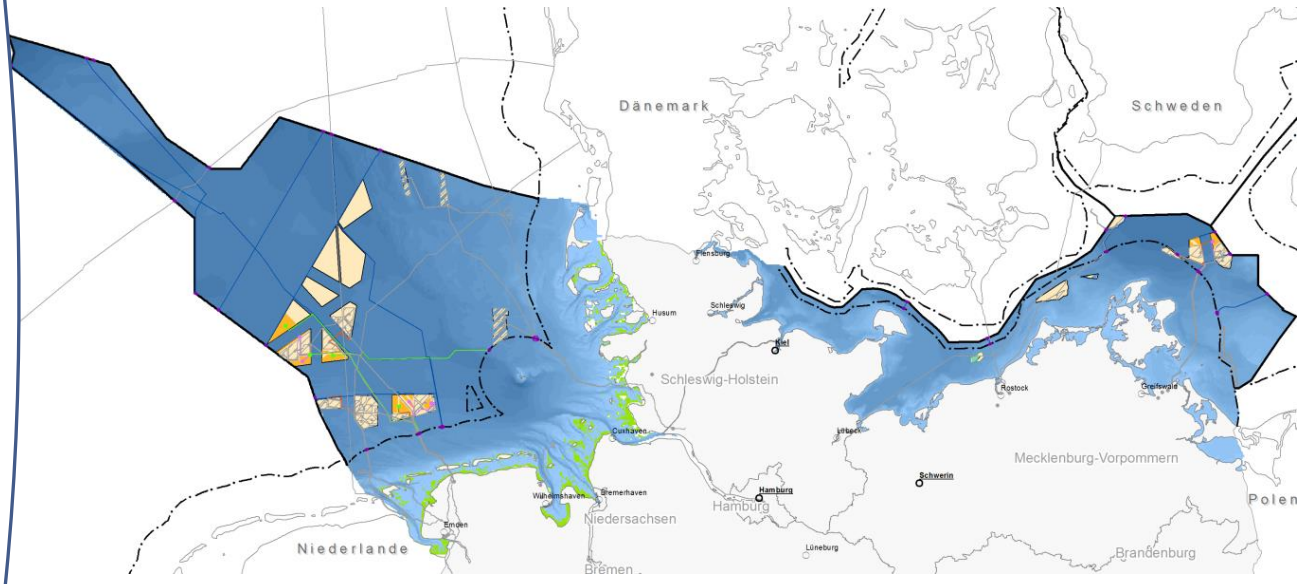
BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

Site Development Plan 2019 for the German North Sea and Baltic Sea

- unofficial translation -



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Photos: BSH, Sebastian Fuhrmann

Content

List of figures

List of tables

List of abbreviations

AC	Alternating current
AIS Data	Data from the automatic identification system in shipping
EEZ	Exclusive Economic Zone
EEZ North Sea ROV	Regulation concerning development in the German exclusive economic zone in the North Sea
EEZ Baltic Sea ROV	Regulation concerning development in the German exclusive economic zone in the Baltic Sea
BAW	Federal Waterways Engineering and Research Institute
BfN	Federal Agency for Nature Conservation
BFO	Spatial Offshore Grid Plan
BFO-N	Spatial Offshore Grid Plan North Sea
BFO-O	Spatial Offshore Grid Plan Baltic Sea
BGBI	Federal Law Gazette
BImSchG	Act concerning the protection from harmful environmental impacts through air pollution, noise, vibrations and similar events (Federal Immission Control Act)
BKG	Federal Agency for Cartography and Geodesy
BMI	Federal Ministry of the Interior, for Construction and Homeland
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
BMVBS	Federal Ministry for Transport, Building and Urban Development
BMVI	Federal Ministry for Transport and Digital Infrastructure
BMWi	Federal Ministry for Economic Affairs and Energy
BNatSchG	Act concerning nature conservation and landscape management (Federal Nature Conservation Act)
BNetzA	Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway
BSH	Federal Maritime and Hydrographic Agency
DC	Direct current
DRU	Diode rectifier unit
DWD	German Meteorological Service
EEA	European Environmental Agency
EEG	Act concerning the development of renewable energy (German Renewable Energy Act)
ENTSO-E	European network of transmission system operators for electricity
EnWG	Act concerning electricity and gas supply (German Energy Act)
ESCA	European Subsea Cables Association
R&D	Research and Development
FEP	Site Development Plan
FFH	Flora Fauna Habitat
GDWS	Directorate General for Navigation and Waterways
GW	Gigawatt
HELCOM	Helsinki Commission
HVDC	High-voltage DC transmission
ICES	International Council for the Exploration of the Sea
ICPC	International Cable Protection Committee

