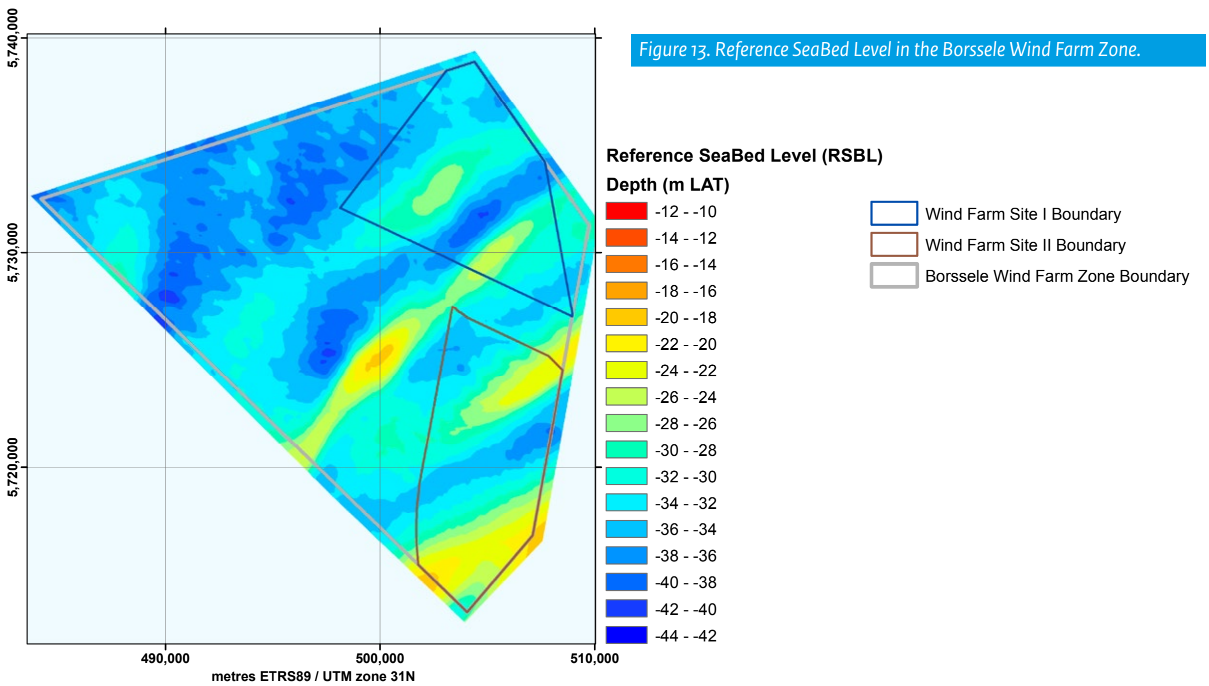


Figure 13. Reference SeaBed Level in the Borssele Wind Farm Zone.

Comparison of the RSBL with the most recent bathymetry from 2015 showed a potential maximum lowering of the seabed of approximately 5 m. The largest potential seabed lowering occurs at locations where wave crests are present. A comparison of the RSBL with the base of the Holocene Formation showed that no unrealistic - by means of assuming dynamic soil behaviour (sand) for non-dynamic soils (clay) - values for the seabed lowering were computed in this study.

The predicted seabed level changes presented in this study follow from the applied morphological analysis techniques, describing the (uncertainty of the) physics and the natural variability of the analysed morphological system.
No additional safety margins for design purposes have been applied.

4.3 Archaeological assessment

4.3.1 Introduction

The purpose of the study is to provide insight into any archaeological aspects that impact the development of the BWFZ. The main objectives of the study are:

1. Assess whether there are (indications for) areas with specific archaeological interest (wrecks and prehistoric life) at the BWFZ.
2. If present, specify expected locations, size and dating of the areas with specific archaeological interest.
3. Determine possible effects of offshore wind farm installation on the areas with specific archaeological interest.
4. Assess options to mitigate disturbance on areas with specific archaeological interest.
5. Identify whether further archaeological risk assessments should be carried out and make a recommendation on the scope of future investigations.
6. Specify obligations and requirements for any activity carried out in the Wind Farm Zone (including site investigations or monitoring activities, installation activities, operational activities) that could have an effect on archaeological aspects.

4.3.2 Supplier

Vestigia Coastal and River Archaeology were selected to perform the archaeological desk study [7]. This subsidiary of Vestigia combines the offshore archaeology expertise of Vestigia and its cooperating partners. Vestigia has a track record in maritime archaeological preparatory research, such as for Nuon's offshore wind prospects, the Maasvlakte 2 and the COBRA-cable between the Netherlands and Denmark.

4.3.3 Results

The desk study was performed prior to the geophysical and geotechnical investigations. The report assesses the presence of early prehistoric sites from an era when the North Sea was still land, as well as historic shipwrecks, lost cargo and crashed airplanes.

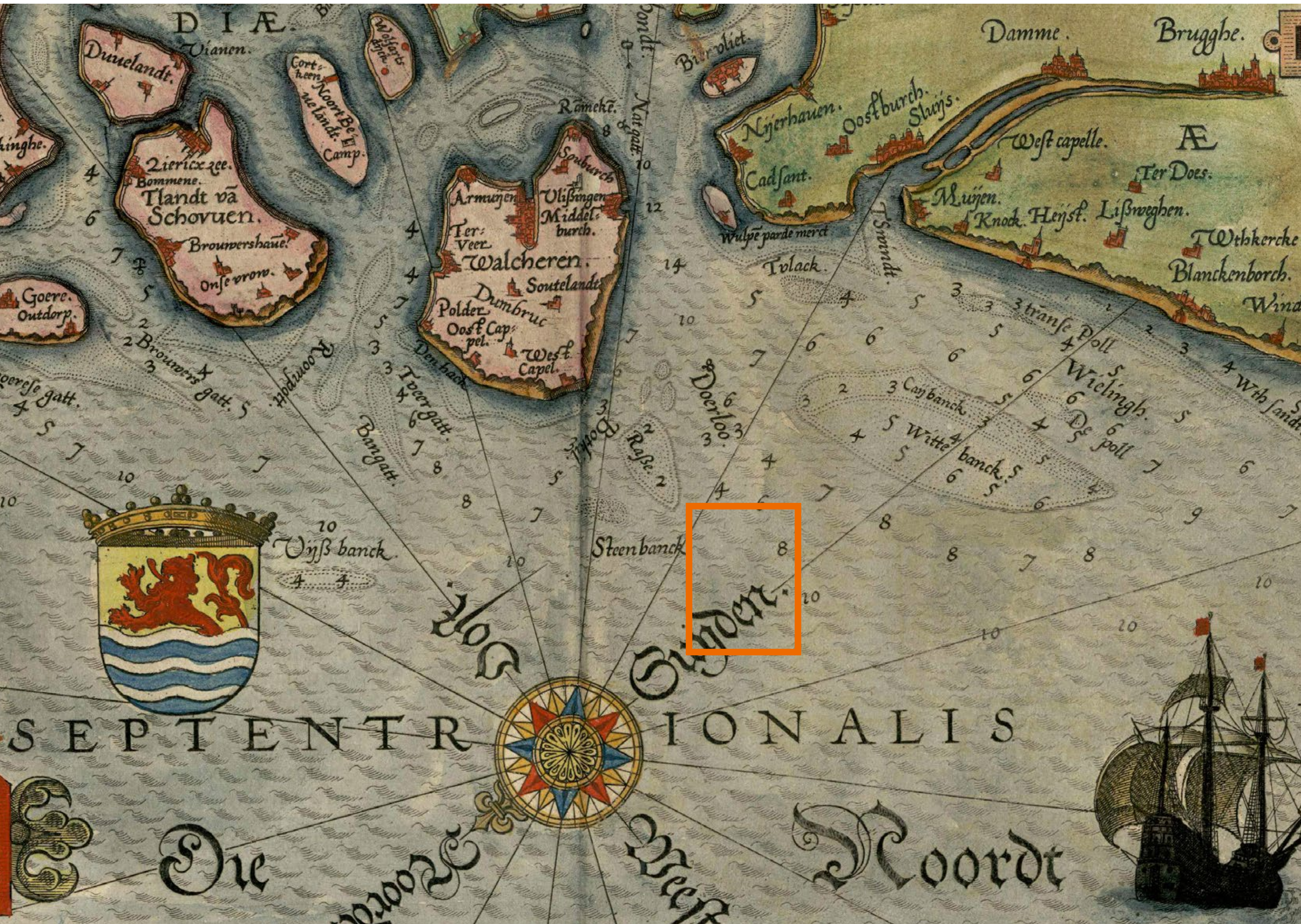
Prehistoric sites:

1. No early prehistoric sites have been identified within the Wind Farm Zone itself, the nearest being 9 miles southeast of zone.
2. If present at all, prehistoric remains are located at a depth of about 30 to 40 m below present day sea level.
   This means the site has been submerged by the expanding North Sea around 7000 BCE and therefore possible settlements will most likely be older. However, population density in North-western Europe during these early stages of prehistory was very low. Therefore, the density of archaeological traces of those people is also very low while the chance of any traces being well preserved is even lower. In conclusion, the chances of encountering prehistoric archaeology within the Wind Farm Zone are small (low sensitivity).

Historic shipwrecks:

1. Three shipwrecks have previously been identified within the BWFZ, one of which is located in BWFS I or II. There are a number of unidentified obstructions reported within the Wind Farm Zone, three of which are located in BWFS I or II. These could either be wrecks, part of wrecks or anchors, cargo or garbage. They may also be the remains of aircraft lost in the World War II. The recorded shipwrecks and objects may or may not be of archaeological significance. As long as it is impossible to determine the significance, these locations are best avoided during development. During the geophysical survey (see paragraph 4.5), only two of the obstructions/ shipwrecks were found.
2. Vestigia has found no records of systematic surveys using side-scan sonar or other geophysical techniques within the Wind Farm Zone, mainly because the area has not been of commercial interest until now. The reported discoveries are considered random discoveries although their low number is in no way a reflection of the actual density of historic archaeological sites however. More undiscovered shipwrecks and other historical objects are likely to be present within the Wind Farm Zone. Therefore, the chance of encountering further historic archaeology (shipwrecks, airplanes, etc.) within the entire BWFZ is considered to be average (medium sensitivity).

*Figure 14. Chart from 'Spiegel der Zeevaerdt' (1588).
Borssele Wind Farm Zone is approximately located inside the orange rectangle. Note: the North is in the left bottom corner.*



4.3.4 Conclusions and recommendations

No early prehistoric sites have been identified within the BWFZ itself and the likelihood of encountering prehistoric archaeology within the zone is small. Therefore, further archaeological surveys regarding the prehistoric sites are not recommended.

Historic shipwrecks have been identified in the area and shipwrecks of high archaeological significance have been found in the vicinity, leading to an average chance of encountering historic archaeology. The recommendations of Vestigia regarding wrecks were taken into account during the geophysical survey carried out by Netherlands Enterprise Agency (RVO.nl).

Current developments

Commissioned by RVO.nl, Periplus has executed a pilot in March 2016. This pilot assessed for BWFS III and IV whether the geophysical study proved a good basis for a further archeological analysis. Due to promising results of the pilot, RVO.nl commissioned Periplus to execute an archeological analysis of the BWFZ based on the geophysical data. Results are to be expected by April 2016. The final Wind Farm Decisions incorporates archeological measures in requirement 4.5.

4.4 Unexploded Ordnance (UXO) assessment

4.4.1 Introduction

The UXO desk study looks at areas in the BWFZ with an increased risk of encountering unexploded ordnances (UXOs). The main objectives of this study are:

1. Identify constraints for offshore wind farm related activities in the BWFZ as a result of the presence of UXOs.
2. Identify areas within the BWFZ where wind farm or cable installation should be avoided.
3. Identify requirements from an UXO perspective that should be taken into account for:
   a. Determining the different concession zones in the Wind Farm Zone.
   b. Carrying out safe geophysical and geotechnical investigations.
   c. Safe installation of wind turbine foundations.
   d. Safe installation of inter array cables.

4.4.2 Supplier

REASEuro performed the UXO desk study [8].
The company is specialised in offshore UXO studies, serving dredging, wreck recovery and offshore wind construction.

Since 2012, REASEuro has been involved with several offshore projects in the Persian Gulf, performing data analysis, project risk assessment and coordination of demining activities. The project team members for this assessment have specific North Sea experience from their previous employment at Van Oord Dredging and the demining department of the Royal Dutch Navy.

4.4.3 Results

The BWFZ and surrounding areas were the scene of many war-related activities during World War I and World War II. In both wars a large number of naval mines were deployed in the North Sea, but they were only partially recovered after the war. In addition, the BWFZ is located along the main flight path of Allied bomber raids - many bombs were dropped and a large number of aircrafts have crashed in the North Sea (see figure 15).