kV	Kilovolt
LEP S-H	State Development Plan Schleswig-Holstein
LEP M-V	State Spatial Development Programme of Mecklenburg-Western Pomerania
LROP	State spatial planning program of Lower Saxony
MARNET	Automated monitoring network of stations in the German Bight and western Baltic Sea
MI Cable	Paper and oil insulated ground cable
MSRL	Directive 2008/56/EC of the European Parliament and the Council dated 17 June 2008 for the establishment of a Framework for Community Action in the field of Marine Environment (Marine Strategy Framework Directive)
MW	Megawatt
n.s.	not stated
NABEG	Network expansion acceleration act for transmission network
NDP	Network development plan
NfS	Notice to mariners
NVP	Grid connection point
O-NDP	Offshore network development plan
OSPAR	Oslo-Paris Convention for the Protection of the Marine Environment of the North-East Atlantic
POD Stations	Porpoise click detector stations
ROG	Spatial Planning Act
SeeAnlG	Offshore Installations Act
SeeAnlV	Ordinance concerning offshore installations for defining German coastal waters (Offshore Installations Ordinance)
SeeAufgG	Act concerning the responsibilities of the State with respect to maritime navigation (Federal Maritime Responsibilities Act)
SEL	Sound event level
n.m.	Nautical mile
SPL p-p	Peak emission sound pressure level (peak-peak)
UNCLOS	United Nations Convention on the Law of the Sea
StUK4	Standard "Investigation into the impacts of offshore wind turbines (StUK4)"
SEA	Strategic environmental assessment
TYNDP	Ten-Year Network Development Plan
UBA	Federal Environment Agency
TSO	Transmission system operator
UVPG	Environmental Impact Assessment Act
EIS	Environmental impact study
VSC	Voltage sourced converter
VS-RL	Conservation of Wild Birds Directive
VTG	Traffic separation scheme
VwVfG	Administrative Procedure Act
WEA	Wind turbine
WFS	Web Feature Service
WHG	Act for regulating water resources (Water Resources Act)

WindSeeG	Act concerning the development and promotion of offshore wind energy (Offshore Wind Energy Act)
WMS	Web Map Service

1 Introduction

1.1 The Central Model

The year 2017 marks a system change in the offshore wind energy sector. Based on the Act concerning the development and promotion of offshore wind energy (Offshore Wind Energy Act - WindSeeG[1]), the Federal Maritime and Hydrographic Agency (BSH) shall undertake the task of central development and, on behalf of the Federal Network Agency (BNetzA), the investigation of sites for the construction and operation of offshore wind turbines.

The central model describes a staged planning and tendering process. In the first step, spatial and time requirements are defined for sites for offshore wind energy in the Site Development Plan. The next step is the preliminary investigation of the sites determined in the Site Development Plan. After completing the site investigation, the sites will be allocated in a competitive tender process, wherein the tenderers are provided with the information gained by the site investigation.

After the approval procedure is completed, the bidder who is awarded a contract may construct wind turbines on the site, is entitled to the market premium, and is permitted to use the connection capacity.

The central model applies for commissioning offshore wind turbines from 2026 onwards.

The Site Development Plan in the central model is therefore the governing planning instrument for the synchronous expansion of wind energy and its offshore grid connections.

The current Spatial Offshore Grid Plan (BFO) of the Federal Maritime and Hydrographic Agency for the Exclusive Economic Zone (EEZ) of the North Sea and Baltic Sea, and parts of the current offshore network development plan (O-NDP) confirmed by BNetzA, are incorporated into the Site Development Plan. The requirement for offshore connecting lines is determined based upon rules of the Site Development Plan in the onshore network development plan (NDP).

[1] Act dated 13 October 2016, Federal Law Gazette I p. 2258, 2310, last amended by article 21 of the Act dated 13 May 2019, Federal Law Gazette I p. 706.

1.2 Statutory basis of the Site Development Plan

According to sections 4ff. WindSeeG, the Federal Maritime and Hydrographic Agency shall establish a Site Development Plan (FEP) in conjunction with the Federal Network Agency (BNetzA) and in consultation with the Federal Agency for Nature Conservation (BfN), the Directorate General for Navigation and Waterways (GDWS) and the coastal states.

The regulations of the Act for the expansion of renewable energy (Renewable Energy Act – EEG 2017[2]) and the Act concerning the environmental impact assessment (EIA Act[3]) are also applicable.

1.3 Purpose and goals of the Site Development Plan

According to section 4 subsection 1 WindSeeG, the purpose of the Site Development Plan (FEP) is to define sectoral planning rules for the EEZ of the Federal Republic of Germany. According to an administrative agreement between the Federal Government, represented by the Federal Maritime and Hydrographic Agency, and the relevant state, planning rules can also be defined for coastal waters.

Section 4 subsection 2 WindSeeG stipulates that site development plan shall define rules for the expansion of offshore wind turbines and the offshore connecting lines necessary for this with the goal

- achieving the expansion target in section 4 No. 2b of the Renewable Energy Act,
- of expanding electricity generation from offshore wind energy installations in a well-structured layout that uses space efficiently, and
- ensuring well-organised and efficient use and capacity utilisation of the offshore connecting lines, and planning, installation, commissioning and use of offshore connecting lines in parallel with the expansion of electricity generation from offshore wind turbines.

According to section 4 subsection 3 WindSeeG, the Site Development Plan may define rules for offshore wind turbines and other off-grid electricity generation systems with the aim of enabling practical testing and implementation of

[2] Act dated 21 July 2014, Federal Law Gazette I p. 1066, last amended by article 5 of the Act dated 13 May 2019, Federal Law Gazette I p. 706).

[3] Act in the officially published version dated 24 February 2010, Federal Law Gazette I p. 94, last amended by article 22 of the Act dated 13 May 2019, Federal Law Gazette I p. 706.

innovative concepts for off-grid electricity - generation in a well-structured layout that uses space efficiently.

The Site Development Plan serves primarily to implement the purpose of the WindSeeG and the German Renewable Energy Act.

According to section 1 of the Renewable Energy Act, the purpose of the Act is to enable the sustainable development of the energy supply, in particular in the interest of mitigating climate change and protecting the environment, to reduce the economic costs of energy supply by including long-term external effects, to conserve fossil energy resources and to promote the further development of technologies for the generation of electricity from renewable energy sources. Section 1 subsection 2 of the Renewable Energy Act stipulates an increase in the share of gross electricity consumption generated from renewable energy to

- 40 to 45% by 2025,
- 55 to 60% by 2035, and
- at least 80% by 2050.