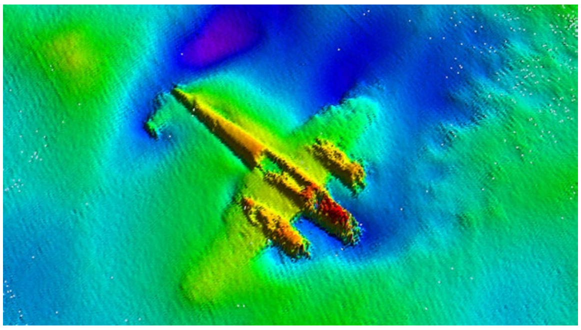


Figure 15. A scan of the sea bed in the English Channel shows the Dornier-17 German bomber, buried under the sand since World War II.

After the war, some ordnances are likely to have moved as a result of fishing, tidal streams and seabed migration. Overall, the entire Wind Farm Zone is considered an UXO risk area. This conclusion is validated by the fact that since 2005 fishermen have found over 20 UXOs.

An UXO can be sensitive to hard jolts, change in water pressure and acceleration with an amplitude >1m/s^2.
A detonation can lead to serious damage to equipment and injuries to crewmembers. The possible presence of UXOs in the area, however, is no constraint for offshore wind farm related activities. With proper UXO risk management risks can be reduced to a level that is as low as is reasonably practicable.

A challenge in UXO risk management at BWFZ is movement of the UXO over the seabed. This can lead to resurfacing UXOs that were buried during preliminary scanning and introduction of new UXOs by sea currents or fishing activities. Therefore, monitoring needs to be a crucial aspect of all development phases, closely integrated into UXO risk management.

The report provides a number of recommendations for each phase in the development:

1. Preparation phase
   a. A geophysical (bathymetric) survey should be conducted to assess geomorphology and identify objects - Netherlands Enterprise Agency (RVO.nl) has already conducted this survey (See chapter 4.5)
   b. In case of any soil intrusive operations, an UXO search of the area affected should be conducted and any discovered UXOs should be cleared. The clearance operation should be conducted by a certified EOD company.
2. Execution Phase
   a. UXO-related risk assessment based on the first draft of the wind farm design and optimisation of the design based on the outcomes.
   b. UXO risk mitigation strategy, which includes a search for and safe removal of UXOs. Because the validity of the collected data is time-limited, it is recommended that the period between the survey and installation work is minimised.
3. Operational phase
   a. After completion of construction activities it is still important for wind power companies to remain vigilant and remember that UXOs can move as a result of tidal streams, mobility of sand waves and seabed usage.
   b. Maintenance and Monitoring Plan.

4.4.4 Conclusion and recommendations

UXOs from both world wars are likely to be present at the site, which is therefore considered an UXO risk area. However, with proper UXO risk management the risks can be minimised. Due to the highly dynamic soil morphology, it is recommended companies conduct UXO search and removal operations immediately prior to construction activities at specific locations. The validity of the collected magnetometer survey data in regards to tidal streams, mobility of sand waves and seabed usage should be taken into account when planning survey and construction operations. The time lapse between project phases should be limited. Due to the time-limited nature of findings, a dense magnetometer survey to detect UXOs was not part of the geophysical survey objectives [5].

4.4.5 UXO removal procedure

If a wind farm developer identifies an UXO on a location where a foundation of a wind turbine is planned, it should be reported to the Dutch Coast guard. A developer is not allowed to undertake UXO removal with a qualified contractor. The Royal Netherlands Navy is responsible for the disposal (removal) of all UXO encountered. Dutch authorities will cover costs of this removal.

Rijkswaterstaat Zee en Delta, part of the Ministry of Infrastructure and the Environment, is the competent authority regarding the public security. It is advisable to consult the competent authorities in regards to management measures that can be taken to prevent stagnation in the execution phase. A possible measure is to safely move the UXO outside the work area awaiting destruction.

4.5 Geophysical survey

4.5.1 Introduction

The objective of the geophysical survey is to:

1. Improve the geological and geotechnical understanding of the BWFZ; and
2. Obtain geophysical information which is suitable for the preparation of geotechnical investigations and for progressing the design and installation requirements of offshore wind farms, including (but not limited to) foundations and cables.

4.5.2 Supplier

Netherlands Enterprise Agency (RVO.nl) contracted Deep BV to conduct geophysical surveys [5] in the BWFS I and II and a small area around them (‘investigations areas’). Deep BV has a track record in bathymetric, geophysical, UXO and archaeological surveys, especially off the Dutch coast in the North Sea. DNV GL provided a Statement of Compliance for the results of the study.

4.5.3 Results

Deep BV performed a full geophysical and bathymetric survey, consisting of the following activities:

1. Bathymetric mapping with multibeam echosounder for full seafloor cover within the survey area;
2. Side-scan sonar (SSS) mapping with full seafloor cover within the survey area, to detect man-made objects on the seabed as well as for seabed feature classification;
3. Magnetometer profiling with an 100m line distance to detect ferro-magnetic objects (≥ 5 nano Tesla (nT)). Note: this survey was not intended for the detection of UXOs;
4. Sub-bottom profiling with two systems: one high-resolution parametric echosounder to image the upper part of the seabed and a multi-channel sparker seismic system for deeper penetration into the seabed.

The surveys have provided:

1. Accurate bathymetric charts of the development areas;
2. Information on seabed features including:
   - natural objects such as boulders;
   - non-natural objects such as wrecks, debris or UXOs;
3. Isopach charts to show the thickness of the main geological formations including mobile sediments and other significant reflector levels which might impact engineering design;
4. Locations of structural complexities or geohazards within the shallow geological succession such as faulting, accumulations of shallow gas, buried channels;
5. Detailed geological interpretation to show facies variations and structural feature changes via appropriate maps and sections;
6. The position of existing cables and pipelines;
7. Input into the specification and scope for a geotechnical sampling and testing programme following the completion of the geophysical survey;
8. A comprehensive interpretative report on the survey results obtained to assist design of the offshore foundations/structures and cable burial.

Bathymetry and seabed classification

The bathymetric data shows water depth ranging between -17.8 and -39.7 m LAT (BWFS I) and -14.0 and -38.5 m LAT (BWFS II). Large sand dunes are present throughout both areas, as are smaller sand waves, creating a dynamic seabed.

The backscatter data derived from the multibeam echosounder (MBES) survey was used for seabed classification purposes, classifying the soil within six possible soil classes. The sediment classes found nearly all fall within the two neighbouring classes, 'sands' and 'muddy sands'. The finer sediments were found sheltered from the currents between the sand waves. Coarser sediments were found on the exposed tops of the sandbank. The classification shows that there is little large-scale sediment difference between the tops and bottoms of the large sand dunes. Patches of coarse sand or gravel are found sporadically.

Man-made objects and cables

The SSS survey provided full data coverage of both areas. The magnetometer survey was executed along survey lines with 100 m line spacing. Both surveys indicated the presence of several objects as shown in the contact chart (figure 16). It must be noted that the magnetometer survey results provide an indication of the presence of ferromagnetic objects. However, given the line spacing of the survey and the high mobility of the seabed within the BWFZ, these results are not suitable for an UXO analysis.

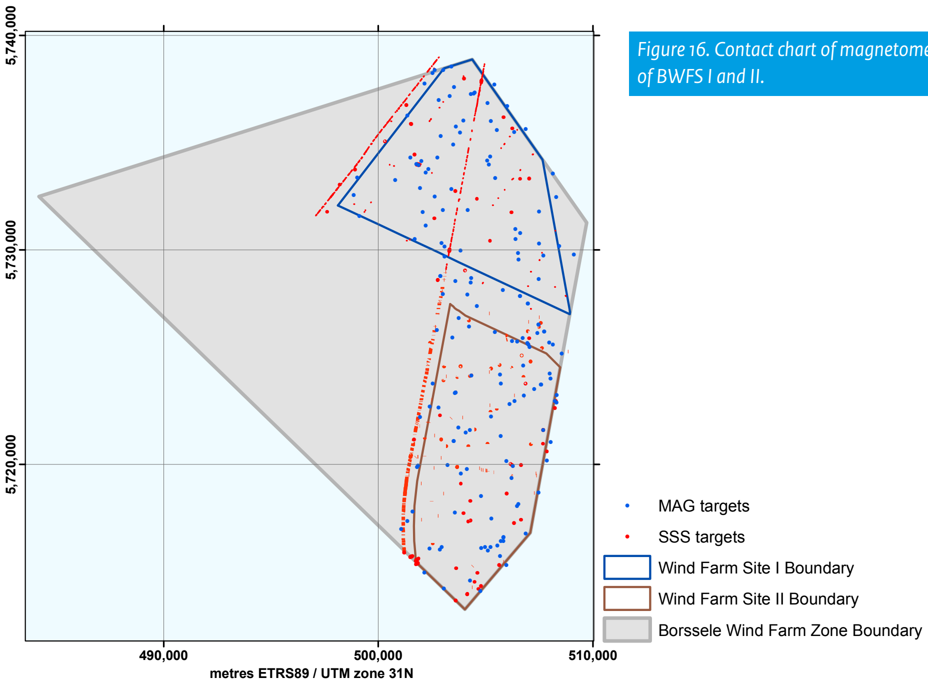


Figure 16. Contact chart of magnetometer and side-scan sonar survey of BWFS I and II.

A number of cables and pipelines have been discovered, some with an offset in relation to their theoretical charted position (Aldenburg-Domburg, Farland N, UK-NL3).
In addition, 111 (BWFS I) and 180 (BWFS II) seabed contacts not associated with pipelines, cables or wrecks have been detected. Two magnetic lineations, that might be related to unknown or uncharted cables, have been found in BWFS II. Both have an east-west orientation. Meantime, two known wrecks are present in the Wind Farm Zone. However, only one of each wrecks has been detected. No previously unknown wreck locations were identified from interpretation of the SSS and magnetometer data.

Sub-bottom profile
A high resolution sub-bottom profiler survey was executed with 100 m line spacing. The resulting dataset was used to create an isopach of the base of the mobile, subaqueous dunes on the seabed. The base of this layer has been found in the large majority of the sub-bottom profiler survey lines. The deep penetrating multi-channel sparker survey executed with a 400 m line spacing with some 200 m infill lines showed the presence of two major units within 100 m below seabed, horizontally stratified marine and coastal Tertiary deposits and shallow marine and fluvial Quaternary deposits within the Tertiary deposits. Five seismic units were identified based on their seismic facies and stratigraphical boundaries. The boundary between Tertiary and Quaternary deposits is of erosional behaviour. The Quaternary units are formed of river and shallow marine deposits. They consist of sand deposits with patches of gravel or clay present.

4.5.4 Conclusion
Based on the sub-bottom profiling datasets, Deep BV has developed a proposed borehole location plan. Netherlands Enterprise Agency (RVO.nl) has developed this plan into a more extensive Borehole and Seabed PCPT Plan, which has been applied to the geotechnical survey (See paragraph 4.6).

4.6 Geotechnical survey

4.6.1 Introduction
The objective of the geotechnical soil investigation is to improve the geological and geotechnical understanding of the wind farm sites and to obtain geotechnical information on these locations, which is suitable for progressing the design and installation requirements of offshore wind farms, including (but not limited to) foundations and cables.

The geotechnical survey uses intrusive techniques, such as boreholes and Piezo Cone Penetration Testing (PCPT), to gain an insight into the characteristics of the subsoil. The results of the geotechnical survey have been used to:
- Confirm the geological and geophysical model;
- Determine the vertical and lateral variation in seabed conditions;
- Provide the relevant geotechnical data for design of the wind farm, including foundations and cables;
- Update the geological desk study and provide a geological model.

4.6.2 Supplier
Fugro Engineers B.V., a member of the Fugro global group of companies and responsible offshore geotechnical surveys, performed the survey [9]. The Fugro group is a large offshore and nearshore geotechnical company and offers experience in geotechnical investigations. Fugro has previously performed investigations for many other offshore wind farm projects in The Netherlands, Belgium, UK, Denmark and Germany. Therefore, the company is familiar with the local conditions and technical requirements for geotechnical survey of the BWFZ.
The survey has been performed according to ISO 19901-8 (2014) Marine Soil Investigations, using the vessels MV Bucentaur and MV Fugro Commander from 10 April to 26 May 2015. DNV GL has provided a Statement of Compliance for the results of the study.