The aim is to provide a steady, cost-efficient and grid-compatible expansion. According to section 1 subsection 3 of the Renewable Energy Act, this aim also serves to increase the share of renewable energy in the entire gross final consumption of energy to at least 18% by 2020.

With respect to the expansion of offshore wind energy, the aim according to section 1 subsection 2 WindSeeG is to increase the installed capacity of offshore wind turbines connected to the grid starting in 2021 to a total of 15 gigawatt by the year 2030.

1.4 Subject of the Site Development Plan

According to the statutory order of section 5 subsection 1 WindSeeG (NV), for the period from 2026 to at least 2030 the Site Development Plan contains rules concerning the following for the German EEZ and according to the following regulations for coastal waters:

1. areas; areas can only be defined in coastal waters if the country responsible has designated the areas as a possible subject for the Site Development Plan,
2. sites in areas defined under point 1; sites can only be defined in coastal waters if the country responsible has designated the sites as a possible subject for the Site Development Plan,
3. the chronological order in which the specified sites are put out to tender according to part 3 section 2 of WindSeeG, including the specification of respective calendar years,
4. the calendar years in which the allocated offshore wind turbines and the corresponding offshore connecting lines are to be commissioned in each of the specified sites,
5. the expected generation capacity of the offshore wind turbines to be installed in each of the specified areas and sites,
6. locations of converter platforms, collector platforms and, as far as possible, transformer platforms,
7. routes or route corridors for offshore connecting cables,
8. places at which the offshore connecting cables cross the border between the EEZ and coastal waters,

9. routes or route corridors for border-crossing power cables,
10. routes or route corridors for possible interconnections of the plants, routes or route corridors listed in points 1, 2, 6, 7 and 9, and
11. standardised technical and planning principles.

In accordance with section 5 subsection 2 WindSeeG (NV),

the Site Development Plan may also stipulate the following:

- testing grounds close to the coast not exceeding 40 square kilometres in total outside of areas; testing grounds may be defined in the coastal waters only if the country has designated the area as a possible subject of the Site Development Plan and at least partially for testing purposes; if a testing ground is not actually used or is used to an insignificant extent, a subsequent Site Development Plan may override the definition of the testing ground and define areas and sites instead,
- the calendar years in which the pilot offshore wind turbines and the corresponding pilot connecting line are to be commissioned for the first time on each of the defined testing grounds,
- the capacity of the respective pilot connecting line;
- designate available grid connection capacities for areas in the Exclusive Economic Zone and in the coastal waters on existing offshore connecting lines or on offshore connecting lines to be completed in the subsequent years which can be assigned to pilot offshore wind turbines in accordance with section 70 subsection 2.

In addition, pursuant to section 5 subsection 2a sentence 1 WindSeeG (NV), other electricity - generation areas outside of the areas can be defined for a total of 40 to 70 square km and spatial requirements can be stipulated for lines transmitting electricity or electricity sources.

Sectoral planning rules for the coastal waters may be defined in accordance with section 4 subsection 1 sentence 2 WindSeeG (NV) for areas, sites, the chronological order in which the specified sites are put out to tender, the calendar years of commissioning and the expected generation capacity to be installed, as well as for testing grounds and other electricity generation areas. In accordance with an administrative agreement between the Federal Government, as represented by the Federal Maritime and Hydrographic Agency, and the country responsible, the individual provisions for the coastal waters are specified in more detail.

2 Process for the expansion of offshore wind energy

A new process for the expansion of offshore wind energy is being introduced with the WindSeeG for offshore wind turbines that will be commissioned from 2026 onwards. Various cascades have to be completed, from the overarching development of the sites to the approval procedure for the wind turbines and connecting lines.

In accordance with section 4 ff. WindSeeG, the Site Development Plan will establish sectoral planning rules for the expansion of offshore wind turbines and offshore connecting lines in the EEZ.

The aim of specifying the chronological - completion sequence of the sites is that, from 2026 onwards, offshore wind turbines will be put into operation on these sites and at the same time the required installation of offshore connecting lines will be completed, so that the existing offshore connecting lines are used efficiently and their capacity is utilised.

The next step involves the preliminary investigation of the sites according to sections 9 ff. WindSeeG. This concerns the investigation of the marine environment, the preliminary survey of the construction site, as well as the wind and oceanographic conditions for the site under preliminary investigation.

This will accelerate the subsequent planning approval process for offshore wind turbines in these sites.

Building upon the results of the site investigation, the suitability of the sites for the tender process will then be investigated.

If suitability is confirmed, the information, including the investigation results and the stipulation of the electricity capacity to be installed, shall be established by ordinance and provided to BNetzA.

The BNetzA will then invite tenders for the sites to competitively determine the market premium, and publish the investigation results and information obtained in the site investigation (see sections 14 ff. WindSeeG). Only the successful bidder may subsequently apply for planning approval for the construction and operation of offshore wind turbines on the respective site. The contract award also includes entitlement to the connection of the wind turbines to the offshore connecting line defined in the Site Development Plan and the assigned grid connection capacity on the connecting line.

After the contract has been awarded, the successful bidder or the respective authorised party may apply for planning approval under sections 44 ff. WindSeeG. At this level of the planning stage, the Federal Maritime and Hydrographic Agency will investigate whether a certain project is permissible. If all prerequisites are met and the investigation result is positive, the process is completed with the award of the planning approval notice.