4.6.3 Results
Fugro performed a geotechnical survey, which consisted of borehole drilling, downhole sampling, downhole in situ testing and seafloor in situ testing. For BWFS I, Fugro executed six boreholes (with downhole sampling with alternating PCPT testing including a limited number of seismic PCPT tests), and 29 seafloor Seabed PCPT's (including a limited number of dissipation tests).
For BWFS II, Fugro performed eight boreholes and 27 Seabed PCPT's respectively. The results of the survey can be found in three reports for each site:

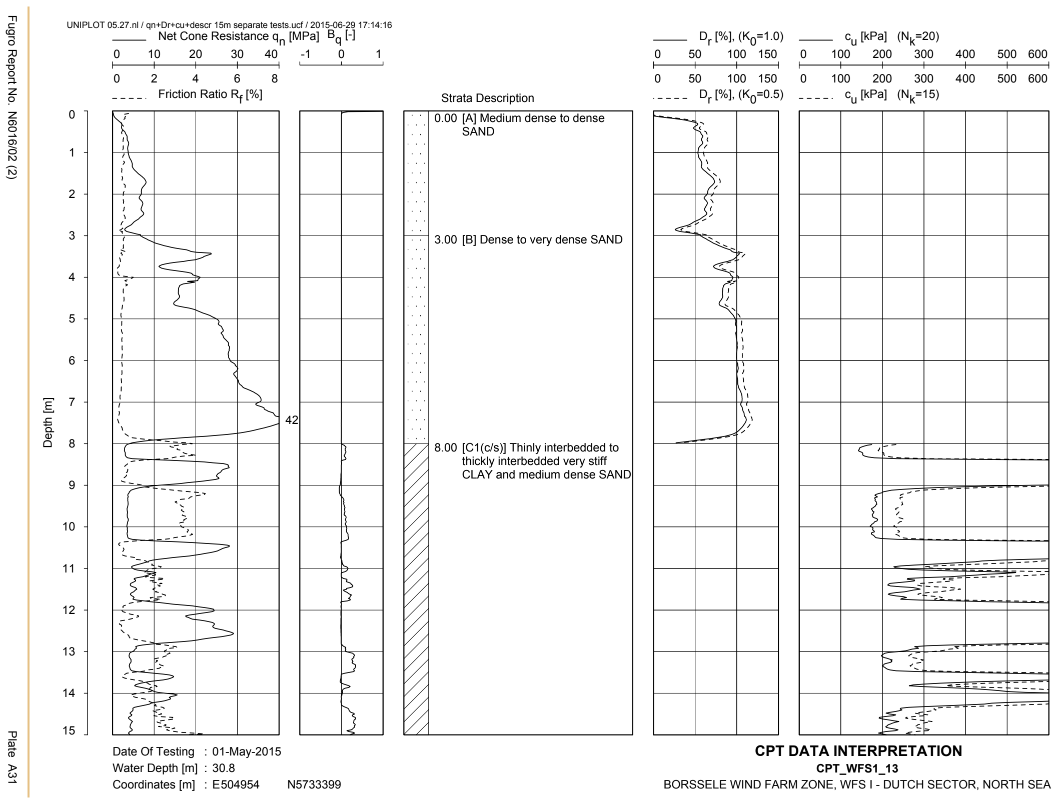
- Geotechnical Borehole Locations;
  Geotechnical data including geotechnical logs, results from downhole (seismic) cone penetration tests and results from geotechnical laboratory tests.
- Seafloor In Situ Test Locations;
  Geotechnical data including interpreted geotechnical logs and results from seafloor cone penetration tests.
- Geological Ground Model;
  Geological ground model including, stratigraphy, lateral soil variability, geohazards, basic geotechnical parameter values and assessment of geotechnical suitability of selected types of structures.

In a combined fourth report for BWFS I and II (Laboratory Test Data) the results of advanced static and cyclic laboratory tests are presented.

The reports include:
Geotechnical logs for borehole locations and seafloor PCPT locations:
- Interpretation of soil profile, strata description and PCPT-derived relative density and shear strength.
- Selected results of laboratory tests.
  Results of Piezo and Seismic CPT and Pore Pressure Dissipation tests:
- Cone resistance (net/total), sleeve friction, pore pressure, friction ratio and pore pressure ratio.
- Recorded shear waves (X and Y) and derived shear wave velocity.
- Dissipation Tests, i.e. cone resistance and pore pressure versus time.

An example of CPT data interpretation provided in the reports is shown in figure 17.

Figure 17. CPT data interpretation of testing point CPT_BWFS1_13.



Results of on-site and laboratory test programmes:

- Geotechnical Index Testing (sample description, water content, unit weight, particle size distribution, Atterberg limits, particle density, min/max index unit weight).
- Geochemical Index Testing (carbonate content and organic content).
- (Index) Strength Testing (pocket penetrometer, unconsolidated undrained (UU) triaxial compression, isotropically consolidated undrained (CIU) triaxial compression).
- Compressibility Testing (incremental loading and constant rate of strain oedometer tests).

Results of an advanced static and cyclic laboratory test programme

- Coarse-grained soils (CIU triaxial compression, selected tests with Bender Element (BE), Cyclic Undrained Triaxial (CTXL)).
- Fine-grained soils (Direct Simple Shear (DSS), Cyclic Simple Shear (CSS), CIU triaxial compression, selected tests with BE, CIU triaxial extension).

A geological ground model

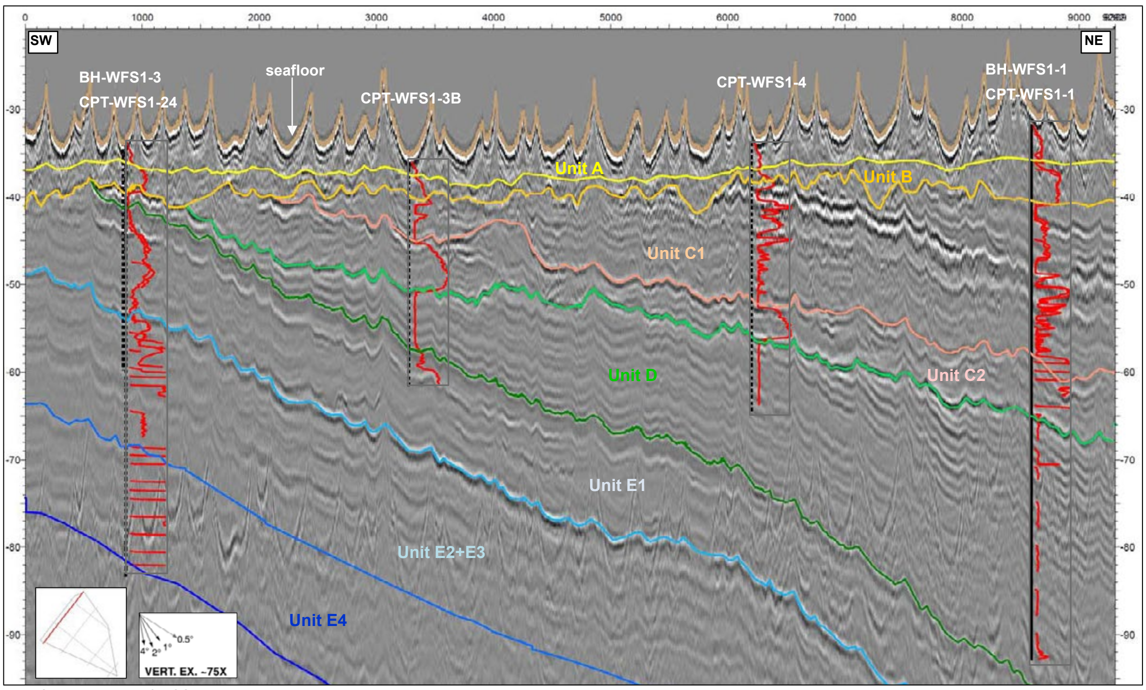
- Depth to top of unit maps and contours;
- Thickness of Unit maps and contours;
- Selection of Isopachs;
- Geotechnical Parameter per borehole location and per unit;
- Assessment of suitability of selected types of structures.

An example of a cross section of BWFS I is shown in figure 18.

The remaining samples will be stored and should be handed over to the winners of the tenders.

All data of the geotechnical survey is disclosed through offshorewind.rvo.nl. From March 2016, RVO.nl also disclosed the combined Kingdom Suite deliverables (BWFS I-V) on a HDD.

Figure 18: An example of MCS seismic line of BWFS I from southwest (left) to northeast (right) with four boreholes.



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NOTE: Example of MCS seismic line (vertical and horizontal scales are in metres).
CPT cone resistance data for the geotechnical locations are projected on the seismic profile (box marks maximum values of 50 MPa).
Location of the cross section is shown on Plate 3-6.

CROSS SECTION – SECTION LINE 12-1200
BORSSELE WIND FARM ZONE, WFS I – DUTCH SECTOR, NORTH SEA

Fugro Report No. N6016/05 (2) Plate 3-7

Figure 19 shows a bedform zonation classification of the site created using the geotechnical data.

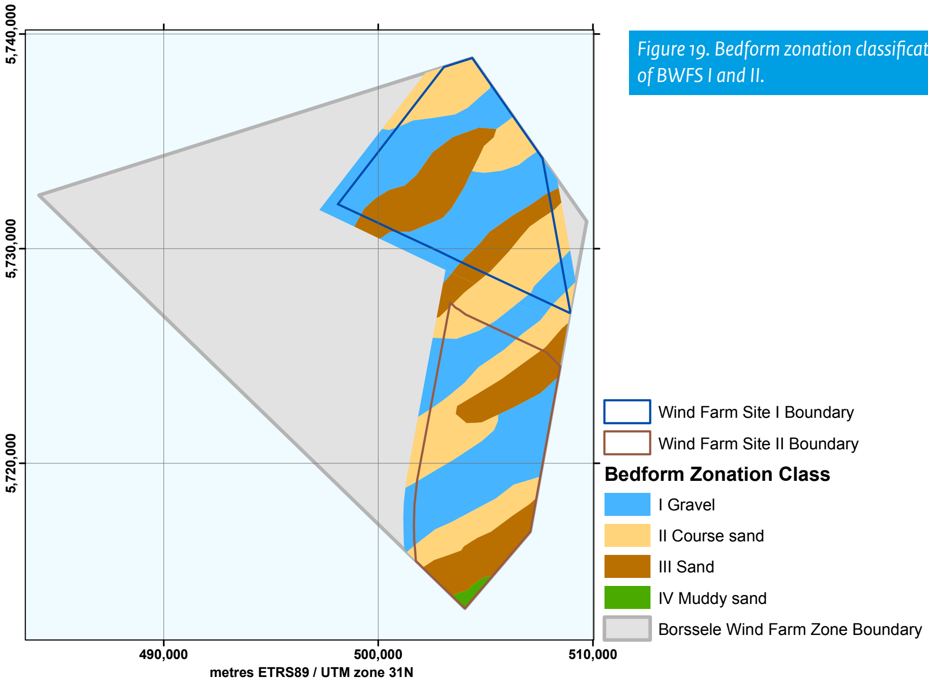

Figure 19. Bedform zonation classification using the geotechnical site data of BWFS I and II.

Figure 20 shows an example of a geologic chart created using the geotechnical data, in this case the depth of the Tongeren foundation below the seabed.

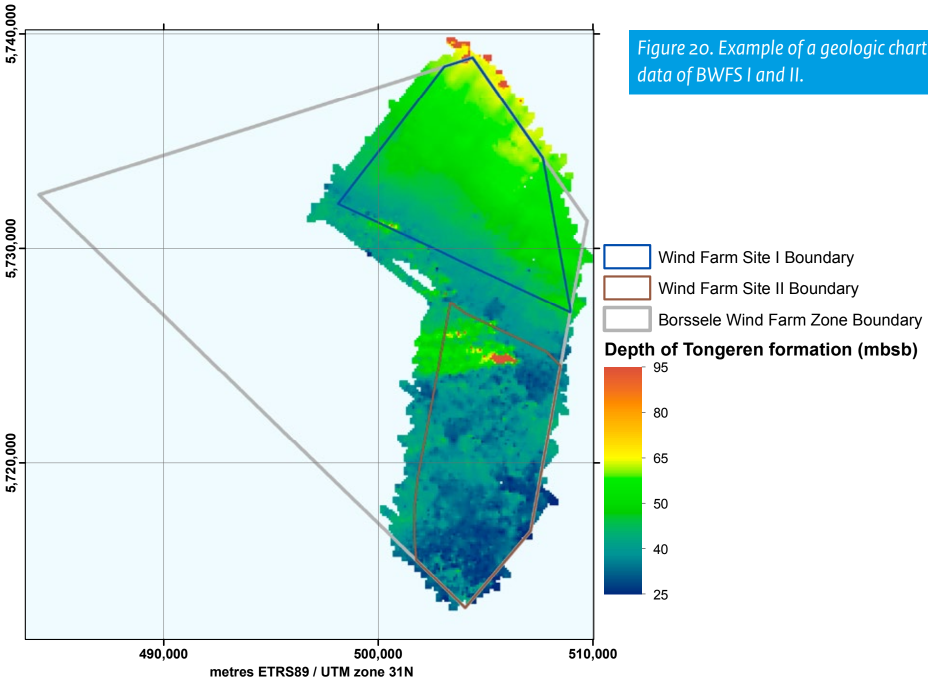

Figure 20. Example of a geologic chart created using the geotechnical site data of BWFS I and II.

4.6.4 Conclusion

All relevant geotechnical parameters for the zone have been measured and an overall geological model has been created using the data.

4.7 Meteorological and oceanographic (metocean) desk study

4.7.1 Introduction

The metocean desk study defines the relevant meteorological and oceanographic data used for design and installation calculations made by companies submitting bids to develop projects in the BWFZ. The study covers the following:

1. Identification of all meteorological and oceanographic parameters required to carry out design calculations for offshore wind farms in the BWFZ.
2. Wave and wind persistence tables relevant for operational assessments relating to wind farms and offshore high voltage station installations in the BWFZ.

4.7.2 Supplier

Deltares performed the metocean desk study [10].
The institute has an extensive track record in offshore wind, with studies related to topics such as scour prediction and protection, metocean conditions, wave loads, cable burial depth and morphodynamics. Deltares also has an extensive track record on offshore wind farms in the near vicinity of the BWFZ. DNV GL has certified the methodology and the results of the study, and provided a Statement of Compliance.

4.7.3 Results

The general objective of this study is to determine the metocean conditions (wind, wave, current and other meteorological parameters) present at the BWFZ.
A metocean report has been produced for each of the five BWFS within the zone. In each report, the data presented is related to a specific reference point selected as representative point for the overall site.

To determine local variations in the five BWFSs, dedicated numerical modelling was required for wave, water level and current related parameters. The local modelling simulations cover a relatively long period (20 years), sufficient for deriving the requested metocean parameters. Local variations in metocean parameters are mainly caused by variation in bathymetry, i.e. the presence of sand banks and sand waves. Therefore, the numerical modelling takes into account the bed level variation in detail. The wind conditions are based on the high resolution HARMONIE data from the Koninklijk Nederlands Meterologisch Instituut (KNMI). The project was conducted, partly in collaboration with KNMI. Information from KNMI was also used for the Wind Resource Assessment conducted by Ecofys [11], which conducted its study later than the Metocean desk study (See § 4.9 for more information).

The metocean conditions were assessed by means of detailed re-analysis of available model and measurement data. The data was statistically analysed for each selected output location. The analyses comprised normal conditions and extreme conditions, for several recurrence periods of 1, 2, 5, 10, 50 and 100 years, as per the requirements of the DNV GL standard. Wind, wave and current normal conditions were computed empirically and given in terms of frequencies of joint occurrences and the extreme climate in terms of return values obtained by means of extreme value analyses. The parameters specifically related to hub height were determined for heights of 70 m, 80 m, 90 m, 100 m and 150 m.

Figure 21 shows an example of dedicated numerical modelling results: the 50-year return value of the significant wave height. The effect of the presence of sandbanks and sand waves on the wave propagation can be observed.

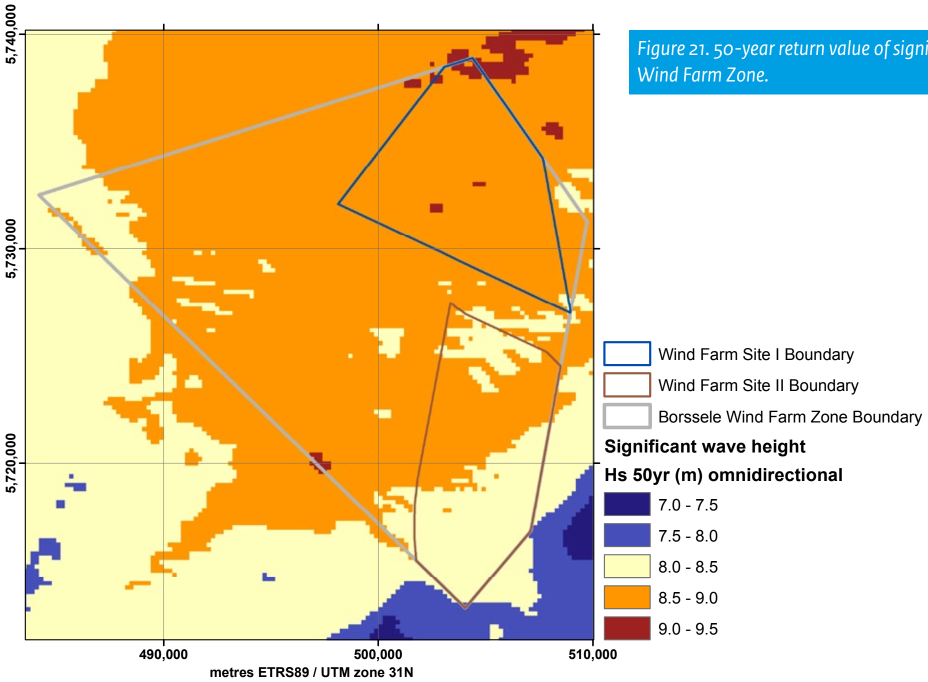

Figure 21. 50-year return value of significant wave height for the Borssele Wind Farm Zone.

4.8 Meteorological and oceanographic (metocean) measurement campaign

4.8.1 Introduction

More accurate metocean data would most likely lead to a lower risk surplus and therefore lower cost of capital (strengthening the business case) for an offshore wind farm. Therefore, DNV GL was asked to perform an assessment of the different options for a metocean measurement campaign [12]. The aim of the study was to investigate the possibility of improving wind resource data in the Dutch North Sea so it could be used in the project development and design studies of the five Wind Farm Zones under development.

Publicly available offshore meteorological mast data is available from the existing IJmuiden and OWEZ masts (~130-140 km from the BWFZ). Combined with publicly available data from Europlatform, Goeree LE and Vlakte van de Raan stations (~30-50 km from the BWFZ), this is expected to provide 'bankable' wind data for the BWFZ. Fixed LiDAR measurements at Lichteiland Goeree also started in October 2014 and this information will further increase the 'bankability' of wind data for the BWFZ.

The data collected since 2014 from Goeree LE plus the results of six months of floating LiDAR measurements provides the best possible dataset that can be used for production calculations for the first round of tenders in the BWFZ. Based on DNV GL's assessment, Netherlands Enterprise Agency (RVO.nl) has contracted Fugro OCEANOR to deploy an onsite floating LiDAR which can provide on-site metocean data for the BWFZ.
The improved data should allow developers to:

- Carry out more accurate calculations for annual energy production;
- Improve/validate metocean models used for wind farm design.

4.8.2 Supplier

The metocean measurement campaign is being conducted by Fugro OCEANOR, a limited company owned by the Dutch Company Fugro NV. Fugro OCEANOR specialises in the design, manufacture, installation and support of environmental monitoring, ocean observing and forecasting systems.

4.8.3 Results

Fugro OCEANOR has placed two metocean buoys in the BWFZ, which provide meteorological and oceanographic data.

The measurement campaign of the buoy positioned in the centre of the BWFZ started in June 2015. Monthly results are being made available on ***offshorewind.rvo.nl***.

In November 2015 the second buoy was installed close to the southern border of the BWFZ. This will help assess any wake effects from the neighbouring Belgian wind farms. Both buoys have experienced unplanned service needs on shore. The service needs are mainly the effect of unsatisfactory marinisation of the Lidar. In February 2016 both buoys are redeployed.

Available data is quality approved by ECN. See figure 22 as an example of available data.

Figure 22. Measured wind speeds in the centre of the BWFZ in July and August 2015.

4.9 Wind Resource Assessment

4.9.1 Introduction

The goal of this study was to provide a preliminary wind resource assessment for the BWFZ and its five sites. At the time of the assessment (May 2015), there were no specific on-site measurement records available.

Therefore, the results are based on mesoscale modelling, validated against nearby offshore wind measurements. Note: wind measurement data has become available from the metocean measurement campaign. This data may be used to perform further wind resource assessments. However, this task shall not be carried out by Netherlands Enterprise Agency (RVO.nl).

4.9.2 Supplier

Netherlands Enterprise Agency (RVO.nl) selected Ecofys to conduct the Wind Resource Assessment [11]. Ecofys has experience in offshore wind resource assessments, having prepared bankable reports on several large offshore wind farm, often at sites where wind measurements were not available. Moreover, the company is skilled in the validation and application of mesoscale model data, including detailed uncertainty assessment. The SoC has been issued by DNV GL.

4.9.3 Results

The report presents a wind climate assessment for the planned BWFZ. This assessment is based on the combined use of offshore wind measurement campaigns and mesoscale model data. No specific on-site measurement records were used for this study. The Meteomast IJmuiden offshore mast is the primary source of data for this assessment, based on the overall greater accuracy of the wind measurements the mast provides, including the horizontal extrapolation to the BWFZ. The extrapolation is based on the KNMI KNW mesoscale model, selected due to validation being based on the need for four offshore met mast datasets. KNMI provided six relevant grid points. Ecofys attributed one representative grid point with each of the four BWFS. These four grid points enable sufficient information to be attained to assess the variation in wind speeds across the zone.

The results indicate that the wind resource is reasonable for an offshore site in the Dutch North Sea and consistent across the modelled heights. Based on the assessment, the mean wind speed at a hub height of 100 m MSL at the BWFZ centre is calculated to be 9.6 ± 0.5 m/s.

The variation across the site is about 0.3 m/s, as seen in figure 23.
Note the wind speeds found in the Ecofys report differ from the wind speeds found by Deltares in the metocean study. These differences are related to the use of the Harmonie model by KNMI. The differences between the studies are within uncertainty tolerance range and can be explained. Therefore, the metocean report(s) already published will not be updated.

4.9.4 Conclusion

Based on previously available KNMI data, Ecofys has created a wind resource assessment. However, tender applicants are advised to create their own assessment. For example, new metocean data is available from the metocean measurement campaign.

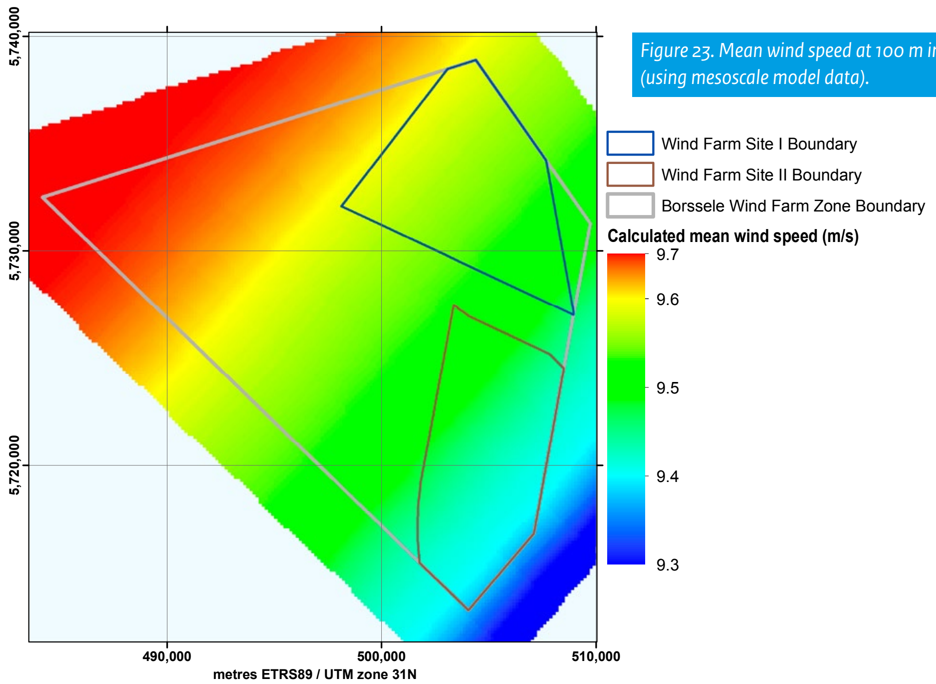

Figure 23. Mean wind speed at 100 m in Borssele Wind Farm Zone (using mesoscale model data).

4.10 Site investigation QA-QC procedures

Procedure

The Netherlands Enterprise Agency (RVO.nl) has sought guidance and information by consulting different sources. Energinet.DK , the organisation in Denmark responsible for organising the Danish offshore wind tenders, has shared lessons learned and shown Netherlands Enterprise Agency (RVO.nl) how these projects are managed in Denmark. Further, Netherlands Enterprise Agency (RVO.nl), the Ministry of Economic Affairs, Rijkswaterstaat (part of the Ministry of Infrastructure and the Environment) and TenneT organised a series of workshops on various subjects with market parties, invited via the Dutch Wind Energy Association (NWEA) and other communication channels.