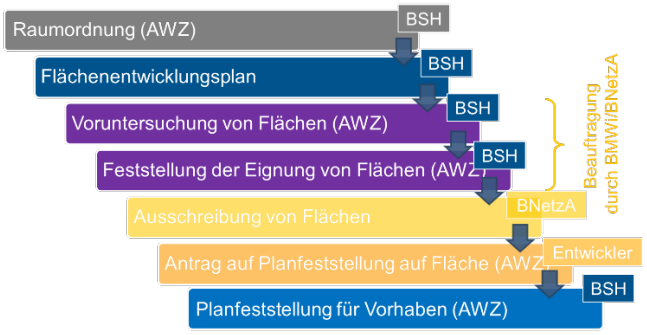

Figure 1: The Site Development Plan in the overall system of the central model for the sector of the German EEZ of the North Sea and Baltic Sea

Please see chapter 5.4 concerning coastal waters.

2.1 Land development plan

section 6 WindSeeG regulates the process of establishing the Site Development Plan, starting from publishing the introduction of the process to publishing the completed plan.

2.1.1 Responsibility

According to section 6 WindSeeG, the Federal Maritime and Hydrographic Agency is responsible for preparing the Site Development Plan.

2.1.2 Initial schedule

On 29 March 2018, the start and expected completion of the preparation process were publicly announced.

The preliminary draft of the Site Development Plan and the drafts of the scopes were consulted between 25 May 2018 and 15 June 2018.

On 27 June 2018, a public hearing was held on the (preliminary) draft documents and the statement of the transmission system operators (TSOs).

The scopes for drawing up the drafts of the environmental reports were defined on 25 October 2018.

The draft of the Site Development Plan and the drafts of the environmental reports were drawn up based on the results of the early consultation and the hearing and published on 26 October 2018.

Authorities whose responsibilities are affected had the opportunity to comment on the draft documents by 03 December 2018; the public had the opportunity to comment on them until 03 January 2019.

On 31 January 2019, a discussion was held on the draft documents, statements and remarks.

The second draft of the Site Development Plan and the second drafts of the environmental reports were drawn up based on the consultation and the results of the discussion meeting and published on 26 April 2019.

During the period from 26 April 2019 to 13 May 2019, government agencies and the public again had the opportunity to comment on the changes that have been made since the publication of the draft Site Development Plan and the draft environmental reports.

In a letter dated 04 June 2018, the North Sea and Baltic Sea states were informed about the start, the process and the estimated completion of the preparation procedure.

In particular, they had the opportunity to comment on the draft documents or the summary in the respective required official - language and to express their opinion in the period from the end of January 2019 to 25 March 2019.

Pursuant to section 6 subsection 7 WindSeeG, agreement has been reached between the coastal countries, the Federal Agency for Nature Conservation and the Directorate General for Navigation and Waterways.

In a letter dated 27 June 2019, BNetzA reached the agreement required on the Site Development Plan pursuant to section 6 subsection 7 WindSeeG.

The Site Development Plan 2019 and the environmental reports for the North Sea and the Baltic Sea will be published by the statutory deadline of 30 June 2019.

The following summary depicts the individual process stages.

Overview of the procedural steps

- Notification of the start and estimated completion of the procedure
- Preparation of a preliminary draft and a draft of the scope
- Official and public participation

- Notification of the North and Baltic Sea states
- Issue of a common statement of the TSOs (Transmission System Operators)
- Hearing
- Determination of the scope
- Preparation of the Site Development Plan draft and the environmental report
- Official and public participation (national and international)
- Public hearing
- Assessment of the environmental report in the light of national and international statements
- Consideration of the assessment in the Site Development Plan draft
- Consultation with the Federal Agency for Nature Conservation, the Directorate-General for Waterways and Shipping and the coastal states
- Establish agreement with BNetzA
- Publication of the Site Development Plan and the environmental report by 30 June 2019
- Submission of a summarised declaration to the participating North Sea and Baltic Sea states

2.1.3 Update

The BSH will draw up the Site Development Plan in accordance with section 6 subsection 8 WindSeeG for the first time by 30 June 2019.

According to section 8 subsection 1 of WindSeeG, the Site Development Plan may be amended or updated by proposal from the Federal Maritime and Hydrographic Agency, wherein the decision concerning timing and scope of a process for amendment or update is made by mutual agreement between the Federal Maritime and Hydrographic Agency and BNetzA.

According to section 5 WindSeeG, the Site Development Plan is amended or updated if, to achieve the goals according to section 4 WindSeeG, it is necessary to establish other or further areas and sites, or a change in chronological order of the preliminary assessment of the sites because, for example, investigated sites were deemed to be unsuitable.

Nevertheless, it is be updated at least every four years (see section 8 subsection 2 sentence 1 WindSeeG).

In any case, the partial update is planned to start in the second half of 2019 with regard to the designation of other electricity generation areas in accordance with section 5 subsection 2a WindSeeG.

2.1.4 Coordination requirements

According to section 6 subsection 7 WindSeeG, the preparation of the Site Development Plan takes place in coordination with the Federal Agency for Nature Conservation, the Directorate-General for Waterways and Shipping and the coastal states.

2.1.5 Consensus requirement

According to section 6 subsection 7 WindSeeG, the Site Development Plan is drawn up and updated in consultation with BNetzA.

2.2 Investigation of sites

According to section 11 subsection 1 sentence 1 of WindSeeG, the BNetzA is responsible for the investigation of sites. BNetzA assigns responsibility for the site investigations in the EEZ to the Federal Maritime and Hydrographic Agency in accordance with the administrative arrangement dated March 2017 in accordance with section 11 subsection 1 sentence 2 No. 1 WindSeeG. Thus, according to section 11 subsection 2 sentence 1 WindSeeG, the Federal Maritime and Hydrographic Agency carries out the tasks of the authority responsible for the site investigation according to the law for the sites in the German EEZ.