Procurement

The procurement of the different studies was carried out in compliance with the applicable procurement procedures within Netherlands Enterprise Agency (RVO.nl). The desk studies have been procured through a limited tender where, for each study, at least two expert parties were invited to submit their proposal. The site investigations, which exceeded the expected maximum budget for a limited tender, were procured through a public European tender. All proposals have been selected on the basis of determining the most economic advantageous offer.

Quality assurance

Netherlands Enterprise Agency (RVO.nl) supported by BLIX maintained a quality assurance procedure to provide accurate and usable studies. BLIX is an offshore wind consultant, specialised in project management of large offshore wind energy projects. First, the scope of the different studies was determined using the following steps:

1. Netherlands Enterprise Agency (RVO.nl) determined the preliminary scope of the different studies.
2. Where applicable, input was provided on these scope descriptions by internal experts from other governmental departments, agencies or external experts.
3. At market consultation sessions, the scope descriptions were discussed with market parties with input on completeness provided by the attendees at these workshops.

In the case of studies where the results will become part of the design basis for the developer, the certifying authority DNV GL was contracted to confirm the completeness of the scope.

After the tender, during the execution of the work by the specific executor, quality assurance was performed as follows:

1. The project team and experts of other ministries reviewed several drafts of the report, provided feedback and assured the execution of the scope was in compliance with the scope description.
2. The draft report was reviewed by independent internal and external experts.
3. The certifying authority (DNV GL) reviewed the report and provided a statement of compliance to assure the results were acquired in compliance with the DNV-OSJ101 and other applicable industry standards. These statements of compliance are added to the report if applicable.

Internal experts that have provided input in the process include:

1. The Cultural Heritage Agency (Archaeological desk study).
2. The Ministry of Infrastructure and the Environment (Morphodynamical desk study).

External experts that have provided input into the process include:

1. Windsupport Ltd (Geotechnical site investigations).
2. Reynolds International Ltd (Geophysical site investigations).
3. RPS Energy Ltd (Geophysical and geotechnical investigations, metocean measurements).
4. ECN (Metocean measurements).
5. Carbon Trust (Metocean measurements).


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5. Legal Framework and specific requirements of the BWFS I and II SDE+ grant and permit tender

Introduction

A legal framework has been put into place to facilitate and manage the Dutch offshore wind programme rollout.

The system consists of several distinct aspects:

- The construction of wind farms is only allowed in Wind Farm Zones that have been designated in the National Water Plan [13]. Any project planned outside these zones will not be consented.
- The government allocated specific sites where wind farms can be built and operated within the Wind Farm Zones.
- In the Water Decree [16] general rules are prescribed for building and operating offshore wind farms.
- An Environmental Impact Assessment (EIA) is required for the government to prepare its Wind Farm Site Decisions. This means that no additional EIA will be required by companies bidding to develop projects.

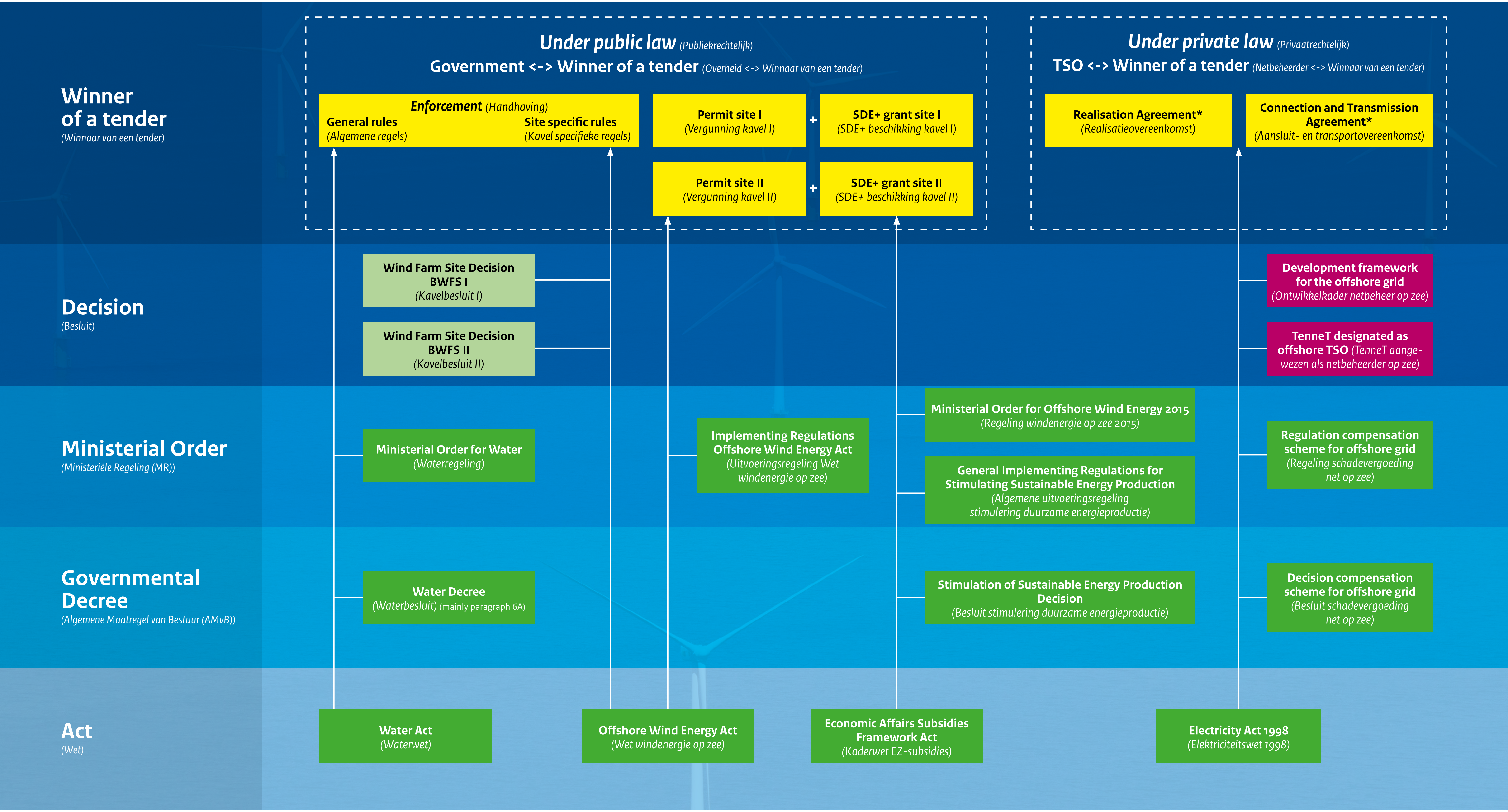
Regarding the Borssele WFS I and II;

- The Ministries of Economic Affairs and Infrastructure and the Environment have published the so-called Wind Farm Site Decisions (kavelbesluiten), which outline the specific rules for building and operating the Borssele Wind Farm Sites I and II.
- The Dutch transmission system operator TenneT develops and will operate the offshore grid connections.
- The government issues the call for tenders for BWFS I and II in April 2016.
- The winner of a tender is allowed to build a wind farm on the specific site and therefore receives:
    - A SDE+ grant;
    - A permit, based on the Offshore Wind Energy Act, allowing it to build, operate and decommission a wind farm.
- The winner and TenneT agree upon (respectively) a Realisation Agreement and a Connection and Transmission Agreement, required prior to realisation and operation of the connection.

The legal framework can be found in figure 24. An informal translation of the relevant law in English can be found in Appendix A.

Figure 23. Legal framework

For the winner of a tender (Winnaar van een tender)
Bill or Draft (Concept wet- of regelgeving)
Final, not yet irrevocable (Finaal, niet onherroepelijk)
Final, into force (Finaal)



* TenneT has offshore model agreements available online.

5.1 SDE+ grant and permit tendering

Grants and permits for BWFS I and II will be awarded through dedicated calls for tender by the Netherlands Enterprise Agency (RVO.nl) under the Stimulation of Sustainable Energy Production (SDE+, Stimulering Duurzame Energieproductie) [14]. The company that tenders the lowest bid for a project will receive both the grant and the permit to build, operate and decommision a wind farm.

5.1.1 SDE+

The SDE+ (Stimulering Duurzame Energie Productie/ Stimulation of Sustainable Energy Production) is an operating grant. Producers receive financial compensation for the renewable energy they generate. Compensation will be available for a period of 15 years. The price for the production of renewable energy is capped (base sum). For BWFS I and II in the BWFZ the base sum is set at € 124/MWh. The yield of fossil energy is established in the correction sum. The SDE+ contribution = base – correction sum. This makes the level of the SDE contribution dependant on energy-price developments.
The application form for BWFS I has been translated for your convenience and can be found in Appendix A.
All information to apply can be found ***online***. April 2016 the Policy Rule concerning a change to power generation facilities for offshore is published. A translation is available in Appendix A: Applicable Law.

5.1.2 Permit

A tender winner also receives a permit which is valid for a 30-year period. The wind farm must be operational within five years, and can operate till year 29. Decommissioning can start latest end of year 25 and should be completed within two years at the latest after the power generation operations have stopped, but at the latest in year 30.

5.2 Enforcement

Rijkswaterstaat (Ministry of Infrastructure and the Environment) is expected to be appointed as the overseeing authority charged with enforcing the general rules that stem from the Water Act (mainly § 6A of the Water Decree) and specific rules that stem from the Wind Farm Site Decisions.

5.2.1 General Rules for offshore activities and offshore wind farms (Water Decree)

The Water Act [15] is applicable for all locations within the Dutch part of the North Sea, including sites with a Wind Farm Site Decision. Paragraph 6A of the Water Decree [16] provides general requirements for the construction of offshore wind farms. These requirements are listed in chapter 6.2.

5.2.2 Site specific rules and requirements

The Offshore Wind Energy Act (Wet windenergie op zee) [17] introduces so called Wind Farm Site Decisions (kavelbesluiten). A Wind Farm Site Decision specifies the location for a wind farm and the conditions under which it may be constructed and operated. These conditions give developers flexibility regarding the design and operational aspects of the wind farm. This should give commercial parties opportunities for choosing the best technical options within the design parameters and realise a project at the lowest possible costs.

Wind Farm Site Decisions are subject to an environmental impact assessment (EIA), which is commissioned by the Ministries of Economic Affairs and of Infrastructure and the Environment.

The EIAs for BWFS I and II are completed [18] - a summary can be found in Appendix B. The results of the EIAs have been taken into account in the Wind Farm Site Decisions. Moreover, the Wind Farm Site Decisions include all considerations and prescriptions based on the Flora and Fauna Act and the Nature Conservation Act. As of April 2016, final decisions for BWFS I and II of the BWFZ are available [19].

Apart from the permit granting consent to build and operate (see 5.1.2) no further consents are required. Proposals submitted in response to request for tenders to build projects will be assessed to ensure they can comply with the general and site specific rules and requirements. The vast majority of the rules and requirements will be subject to enforcement, starting with the obligatory execution plan that has to be submitted to the authorities at least eight weeks prior to the start of the construction. Companies are advised to submit a draft execution plan for verification at a much earlier stage however.

5.3 Connection to the TenneT offshore substation

The Dutch Government will designate TenneT as offshore transmission system operator in the Netherlands [20].

The new amendment to the Electricity Act [21] 1998 introduces a ''Development framework for the offshore grid'' which gives a technical framework and outlines the future development of offshore wind energy in the Netherlands. The content of this development framework is comparable to the draft Scenario that was published 16 December 2015. The Development framework for the offshore grid will be formally published by the Ministry of Economic Affairs.

As prescribed in the development framework, TenneT will build grid connections for the planned 3,500 MW new offshore wind capacity. To create economies of scale, TenneT will construct five standardised offshore substations, each with a capacity of 700 MW. The substations will be connected to the national Extra High Voltage grid with two 220 kV export cables per substation. The two platforms Borssele Alpha and Borssele Beta will be connected via a 66 kV link. Output from BWFS I and II will be connected to a single platform (Borssele Alpha).

In close consultation with the offshore wind industry, the Ministry, the regulator ACM, and representatives of the Dutch energy market, TenneT has developed an offshore legal framework consisting of so-called model agreements. Consultation sessions of these model agreements were open to all stakeholders of the offshore transmission system and this consultation was finalised ahead of the subsidy tender process. The ***model agreements*** consist of a Realisation Agreement and a Connection and Transmission Agreement supported by Offshore General Terms and Conditions, in line with onshore practice. Model agreements are available for parties to be connected to the Borssele Alpha Platform.

The model for these agreements will be the same for all winners of the tenders mentioned above (and for any other future tenders). All agreements will be entered into force according to the model agreements published by TenneT.