Where sites in coastal waters are concerned, the BNetzA according to section 11 subsection 1 sentence 2 No. 2 WindSeeG assigns responsibility for the site investigation to the authority responsible according to national law in accordance with an administrative arrangement.

The preliminary investigation of sites takes place with the aim that BNetzA issues tenders for the suitable sites according to sections 16 ff. WindSeeG. The successful bidder must then complete the planning approval process for the construction and operation of offshore wind turbines at the Federal Maritime and Hydrographic Agency according to sections 44 ff. WindSeeG.

According to section 9 subsection 1 WindSeeG, the site investigation has the aim of providing the tenderers for the available sites

- with sufficient information to enable them to ascertain a competitive market premium according to section 22d of the Renewable Energy Act and
- to determine the suitability of the sites and
- to assess individual investigation objects in advance so as to accelerate the subsequent planning approval process for these sites. The process for the implementation of the site investigation, including the suitability examination of the sites nominated in the Site Development Plan is guided by section 12 WindSeeG.

A strategic environmental assessment (SEA) must also be carried out

According to section 9 subsection 3 WindSeeG, the investigation of sites must be carried out so that, prior to the publication of the tender, the site investigation is completed for at least those sites for which, according to the Site Development Plan, tenders will be issued in the current and the following calendar year.

The following stages are legally provided in particular:

Summary of the process stages

- Publication of the introduction of the process
- Hearing
- Determination of the scope
- Provision of information concerning the maritime environment, the preliminary investigation of the installation site and wind and oceanographic conditions
- Suitability examination and determination of the power output to be installed
- Determination of suitability through a statutory ordinance
- Interpretation of the documents
- Submission of the information to BNetzA

2.3 Call for tenders

For sites deemed suitable, BNetzA shall determine the value of the market premium and the respective entitled party by way of a tender process. BNetzA is responsible for this according to sections 16 ff. WindSeeG.

According to section 17 sentence 1 WindSeeG, BNetzA invites annual bids from 2021 onwards for a bid deadline of 1 September, covering a volume between 700 and 900 MW. The tendered quantities must not exceed those that were determined in the Site Development Plan, which according to section 5 subsection 5 sentence 1 WindSeeG is an average of 840 MW. The tendered volume is distributed over the preliminary investigated sites which, according to the Site Development Plan, are to come up for tender in the current calendar year, provided that the Site Development Plan allows for tenders in multiple sites in one year, and that the expected generation capacity in total makes up the entire tender volume. The share of a site in the total tender volume is determined by the Site Development Plan and the power to be installed on the sites as determined by the site investigation.

Six months prior to the tender deadline, BNetzA shall publish the tender on its internet web site according to section 19 WindSeeG, including any information to be provided by the Federal Maritime and Hydrographic Agency, and documentation according to section 10 subsection 1 WindSeeG containing any further information as required by statutory ordinance.

The Federal Network Agency (BNetzA) awards the tender for each tendered site to the bid with the lowest bid value under the caveat of revocation as well as the caveat of a transition in the event of an effective exercise of subrogation. The value to be applied is the bid value of the successful bid.

With the award of the tender according to section 23 WindSeeG, the successful bidder has the exclusive right to carry out a planning approval process on the respective site, wherein the successful bidder benefits from the information and suitability determination of the site investigation.

Furthermore, the successful bidder is entitled to the market premium according to section 19 of the Renewable Energy Act to the extent of the applied bid size on the respective site, as long and insofar as the further prerequisites for the entitlement according to section 19 of the Renewable Energy Act are met. Moreover, to the extent of the awarded bid quantity, the successful bidder is entitled to be connected to the wind turbines on the respective site by the offshore connecting line specified in the Site Development Plan from the binding completion date, and receives the assigned grid connection capacity of the offshore connecting cable specified in the Site Development Plan from the binding completion date according to section 17d subsection 2 sentence 9 of the Energy Industry Act (EnWG).[4]

[4] Act dated 7 July 2005, Federal Law Gazette I p. 1970, 3621, last amended by article 1 of the Act dated 13 May 2019, Federal Law Gazette I p. 706.

2.4 Planning approval

After the tender has been awarded by BNetzA, applications for a planning approval may be submitted for the site covered by the plan according to section 46 subsection 1 WindSeeG. According to section 45 subsection 2 WindSeeG, the Federal Maritime and Hydrographic Agency is the government agency responsible for the hearing process, planning approval process and planning permission process.

In addition to the statutory specifications of section 73 subsection 1 sentence 2 of the Administrative Procedure Act (VwVfG)[5], the plan must contain the information outlined in section 47 subsection 1 WindSeeG.

In the planning approval notice, according to section 48 subsection 3 WindSeeG, the Federal Maritime and Hydrographic Agency has the power, in the interest of a rapid installation and commissioning of the project and under consideration of the time and action plan provided by the contractor, to specify measures and to set deadlines by which said measures must be fulfilled.

The plan may only be approved under certain conditions that are listed in section 48 subsection 4 WindSeeG. This includes that the marine environment is not endangered, that the safety and ease of traffic is not compromised, that the safety of the national and Alliance defence is not compromised, that the plan is reconcilable with overriding mining activities, that it is compatible with existing and planned routes of cables, offshore connection cables, pipelines and other lines, that it is compatible with existing and planned locations of converter platforms or transformer platforms, that the obligation according to section 66 subsection 2 WindSeeG has been declared effective, and that other regulations according to WindSeeG and other public law regulations have been met.

A planning approval notice or planning permission for an offshore wind turbine is granted with a limit of 25 years. A single retrospective extension of the time limit by a maximum of five years is possible, provided that the Site Development Plan provides for an immediate subsequent use according to section 8 subsection 3 WindSeeG (see section 48 subsection 7 WindSeeG).

The planning approval or planning permission requires the consent of the Directorate-General for Waterways and Shipping.

As soon as the planning approval notice or planning permission is no longer in force, the facilities must be removed according to section 58 subsection 1 WindSeeG as required therein.

According to WindSeeG, the successful bidders must

- within twelve months of being awarded the tenders, submit the documentation required for the implementation of the hearing process concerning the plan to the Federal Maritime and Hydrographic Agency,
- at the latest 24 months prior to the binding completion date, supply proof to BNetzA of an existing financing arrangement for the construction of wind turbines to the extent of the awarded bid quantity,
- at the latest three months prior to the binding completion date, supply proof to BNetzA that the construction of the wind turbines has commenced,
- within six months after the binding completion date, supply proof to BNetzA that at least one wind turbine is technically operational,

[5] in the officially published version dated 23 January 2003, Federal Law Gazette I p. 102, last amended by article 7 of the Act dated 18 December 2018, Federal Law Gazette I p. 2639.

- and within 18 months after the binding completion date, supply proof to BNetzA that all of the wind turbines are technically operational (see section 59 subsection 2 WindSeeG).

In the instance of non-compliance with deadlines, a financial penalty shall be automatically applied.

2.5 Interfaces with other instruments of network planning

As a result of the changeover to renewable energy and hence the expansion of offshore wind energy, a nationwide network expansion is required. To determine the extent of the network expansion required, a statutory process consisting of multiple instruments and the participation of the public will assess and specify the nationwide requirement for expansion.

The following describes the interfaces with the other instruments involved in the network planning process in relation to the Site Development Plan.

2.5.1 Scenario framework

According to section 12a Energy Industry Act, the TSOs shall draw up a joint scenario framework that describes the most likely development of the German electricity supply system every 2 years (in every even calendar year). The scenario framework comprises at least three development paths (known as scenarios) which cover the range of likely developments for at least the next 10 years and at most 15 years given the medium- and long-term energy policy aims of the Federal - Government. One of the scenarios must show the most likely development over the at least next 15 years and at most 20 years. The scenario framework forms the basis for the establishment of the NDP according to section 12b Energy Industry Act for determining the expansion requirement of the transmission system, and is approved by BNetzA after consultation and assessment according to section 12a subsection 3 of the Energy Industry Act.

2.5.2 Network development plan

Based on the scenario framework, the transmission system operators shall submit a joint national NDP to the regulatory authority for confirmation every even calendar year according to section 12b Energy Industry Act. This plan must contain, among other things, all effective measures for needs-based optimisation, improvement and expansion of the network which are necessary for secure and reliable network operation at the latest by the end of the review period within the meaning of the scenario framework according to section 12a subsection 1 sentence 2 Energy Industry Act.

The NDP takes into consideration the community-wide network development plan (Ten-Year Network Development Plan, TYNDP for short; see chapter 2.5.4).

Starting with the submission of the first draft of the NDP in 2019, it contains all effective measures for needs-based optimisation and improvement for the expansion of the offshore connecting lines in the exclusive economic zone (EEZ) and in coastal waters, including the onshore grid connection points, which are required by the end of the review period according to section 12a subsection 1 sentence 2 Energy Industry Act, for gradual, needs-based and economic expansion as well as safe and reliable operation of the offshore connecting lines and the further transmission of electricity generated offshore. Based upon the findings of the latest published Site Development Plan, details concerning the planned completion date of these measures shall be provided in the NDP.

According to section 12c subsection 4 Energy Industry Act, BNetzA shall confirm the NDP by 31 December of each odd calendar year at the latest, taking into account the results of the official and public participation.

From 1 January 2019 onwards, the TSO (transmission system operators) must, according to section 17d subsection 1 Energy Industry Act, construct and operate the offshore connecting lines according to the specifications of the NDP and the Site Development Plan. The TSOs are required to commence the grid connection of offshore wind turbines according to the specifications of the NDP and the Site Development Plan and to proceed as quickly as possible with the construction of the grid connections of offshore wind turbines.

Some statements on the preliminary draft of the Site Development Plan requested the O-NDP - approved by BNetzA on 22 December 2017 to be taken into account. Firstly, reference is made to section 17c subsection 1 sentence 2 Energy Industry Act, according to which the O-NDP (Offshore Network Development Plan) for offshore connecting cables, the planned completion date of which is after 2025, is confirmed with the proviso of the corresponding rule of the respective offshore connecting cable in the Site Development Plan. Accordingly, the confirmation of the O-NDP 2017-2030 and the assignment of the confirmed connection systems are subject to proviso of the respective confirmation in the NDP 2019-2030 based on the Site Development Plan rule according to section 12c subsection 4 sentence 1 Energy Industry Act in conjunction with section 12b subsection 1 sentence 4 No. 7 Energy Industry Act. This proviso is no longer in effect for the confirmation and assignment of the connecting systems OST-2-1, OST-2-2 and OST-2-3 since in each respective connecting system at least one existing wind farm project according to section 37 subsection 1 No. 2 WindSeeG has received capacity by way of tender award within the scope of the second tender deadline according to section 26 subsection 1 WindSeeG. Secondly, reference is made to the fact that the criteria of the O-NDP for the chronological sequence of the implementation of the offshore connecting lines according to section 17b subsection 2 sentence 3 Energy Industry Act differs from the criteria of the Site Development Plan for the rule of the sites and the chronological order of their call for

tender according to section 5 subsection 4 sentence 2 WindSeeG, and also refer to different rules, so that it is possible in principle that the completion dates of offshore connecting lines may differ. Thus, the confirmation of the O-NDP 2017-2030 in the Site Development Plan cannot be taken into account for offshore connecting lines after 2025.