The agreements will be concluded on an equal basis with the parties concerned in accordance with the model which has been consulted. For the sake of completeness: the content of these agreements is non-negotiable. The missing data in these agreements will be completed in close consultation with the parties with whom TenneT enters into agreements.

The generic technical requirements for offshore wind farm connections will be established as technical code requirements, and as such be based on public law. The formal process to introduce this 'offshore code' can only start after the Electricity Act 1998 has entered into force. For now, TenneT is providing the proposed generic and uniform technical requirements as annexes to the model agreements. These annexes are expected to be overruled and become dispensable once the offshore code is concluded by the regulator.

By entering into the agreements, the connection process starts with the necessary steps for connecting a wind farm to the offshore transmission system:

- TenneT will (as soon as possible after the award of the grant is announced), contact the winner(s) of the tender, being the entity to whom the SDE + subsidy is granted.
- Within four weeks after being invited by TenneT, the winner of the tender will provide TenneT with the missing data as indicated by TenneT in the Realisation Agreement and the Connection and Transmission Agreement.
- TenneT will process the data received in the agreements and provide fully completed agreements to the winner.
- Signing of both agreements by both the winner and TenneT will take place within two months after TenneT has invited the winner to supply the missing data.
- After both agreements have been signed by both parties, the parties will consult on the joint planning, and further information exchange and coordination will take place in the project working group (as referred to in Article 6 of the Realisation Agreement).
- Timely conclusion of the agreements is vital to effecting the connection to the offshore transmission system according to the planning.

6. *Specific requirements and relevant information from the legal framework*

This chapter outlines the specific information that is relevant or needs to be adhered to when competing in the tender to design and build a wind farm in BWFS I and /or II. These requirements originate from the legal framework (an informal English translation of the legal framework can be found in Appendix A).

6.1 Coordinates and exclusion zones

BWFS I is divided into four parcels (to accommodate the maintenance zones of the Zeepipe pipeline and SeaMeWe cable that cross the area), while BWFS II is a single undivided site. The rotor blades of installed wind turbines are only allowed within the border coordinates of the specific zone. No turbines or overhanging rotor blades are allowed within the maintenance zones.

Subsea infield cables are allowed in the maintenance zones and a specified corridor toward the TenneT Offshore Substations Alpha. However, crossing and proximity agreements with the cable or pipeline owner need to be agreed. Both sites and their maintenance zones are shown in figure 25.

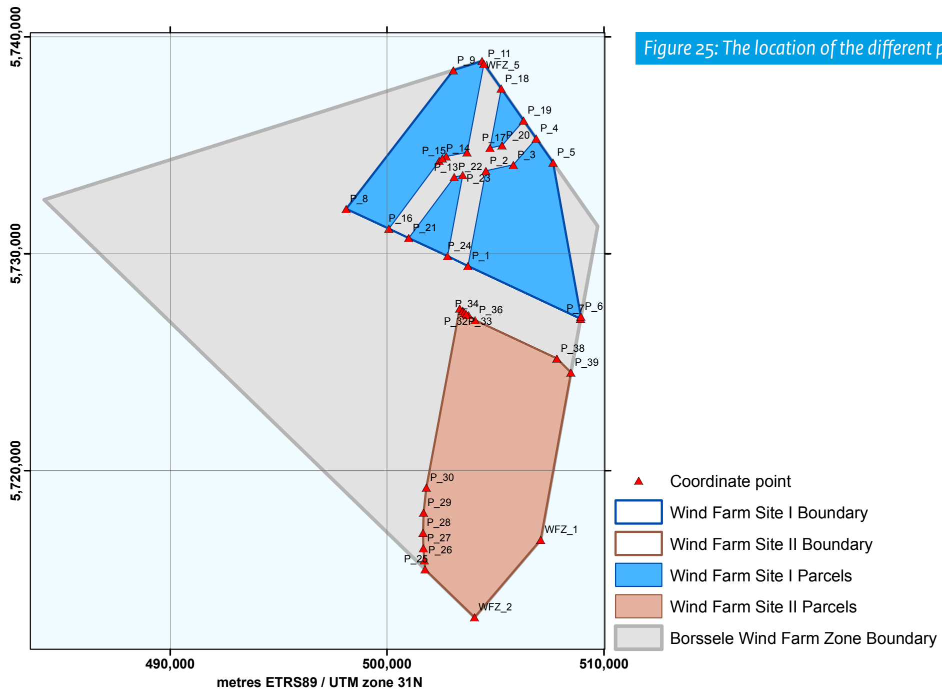


Figure 25: The location of the different parcels of BWFS I and II.

BWFS I and II are bordered by the coordinates provided in table 5.

Table 5. Border coordinates of Borssele Wind Farm Site I and II. Rotor blades of all turbines are not allowed outside these coordinates.

		Geographic coordinates (ETRS89)		UTM (ETRS89, zone 31)	
Location	Point	Degrees N	Degrees E	Easterly	Northerly
BWFS I	P_5	51.758650	3.110880	507652.8	5734201.1
BWFS I	P_6	51.694840	3.129388	508942.8	5727106.6
BWFS I	P_7	51.693920	3.129118	508924.4	5727004.4
BWFS I	P_8	51.739550	2.972631	498110.2	5732071.4
BWFS I	P_9	51.796990	3.044267	503052.7	5738460.0
BWFS I	P_10	51.800740	3.063428	504373.7	5738878.4

		Geographic coordinates (ETRS89)		UTM (ETRS89, zone 31)	
Location	Point	Degrees N	Degrees E	Easterly	Northerly
BWFS II	P_25	51.590190	3.025309	501753.3	5715460.5
BWFS II	P_26	51.593780	3.024831	501720.0	5715858.6
BWFS II	P_27	51.598990	3.024168	501673.9	5716438.6
BWFS II	P_28	51.605230	3.023953	501658.8	5717132.6
BWFS II	P_29	51.613690	3.024337	501685.1	5718073.0
BWFS II	P_30	51.624080	3.026175	501812.0	5719229.4
BWFS II	P_31	51.698160	3.048502	503352.1	5727468.4
BWFS II	P_32	51.697260	3.050440	503486.1	5727368.4
BWFS II	P_33	51.696480	3.051523	503561.0	5727281.4
BWFS II	P_34	51.695860	3.052854	503653.0	5727212.7
BWFS II	P_35	51.695430	3.054370	503757.8	5727165.7
BWFS II	P_36	51.693380	3.058786	504063.2	5726937.9
BWFS II	P_38	51.677400	3.113293	507833.4	5725165.1
BWFS II	P_39	51.671600	3.122580	508476.6	5724520.4
BWFS II	WFZ_1	51.602300	3.102329	507087.1	5716811.7
BWFS II	WFZ_2	51.570270	3.058286	504039.6	5713246.1

The maintenance zones (only in BWFS I) are bordered by the coordinates provided in table 6.

Table 6. Border coordinates of the maintenance zones of the SeaMeWe cable and Zeepipe. Rotor blades are not allowed inside these zones.

		Geographic coordinates (ETRS89)		UTM (ETRS89, zone 31)	
Location	Point	Degrees N	Degrees E	Easterly	Northerly
BWFS I	P_1	51.715850	3.053939	503726.3	5729436.4
BWFS I	P_2	51.755290	3.065988	504554.7	5733823.5
BWFS I	P_3	51.757750	3.084365	505822.9	5734098.7
BWFS I	P_4	51.768550	3.099732	506881.9	5735300.8
BWFS I	P_11	51.799590	3.064726	504463.3	5738750.6
BWFS I	P_12	51.762930	3.053490	503691.5	5734672.8
BWFS I	P_13	51.761170	3.039591	502732.4	5734476.1
BWFS I	P_14	51.760410	3.036854	502543.5	5734391.2
BWFS I	P_15	51.759380	3.034976	502414.0	5734276.6
BWFS I	P_16	51.731280	3.001223	500084.5	5731151.3
BWFS I	P_17	51.764760	3.068779	504746.4	5734877.4
BWFS I	P_18	51.789330	3.076306	505263.0	5737609.9
BWFS I	P_19	51.775990	3.091341	506301.9	5736128.1
BWFS I	P_20	51.765820	3.076865	505304.3	5734995.0
BWFS I	P_21	51.727360	3.014521	501002.9	5730715.5
BWFS I	P_22	51.752700	3.044923	503101.0	5733534.1
BWFS I	P_23	51.753460	3.050585	503491.7	5733618.6
BWFS I	P_24	51.719910	3.040394	502790.4	5729887.6

The cable entry zone coordinates from BWFS I and BWFS II to Substation Alpha (TenneT) are given in table 7.

Table 7. Cable entry zone BWFS I to substation Alpha Borssele (TenneT).

		Geographic coordinates (ETRS89)		UTM (ETRS89, zone 31)	
Location	Point	Degrees N	Degrees E	Easterly	Northerly
BWFS I	P_1	51.715850	3.053939	503726.3	5729436.4
BWFS I	T_1	51.699920	3.056708	503919.0	5727665.3
BWFS I	T_10	51.700680	3.057555	503977.5	5727748.8
BWFS I	T_18	51.701960	3.049751	503438.1	5727891.2
BWFS I	T_9	51.707660	3.082046	505669.1	5728527.4

Cable entry zone BWFS II to substation Alpha Borssele (TenneT).

		Geographic coordinates (ETRS89)		UTM (ETRS89, zone 31)	
Location	Point	Degrees N	Degrees E	Easterly	Northerly
BWFS II	P_31	51.698160	3.048502	503352.1	5727468.4
BWFS II	P_32	51.697260	3.050440	503486.1	5727368.4
BWFS II	P_33	51.696480	3.051523	503561.0	5727281.4
BWFS II	P_34	51.695860	3.052854	503653.0	5727212.7
BWFS II	P_35	51.695430	3.054370	503757.8	5727165.7
BWFS II	P_36	51.693380	3.058786	504063.2	5726937.9
BWFS II	P_37	51.690450	3.068801	504755.8	5726612.2
BWFS II	T_1	51.699920	3.056708	503919.0	5727665.3
BWFS II	T_11	51.699450	3.056641	503914.4	5727612.4
BWFS II	T_18	51.701960	3.049751	503438.1	5727891.2

The safety zone coordinates from BWFS I and BWFS II are given in table 8.

Table 8. Borssele Wind Farm Site I safety zone

		Geographic coordinates (ETRS89)		UTM (ETRS89, zone 31)	
Location	**Point**	**Degrees N**	**Degrees E**	**Easterly**	**Northerly**
BWFS I	SZ_01	51.805030	3.061245	504222.7	5739355.0
BWFS I	SZ_02	51.805210	3.064269	504431.2	5739375.1
BWFS I	SZ_03	51.804600	3.067146	504629.6	5739307.9
BWFS I	SZ_04	51.803320	3.069370	504783.1	5739165.4
BWFS I	SZ_05	51.761230	3.116818	508062.2	5734488.1
BWFS I	SZ_06	51.759450	3.118010	508144.8	5734290.6
BWFS I	SZ_07	51.695640	3.136508	509434.7	5727196.1
BWFS I	SZ_08	51.694040	3.136505	509434.9	5727017.9
BWFS I	SZ_09	51.693120	3.136235	509416.4	5726915.7
BWFS I	SZ_10	51.691250	3.134931	509326.7	5726707.5
BWFS I	SZ_11	51.689930	3.132431	509154.1	5726560.3
BWFS I	SZ_12	51.689430	3.129250	508934.3	5726504.5
BWFS I	SZ_13	51.689860	3.126041	508712.5	5726551.5
BWFS I	SZ_14	51.735480	2.969575	497899.0	5731618.2
BWFS I	SZ_15	51.736400	2.967464	497753.3	5731721.3
BWFS I	SZ_16	51.737730	2.966011	497653.0	5731869.0
BWFS I	SZ_17	51.739290	2.965402	497611.1	5732042.6
BWFS I	SZ_18	51.740880	2.965715	497632.8	5732219.8
BWFS I	SZ_19	51.742310	2.966910	497715.4	5732378.1
BWFS I	SZ_20	51.799740	3.038535	502657.2	5738766.0
BWFS I	SZ_21	51.801280	3.042082	502901.7	5738936.7