2.5.3 Federal requirement plan

For certain high-voltage line projects which serve the adaptation, development and expansion of transmission systems for the integration of electricity from renewable energy sources, for the interoperability of electricity grids within the European Union, for the connection of new power plants or for the avoidance of structural bottlenecks in the transmission grid, the energy-related necessity and the urgent need to ensure safe and reliable grid operation are determined as a federal requirement plan pursuant to section 12e Energy Industry Act in accordance with section 1 subsection 1 of the Federal Requirement Plan Act (Bundesbedarfsplangesetz - BBPlG)[6]

For this purpose, the regulatory authority BNetzA submits the current NDP as a draft for a federal requirement plan (BBP) to the Federal Government at least every four years in accordance with section 12e Energy Industry Act, which the Federal Government in turn submits to the upper and lower chambers of parliament (Bundestag and Bundesrat). In its draft, the regulatory authority may specifically identify the transnational and cross-border ultra--high-voltage lines and the connecting lines from the transformers of the offshore wind farm to the onshore grid connection points.

With the adoption of the federal requirement plan by the federal legislative body, the need for the energy sector and the urgent need for the projects included in the BBP are established as binding.

The Bundestag and Bundesrat adopted the first BBP in mid-2013 based on the NDP 2012. In December 2015, the BBP was amended based on the NDP 2014.

Offshore connecting lines are not included or specifically identified in the current Federal Requirement Plan Act.

2.5.4 Ten-Year Network Development Plan

Pursuant to article 8 subsection 3b) of Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross--border exchanges in electricity and repealing Regulation (EC) No 1228/2003[7], every two years the European transmission system operators for electricity (ENTSO-E) shall adopt a non-binding, Community-wide Ten-Year Network Development Plan, including a European forecast on the adequacy of electricity generation.

In this context, on 28 November 2018 the European TSOs ENTSO-E submitted a Ten-Year Network Development Plan (TYNDP 2018) to the Agency for the Cooperation of Energy Regulators (ACER) in the reviewed and final version and published it.

It contains national and international expansion measures that are significant for cross-border, European electrical power transmission. The results obtained from the NDP at a national level are included in the relevant TYNDP.

[6] Act dated 23 July 2013, Federal Law Gazette I p. 2543; 2014 I p. 148, 271, last amended by article 12 of the Act dated 26 July 2016, Federal Law Gazette I p. 1786.

[7] OJ 211/15, 14 August 2009.

2.5.5 Federal network plan

According to section 17 Grid Expansion Acceleration Act for transmission systems (Netzausbaubeschleunigungsgesetz Übertragungsnetz - NABEG)[8], the route corridors determined by the federal sectoral plan and those designated for connecting lines and cross-border power lines in the current Spatial Offshore Grid Plan and, as of 1 January 2019, in the current Site Development Plan, are included in the federal network plan for informational purposes.

This is how the federal sectoral plan culminates in the federal network plan. The route corridors defined by the federal sectoral plan are documented here and form the basis for the following approval procedures.

The federal network plan is administered by BNetzA and must be published once every calendar year in the Federal Gazette. It serves mainly informational purposes.

2.6 Existing spatial planning and planning

For the coordination of all space demands and concerns that occur in a certain space, Germany has a step-by-step planning system for spatial planning through federal spatial planning as well as state and regional planning. With this system, according to section 1 subsection 1 sentence 2 of the Federal Spatial Planning Act[9], different demands on a space are coordinated so as to settle conflicts that may occur at a respective planning level and to plan for individual uses and functions of the space.

The planning of the subsequent planning levels is specified in more detail through the step-by-step system. According to section 1 subsection 3 of the Federal Spatial Planning Act, the development, organisation and protection of the individual regions shall match the conditions and requirements of the territory as a whole; the development, organisation and protection of the territory as a whole shall allow for the conditions and requirements of its individual regions.

The Federal Ministry of the Interior, Building and Community (Bundesministerium des Inneren, für Bau und Heimat - BMI) is responsible for spatial planning in the EEZ at the federal level.

In contrast, for state-level planning, the respective federal state is responsible for the entire space of the federal state including the respective coastal waters. Regional planning is the responsibility of the federal states.

In addition to spatial planning for the respective areas of responsibility, there are sectoral plans based on sectoral laws for certain special planning areas. Sectoral plans serve to define

[8] Act dated 28 July 2011, Federal Law Gazette I p. 1690, last amended by article 2 of the Act dated 13 May 2019, Federal Law Gazette I p. 706.

[9] Act dated 22 December 2008, Federal Law Gazette I p. 2986, last amended by article 2 subsection 15 of the Act dated 20 July 2017, Federal Law Gazette I p. 2808.

details for the respective sector, taking into account the requirements of spatial planning.

2.6.1 Exclusive Economic Zone

Since 2004, the EEZ has provided the statutory basis for the establishment of maritime Spatial Plans (see chapter 2.6.1.2).

As part of the resolutions concerning the energy transition in June 2011 and the corresponding statutory changes, the Federal Maritime and Hydrographic Agency was tasked with preparing a plan for offshore power networks in the German EEZ, the Spatial Offshore Grid Plan, and to update it regularly (see chapter 2.6.1.1).

2.6.1.1 Spatial Offshore Grid Plans

The task of federal sectoral planning is now implemented in the Site Development Plan with additional tasks, mainly with regard to specifying the chronological implementation sequence of the sites for offshore wind turbines and offshore connecting lines. Please see chapters 2.1 and 2.5.