Borssele Wind Farm Site II safety zone

		Geographic coordinates (ETRS89)		UTM (ETRS89, zone 31)	
Location	Point	Degrees N	Degrees E	Easterly	Northerly
BWFS II	CP_21	51.594960	3.017412	501206.1	5715990.5
BWFS II	CP_22	51.597810	3.017051	501181.0	5716307.4
BWFS II	SL_23	51.697160	3.062864	504344.7	5727358.0
BWFS II	SZ_22	51.681130	3.117527	508125.5	5725580.2
BWFS II	SZ_23	51.674770	3.127707	508830.6	5724873.6
BWFS II	SZ_24	51.673600	3.129054	508923.9	5724743.9
BWFS II	SZ_25	51.672230	3.129739	508971.5	5724591.5
BWFS II	SZ_26	51.670790	3.129694	508968.7	5724431.7
BWFS II	SZ_27	51.601500	3.109432	507579.1	5716723.0
BWFS II	SZ_28	51.599380	3.107810	507467.1	5716486.8
BWFS II	SZ_29	51.567350	3.063766	504419.6	5712921.2
BWFS II	SZ_30	51.566230	3.061453	504259.4	5712797.0
BWFS II	SZ_31	51.565780	3.058620	504063.1	5712746.6
BWFS II	SZ_32	51.566070	3.055731	503862.9	5712778.4
BWFS II	SZ_33	51.567050	3.053263	503691.7	5712886.9
BWFS II	SZ_34	51.586970	3.020286	501405.4	5715101.4
BWFS II	SZ_35	51.589820	3.018116	501255.0	5715418.9
BWFS II	SZ_37	51.700660	3.042496	502936.8	5727746.8
BWFS II	SZ_38	51.701930	3.044572	503080.2	5727888.0
BWFS II	SZ_39	51.702590	3.047286	503267.7	5727961.2
BWFS II	SZ_40	51.702530	3.050196	503468.8	5727954.5
BWFS II	SZ_41	51.701760	3.052832	503651.0	5727869.1
BWFS II	CP_23	51.602150	3.016749	501160.0	5716790.0
BWFS II	CP_24	51.608140	3.016862	501167.6	5717455.3
BWFS II	CP_25	51.614070	3.017142	501186.9	5718115.4
BWFS II	CP_26	51.624540	3.018989	501314.5	5719280.2
BWFS II	SZ_36	51.698990	3.041392	502860.6	5727560.3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6.2 Design and operation requirements

This paragraph contains tables summarising specific requirements that need to be adhered to when competing in call for tenders relating to the design and build of a wind farm in BWFS I or II. The requirements are grouped in line with the five different wind farm development stages (design, finance, build, operate, and decommissioning).

While Netherlands Enterprise Agency (RVO.nl) has tried its best to provide a complete overview of all relevant requirements, this list may still be incomplete or may be superceded. In any case, the applicable law is leading.

6.2.1 Design other

In order to be compliant with the permit, the design of a wind farm built in the BWFZ shall be compliant with the requirements listed in table 9, which are an abstract of the applicable law (Appendix A).

Table 9. Bandwidth of design characteristics for BWFS I and II

Requirement	Applicable Law
BWFS I and II are appointed as locations for wind farms with a total capacity of 350 MW with a minimum of 342 MW and a maximum of 380 MW.	WFSD I and II, I
The wind farm will be situated within the contours of the coordinates listed in table 5 of this PSD.	WFSD[3] I and II, III 2.1
The route of the grid connection to the Offshore Substation Borssele Alpha is within the coordinates shown in table 7 of this PSD.	WFSD I and II, III 2.2
No wind turbines will be installed in the maintenance zones of the pipe 'Zeepipe' and the cable 'SeaMeWe'. These zones are within the coordinates shown in table 6 of this PSD.	WFSD I, III 2.3
The rotor blades of the wind turbines must remain completely within the contours cited in table 5 of this PSD and completely outside of the maintenance zones cited in table 6 of this PSD. (Contours of maintenance zones only applicable for BWFS I)	WFSD I and II,III 2.4
The maximum number of wind turbines to be installed: 95	WFSD I and II,III 2.5
The maximum total swept area permitted: 1.461.542 m^2	WFSD I and II,III 2.6
Only wind turbines of 4 to 10 MW per wind turbine are to be installed in the wind farm.	WFSD I and II,III 2.7
The minimum distance between wind turbines must be 4 times the rotor diameter expressed in metres.	WFSD I and II,III 2.8
The minimum tip lowest level is 25 m above sea level (MSL).	WFSD I and II,III 2.9
The maximum tip highest level is 250 m above sea level (MSL).	WFSD I and II,III 2.10
The cables from the wind turbines must be connected to the Borssele Alpha Offshore Substation.	WFSD I and II,III 2.11
The permitted foundations for the wind turbines are: monopile, tripod, jacket, gravity based and suction bucket. If the permit holder wishes to deploy a type of foundation that is not cited in this paragraph, then the environmental impact of that must be determined and submitted to the Minister of Economic Affairs. The environmental impact must not exceed the limits set out in this Decision.	WFSD I and II,III 2.12
The permit holder must make demonstrable efforts to design and build the wind farm in such a way that it actively enhances the sea's ecosystem, helping to foster conservation efforts and goals relating to sustainable use of species and habitats that occur naturally in the Netherlands. Extra installations are not allowed if they do not directly related to the wind turbines to be constructed. In this respect the company is required to create an action plan, to be delivered to the Ministry of Economic Affairs no later than 8 weeks before the planned start of construction. Construction work must adhere to this plan.	WFSD I and II,III 2.15
The permit holder must make a demonstrable effort to design, build, and operate the wind farm, while taking into account the prevailing laws, in such a manner that the wind farm actively contributes to strengthening the local and regional economy. For that purpose, the permit holder prepares an action plan and submits it to the Minister of Economic Affairs at least 8 weeks before the commencement of the construction. The work will be performed in accordance with this action plan.	WFSD I and II, III 2.16
The permit as referred to in Section 12 of the Offshore Wind Energy Act will be issued for a period of 30 years.	WFSD I and II, III 3
If it is determined by the Water Decree that a measure must be taken for the protection of the North Sea, then another measure can be taken if Our Minister has decided that at least an equal level of protection of the North Sea will be achieved by means of that measure. The person or entity who intends to take another measure should submit an application to Our Minister for that purpose, containing details from which it can be demonstrated that at least an equal level of protection of the North Sea will be achieved by means of that other measure. Our Minister will make a decision within eight weeks regarding an application to take another measure (to protect the North Sea), determining whether or not it will ensure an equal or improved level of protection. Our Minister may extend this period once by six weeks at most.	Water Decree[4] / Article 6.16b
The operator will report its intention to install and/or change a wind farm to Our Minister at least eight weeks before the start of the construction period and will provide the following data thereby: its location, the type of turbines, cabling, expert assessment on quality and security provisions. Within three months after installation an operator will provide Our Minister the position of foundations and export cables and related works.	Water Decree / Article 6.16d

3) WFSD: Wind Farm Site Decision BWFS I and II [19].

4) Please note: The requirements of the Water Decree mentioned are a selection of importance for the design phase.

6.2.2 Financial and legal requirements

Table 10. Financial and legal requirements BWFS I and II

Requirement	Applicable Law
The nominal capacity of the offshore wind farm, amounts to: a) at least 351 MW per wind farm site minus the number of MW of the wind turbine with the least capacity, and b) at most 380 MW per wind farm site.	MOOWE 2015[5], §2.3
The deadline for tender submissions is 12 May at 17.00 Dutch time. Companies can submit a single application covering both sites and one separate application for each individual site (allowing three applications in total).	MOOWE 2015, §2.4
The Minister will reject an application if the total equity of the lead party requesting the SDE+ subsidy and permit is less than 10% of the total investment cost of the requested site.	MOOWE 2015, §2.5
The insight into equity will be offered by the provision of the most recent annual accounts of the applicant, its parent company and/or the participants in the collaborative venture.	GIR SDE+[6] Art. 2 §7
If an applicant will invest less than 20% equity in the project itself a letter of intent from a financier for the financing of the remaining part of the 20% is included.	GIR SDE+ Art. 2 §3c
The grant available is capped at € 2,500,000,000 per wind farm site.	MOOWE 2015, §2.6.1
A combined application will only be entitled to a grant if the application is ranked at least equally high in the ranking for both wind farm sites as the highest ranked individual application for each site.	MOOWE 2015, §2.6.6
If individual applications from the same applicant are ranked the highest for both wind farm sites but the level of own assets held by that applicant is lower than 10% of the combined total investment costs for the two projects, then only the application featuring the lowest bid price per kWh will be entitled to a grant. If the amount bid for each project is equal, then the Minister will determine by means of a lottery which application will be entitled to a grant.	MOOWE 2015, §2.6.8
A price cap of € 0.124/kWh applies.	MOOWE 2015, §2.6.7
Tender winners will be granted the SDE+ subsidy under the following conditions: a. The tender winner shall enter into an execution agreement with the Ministry within two weeks from award of the contract to build and operate the respective wind farm. b. The tender winner shall provide a bank guarantee of € 10,000,000 within four weeks from Award.	MOOWE 2015, §2.8 MOOWE 2015, appendix to §2.8 MOOWE 2015, §2.9 and §2.10
The tender winner shall provide a second bank guarantee of € 35,000,000 within twelve months from award of contract, unless the Dutch State withdraws, on request of the tender winner, the Award within that period.	GIR SDE+, MOOWE art. 8 (appendix)
The grant will be provided for a period of 15 years. The wind farm should be commissioned within 5 years after the date of the Decision to award the grant or 5 years after the Wind Farm Site Decision is irrevocable.	MOOWE 2015, §2.9.1 MOOWE 2015, §2.10
The SDE+ subsidy programme subsidises the difference between the market price of electricity and the tender price offered by the lowest bidder. If the market price falls, the subsidy amount rises, so the overall income of an operator remains the same. However, if the market price falls below the base electricity price (floor price), the subsidy will not increase any further, so the overall income of an operator will be lower.	Stimulation of Sustainable Energy Production decision.
The base electricity price (floor price) for the BWFS I and II tender will be € 0.029/kWh.	MOOWE 2015, §2.11.1
The maximum number of full load hours [eligible for subsidy] is equal to the net P50-value full load hours that is included in the application.	MOOWE 2015, §2.11.2
When calculating the P50 value, only Belgian wind farms that are operational as of July 1st 2015, should be taken into account.	MOOWE 2015 §3.13.A.6

5) MOOWE = Ministerial Order for Offshore Wind Energy 2015 [24]

6) GIR SDE+ = General Implementing Regulations for Stimulating Sustainable Energy Production [25]

6.2.3 Construction

Table 11. Construction requirement parameters for BWFS I and II

Requirement	Applicable Law
The operator will report its intention to install and/or change a wind farm to Our Minister at least eight weeks before the start of the construction period and will provide all relevant issues related to safety and environment during the construction and operational phase.	Water Decree/§ 6.16d1
Prevention of permanent physical harm and/or effects on porpoises, seals and fish: a. Companies must use an acoustic deterrent device during piling and half an hour before piling work starts. b. Piling work should adopt a soft start, to enable porpoises to swim to a safe location.	WFSD I and II, III 4.1
Measures to limit and prevent disturbance to porpoises, seals and fish (sound level): during the construction of the wind farm, the sound level under water at any given time during piling work may not exceed the sound levels cited. From Jan-May the maximum piling sound level is lowest. The permit holder prepares a piling plan and submits this to the Minister of Economic Affairs at least 8 weeks before the commencement of the construction. The work must be performed in accordance with the piling plan. The permit holder will make every effort to generate as little subsea sound as possible and as short a continuous period of time as possible. (summary)	WFSD I and II,III 4.2
If sacrificial anodes are used as cathodic protection for steel structures, than these alloys should consist of aluminium or magnesium. The alloys may contain small quantities (< 5 weight %) of other metals.	WFSD I and II, III 2.13
Measures to protect archaeology and cultural history: a. Exploratory field research to assess the presence of archaeological monuments is required prior to cable laying and placement of the turbine foundations. b. The results will be presented to the Minister no later than 3 months before construction of the wind farm starts. c. Depending on the conclusions of the study: a. the work can proceed without changes; b. a follow-up study is required; c. physical measures must be taken to protect archaeological sites; d. sites are to be excluded from interference taking into account a buffer zone; e. the work must be supervised archaeologically. Please note: Current developments (4.3.4 of this PSD).	WFSD I and II, III 4.5
When carrying out work under the scope of the construction, maintenance or decommissioning of a wind farm or of an export cable, measures will be taken to prevent any adverse effects in terms of safety and efficient use of the sea.	Water Decree 6.16e.1
If, during the construction of a wind farm or during other work relating to wind turbines in the Dutch exclusive economic zone, a monument is found, or what is possibly a monument, as defined in the Monuments and Historic Buildings Act 1988, then the first subsection of Sections 53, 56, 58, and 59 of that Act are equally applicable.	Water Decree 6.16f.1
1. A wind turbine and any other installation that forms part of a wind farm must be sufficiently strong to withstand the expected forces resulting from wind forces, waves, sea currents and use of the turbine itself. 2. At least four weeks before putting the wind farm into operation, the operator will provide Our Minister with a statement confirming that the construction/installation of the wind turbines and other balance of plant components forming part of the wind farm comply with the first subsection.	Water Decree 6.16g 1 and 2
1. In order to ensure the safety of air traffic and shipping traffic, a wind farm will be equipped with identification marks and beacons. 2. The identification marks and beacons referred to in the first subsection must comply with the IALA recommendation O-139 (the marking of manmade offshore structures) and with the guideline published by the British Civil Aviation Authority CAP 764 (policy and guidelines on wind turbines).	Water Decree 6.16h 1 and 2

6.2.4 Operation

Table 12. Operational requirements for BWFS I and II

Requirement	Applicable Law
Vessels used by or on behalf of the permit holder must take into account the presence of seals in the shallows and designated resting areas. The measures cited in the Voordelta Management Plan and the Delta Water Management Plan must be taken into account hereby. This regulation will be withdrawn once the Voordelta Management Plan and the Delta Water Management Plan have been updated/amended to include these restrictions on ships.	WFSD I and II, III 2.14
During repairs to and maintenance of telecommunication cables, the number of rotations per minute per wind turbine of those wind turbines that are situated within a radius of 1,000 metres from the site of the repairs or maintenance must be reduced to less than 1. This requirement is only applicable to BWFS I.	WFSD I, III 2.17
Measures to limit collision victims among birds at rotor height during mass bird migration: a) at night (between sunset and sunrise), during the period in which mass bird migration effectively takes place, the number of rotations per minute per wind turbine will be reduced to less than 1; b) for the purpose of implementing this regulation, referred to in subparagraph a, the control system of the wind turbines will be linked to a system that effectively observes bird migration; c) in a plan, the permit holder describes the system to which the wind turbines will be linked and the transect line based on which bird density will be determined. The permit holder must submit this plan to the Minister of Economic Affairs at least 8 weeks before the commencement of the construction; d) the connection mentioned in part b of this regulation will be executed within the plan mentioned in part c; e) July 1st and January 1st of each year the permit holder reports how and in what way the regulation rules have been executed. Government will pay for the system and its maintenance (WFSD:'Toelichting Article 7.8.4 - Dutch).	WFSD I and II, III 4.3
Measures to prevent victims of collision amongst bats at rotor level: a) the cut-in wind speed of turbines will be 5.0 m/s at axis height during the period of 15 August to 30 September between 1 hour after sunset to 2 hours before sunrise; b) in case of a wind speed of less than 5.0 m/s at axis height, during the period referred to in part a, the permit holder will reduce the number of rotations per minute per wind turbine to less than 1; c) within two months after the end of the period referred to in part a, the permit holder will produce a report outlining how this regulation is implemented and submit it to the Minister of Economic Affairs.	WFSD I and II, III 4.4
1. The Minister of Economic Affairs will create an environmental monitoring and evaluation programme. The permit holder will cooperate in the implementation of this programme to a reasonable extent, without financial compensation. In doing so, the safety regulations applicable on the wind farm will be taken into account. 2. The Minister of Economic Affairs will publish the data generated by the monitoring and evaluation programme. 3. The permit holder will cooperate in the implementation of the monitoring and evaluation programme e.g. as follows: · providing access to the wind farm for vessels conducting monitoring and evaluation work; · enabling the attachment of equipment such as cameras and bat detectors to/on (parts of) the wind turbines; · enabling the attachment of radar equipment to/on (parts of) the wind turbines; · enabling the attachment of measurement equipment (for example measurement buoys, C-PODs, etc.) within the wind farm. · making available bandwidth on the data cable.	WFSD I and II, III 5
The operator is responsible for a good level of maintenance of the wind farm and for this purpose will periodically inspect the wind turbines and other provisions, as well as the security provisions.	Water Decree/Article 6.16i

6.2.5 Decommissioning of the wind farm

Table 13. Decommissioning requirements for BWFS I and II

Requirement	Applicable Law
After the power generation operations have stopped the permit holder will dismantle and remove all elements of the wind farm within two years at the latest, but always within the term of validity of the permit.	WFSD I and II, III 6
1. At the latest at the moment of given proof of produced electricity by the means of so-called 'Garanties van Oorsprong', the permit holder will guarantee the removal of the wind farm by means of a bank guarantee for the State in the amount of €120,000 per MW installed. 2. The permit holder will annually increase the amount referred to under a by 2% as a consequence of indexation during a period of 12 years after the issue of the bank guarantee. 3. After operating for a period of 12 years, operating for a period of 17 years, and 1 year before the date of removal, the permit holder will ask the Minister of Economic Affairs to redetermine the amount referred to under 1 and its indexation.	WFSD I and II, III 7
When carrying out work under the scope of decommissioning of a wind farm, measures will be taken to prevent any adverse effects in terms of safety and efficient use of the sea.	Water Decree 6.16l

6.2.6 Electrical infrastructure

Table 14. Electrical infrastructure requirements

Requirement	Applicable Law
A power producer is entitled to compensation from TenneT if the offshore grid commissioning is late or if there has been too much downtime during the year.	EACT[7]/ Article 16f.1
A downtime of five days per year is allowed without compensation.	COMPS[8]/Article 2.3
Compensation consists of consequential damages and damages resulting from lost or postponed revenue.	EACT/Article 16f.2
In case of late commissioning, the compensation is: postponed income from electricity price (E-E/3.87) + postponed SDE-subsidy (SDE-SDE/2.95) + consequential damages (EACT/Article 16f.2). The rationale behind this factor is that this income is not lost, it is only postponed by 16-20 years. The factors are a compensation for the time value of money.	COMPS/Article 4.3
In case of unavailability, the compensation is: Lost income from electricity sale + Lost SDE + consequential damages. In formula: (Eprice+(SDEprice-SDEprice/1.4)*(kWhmissed-kWhtransported_in_5_days) + consequential damages.	COMPS/Article 4.2
A connection and transmission capacity of 350 MW per site is guaranteed by TenneT.	Letter to parliament May 19th 2015 [22]
The connection voltage level of the inter-array systems to the TenneT offshore transformer platform will be standardised at 66 kV.	Letter to parliament May 19th 2015
Number of bays. With the 66 kV inter-array cables, six 66 kV bays will be available per PPM (Power Park Module). This results in four bays with "one string – one bay" and two bays with "two strings – one bay" on the offshore substation. The "two strings – one bay" solution will be executed with two separate cable disconnectors.	Development framework for the offshore grid[9]
Access to platform. Boat landing and W2W solutions are the standard access method to the offshore substation. The offshore substation will have a helicopter hoisting facility for emergency response (if allowed by authorities) and no helicopter platform.	Development framework for the offshore grid
Organisation of metering. TenneT will centralise the organisation of the accountable metering requirements via one certified party, contracted by TenneT, responsible for the installation, commissioning and maintenance of the metering equipment. The metering responsibilities of the operator of the PPMs as the Connection Party will be dealt with in the Connection and Transmission Agreement.	Development framework for the offshore grid
Overcapacity. The PPM is allowed to transmit to a maximum of 380 MW, with the requirement for output from the PPM to be curtailed in case the 220 kV export cables reach their maximum allowable temperature limits. Curtailment will be addressed in the Connection and Transmission Agreement.	Development framework for the offshore grid

7) Wet van 23 maart 2016 tot wijziging van de Elektriciteitswet 1998 (tijdig realiseren doelstellingen Energieakkoord) [21]

8) Besluit schadevergoeding net op zee (Compensation scheme) [25]

9) Development framework for the offshore grid: 'to be decided'

Table 14. Electrical infrastructure requirements (2)

Requirement	Applicable Law
Number of J-tubes and bays. Based on 66 kV inter-array cables and 64 MW per cable - a standard platform shall be equipped with 18 J-tubes for the inter array system: o 2x 8 J-tubes for offshore PPM o 1 J-tube installed for possible test purposes o 1 J-tube installed for the connection to the neighbouring platform.	Development framework for the offshore grid
Point of Common Coupling. The connection point (CP) between the offshore power park module (PPM) and TenneT is specified at the cable termination of the inter-array cables and the switchgear installation on the platform.	Development framework for the offshore grid
TenneT will decide post award of bid, in consensus with the selected project developer, on details for protection systems and arrange this in the offshore agreements between TenneT and Connected Party. Customized wishes will be at cost of the Connected Party.	Development framework for the offshore grid
TenneT is inclined towards: (i) not installing, nor make provisions for, a (diesel engine powered) back-up generator plant on the offshore platform to provide auxiliary power for the PPMs; and (ii) installing a wireless communication interface (emergency facility) between in the offshore platform and onshore substation, only in case a firm and significant delay in realisation of such communication through the export cable fibres.	Development framework for the offshore grid (i)/ TenneT (ii)
Planning. TenneT plans to have the grid connection for Borssele Alpha ready 31 August 2019. The compensation scheme has this date set as starting date.	Development framework for the offshore grid

For further technical requirements you are referred to TenneT's model agreements published ***here***.

7. *Final steps preparing your bid*

Preparations by the Government for the first Borssele tender have been finalised. This Project and Site Description (PSD, version 3) is the final version, which contains all site data and requirements that are relevant to prepare a tender bid in 2016 for BWFS I and/or II. Key dates are:

- 24 March 2016: opening webpage to download application forms (https://mijn.rvo.nl/sde-windenergie-op-zee-borssele-kavels-i-en-ii)
- 8 April 2016: publication final WFSD's BWFS I and II in 'Staatscourant' (Dutch Bulletin of Acts and Decrees)
- 10 April 2016: opening tender Windenergie op zee 2015 BWFS I and II
- 11 April 2016: delivery of printed applications at the RVO office Zwolle is possible
- 12 May 2016, 17.00 uur CEST: closing of delivery of printed applications at the RVO office Zwolle

Several websites provide the most up-to-date information and status of all relevant studies, the legal framework and the application for subsidy and permit. The most important of these are listed below.

- The most up-to-date information on site data, including the results of the Borssele metocean campaign, can be found at ***offshorewind.rvo.nl***. The site also contains maps, minutes of workshops, a Q&A and revision log.
- More information on the SDE+ grant and permit can be found at ***http://www.rvo.nl/subsidies-regelingen/sde/wind-op-zee***
    - FAQ SDE+ grant and permit can be found at ***www.rvo.nl/subsidies-regelingen/sde/faq/wind-op-zee***
- Wind Farm Site Decisions will be published at ***www.rvo.nl/subsidies-regelingen/wind-op-zee-kavels-borssele-i/ii-fase-1***
- An overview of all relevant wind measument locations in the North Sea: ***www.windopzee.net***
- General information about offshore wind energy from the Dutch Government: ***www.rijksoverheid.nl/onderwerpen/duurzame-energie/windenergie***
- "Noordzeeloket" provides information on several spatial topics concerning the North Sea, including offshore wind ***www.windopzee.nl*** and ***www.noordzeeloket.nl/functies-en-gebruik/windenergie/***
- Information on the permitting procedure for the grid connection: ***www.rvo.nl/subsidies-regelingen/transmissiesysteem-op-zee-borssele***
- All information resulting from TenneT's consultation process with the offshore wind sector (technical, legal, planning and other topics): ***www.tennet.eu/nl/grid-projects/projects-in-the-netherlands/grid-at-sea.html***

8. Applicable documents

8.1 Bibliography

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[17] Wet windenergie op zee (Offshore Wind Energy Act).
[18] Milieu Effect Rapportages Borssele WFS I and II (Environmental Impact Assessments BWFS I and II).
[19] Wind Farm Site Decisions Borssele, Sites I and II.
[20] Kamerbrief Wetgevingsagenda STROOM (Letter to Parliament Energy Legislative Agenda), January 22th 2016 (Available in Dutch).
[21] Wet van 23 maart 2016 tot wijziging van de Elektriciteitswet 1998 (tijdig realiseren doelstellingen Energieakkoord)
[22] Regeling windenergie op zee 2015 (Ministerial Order Offshore Wind Energy 2015).
[23] Algemene uitvoeringsregeling Stimulering Duurzame Energieproductie (General Implementing Regulations for Stimulating Sustainable Energy Production.)
[24] Belgian Wind Farms: Please use provided maps and coordinates of 1 July 2015 to calculate (Appendix A).
[25] Besluit schadevergoeding net op zee (Compensation scheme) (Appendix A).
[26] Regeling schadevergoeding net op zee (Appendix A).

Appendices

A: Applicable Law

B: Summary Environmental Impact Assessment

Appendix A

Applicable Law

Appendix B

Summary Environmental Impact Assessment

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Netherlands Enterprise Agency (RVO.nl) is an agency of the Dutch Ministry of Economic Affairs. Netherlands Enterprise Agency implements policy for various ministries in the areas of sustainability, agricultural, innovation and international business and cooperation. Netherlands Enterprise Agency is the contact point for businesses, knowledge institutions and government bodies for information and advice, funding, networks and legislation and regulations.