The first Spatial Offshore Grid Plan for the EEZ of the North Sea 2012 was published on 22 February 2013. The first Spatial Offshore Grid Plan for the EEZ of the Baltic Sea 2013 was published on 7 March 2014. Both plans were updated for 2016/2017.

2.6.1.2 Spatial Plans

To achieve a sustainable spatial planning in the EEZ, the Federal Maritime and Hydrographic Agency, by order of the Federal Ministry of the Interior, prepares Spatial Plans that come into force in form of ordinances of the Federal Ministry of the Interior. The Federal Maritime and Hydrographic Agency, by order of the then Ministry for Transport, Building and Urban Development (BMVBS), had already prepared the Spatial Plans for the German EEZ of the North Sea and the Baltic Sea in 2009.

BMVBS Ordinance on Spatial Planning in the German EEZ in the North Sea of 21 September 2009 (Federal Law Gazette I p. 3107) entered into force on 26 September 2009. On 19 December 2009, the BMVBS Ordinance on Spatial Planning in the German EEZ in the Baltic Sea of 10 December 2009 (Federal Law Gazette I p. 3861) entered into force.

With regard to maritime spatial planning, the international specifications of the United Nations Convention on the Law of the Sea (UNCLOS) must be observed. Besides the scientific and economic utilisation of the sea, mainly the interests of shipping and nature conservation are relevant. With regard to offshore wind energy, both spatial development plans include objectives and principles for offshore wind energy (3.5) and submarine cables (3.3).

In the process of preparing the Spatial Plans, a strategic environmental assessment was also carried out to determine, describe and evaluate the probable significant environmental impacts on factors.

The update of the existing spatial plans will begin in 2019.

2.6.2 Lower Saxony

The Spatial Plan of Lower Saxony, including the coastal waters of Lower Saxony, is the state spatial planning programme (Landes-Raumordnungsprogramm - LROP). The Ministry of Food, Agriculture and Consumer Protection of Lower Saxony, as the highest state planning - authority, is responsible for its preparation and amendment. The final decision on the state spatial planning program of Lower Saxony is made by the state government.

The state spatial planning program of Lower Saxony is based on an ordinance from 1994 and has been updated several times since then, most recently in 2017.

With regard to offshore wind energy, Annex 1, section 4.2 of the Ordinance on the state spatial planning program of Lower Saxony in the version dated 26 September 2017, contains, among other things, regulations on offshore wind energy use for the coastal waters of Lower Saxony and on the grid connection for wind energy use from turbines in offshore wind farms in the exclusive economic zone.

2.6.3 Schleswig-Holstein

The basis for spatial development in the state of Schleswig-Holstein is the State Development - Plan Schleswig-Holstein (LEP S-H). The Schleswig-Holstein Ministry of the Interior, Rural Areas and Integration is responsible for its preparation and amendment.

The current LEP S-H 2010 is the basis for the spatial development of the state up to 2025.

3.5.2 of the LEP S-H 2010 lays down principles and goals for wind energy, in this case also for submarine cable systems in the coastal waters to connect wind farms in the EEZ.

The state of Schleswig-Holstein initiated the procedure for updating the LEP S-H 2010 and carried out a participation procedure by 31 May 2019.

2.6.4 Mecklenburg-Western Pomerania

For the state of Mecklenburg-Vorpommern, the highest state planning authority is the Ministry of Energy, Infrastructure and Digitalisation of Mecklenburg-Western Pomerania. It is responsible for spatial planning at state level, including the coastal waters.

The State Spatial Development Programme of Mecklenburg-Western Pomerania (LEP M-V) came into force on 9 June 2016. In chapter 5.3 "Energy" of this report, rules are defined, among other things, on the expansion of renewable energy and on the use and expansion of electricity grids. With regard to offshore wind energy, chapter 8 "Spatial planning in coastal waters and integrated coastal zone - management" contains, among other things, rules related to wind turbines and lines.

3 Starting Position

3.1 Current state of the expansion

Offshore wind farms with their associated connecting lines have been constructed and operated since 2009 in German coastal waters as well as in the German EEZ of the North Sea and the Baltic Sea.

By the end of 2018, **offshore wind turbines** with a capacity of approximately 6.4 GW had been constructed and commissioned.

The expansion of offshore wind energy was and remains dependent on the underlying conditions. According to current planning, there will be a capacity of approximately 7.7 GW in offshore wind farm projects connected to the network by the end of 2020, and 10.8 GW by the end of 2025. These projects either have unconditional grid connection commitments based on the old law (pursuant to the old version of section 118 subsection 12 Energy Industry Act), capacity allocations (pursuant to section 17d subsection 3 or section 118 subsection 19 Energy Industry Act) or surcharges (pursuant to section 34 WindSeeG) by BNetzA.

By the end of 2018, **connecting lines** for offshore wind farm projects with a transmission capacity of approximately 6.9 GW had been constructed and put into operation. Eleven of the connecting lines are located in the North Sea and three in the Baltic Sea.

The state of offshore connecting line expansion depicted in Table 1 includes all grid connection systems for offshore wind farm projects that were commissioned to meet the entitlement of an individual wind farm operator to grid connection.

Thus, by the end of 2025 there will be 15 connecting cables in the North Sea and 8 connecting cables in the Baltic Sea.

The spatial proximity to the coast is important for various Site Development Plan rules. As a basis for the assessment of the spatial proximity to the coast, the approach in the O-NDP is adopted for the North Sea and Baltic Sea areas – divided into distance zones. The zones have a spatial depth of about 50 to 100 km. The coastal waters and the German EEZ of the North Sea are divided into five zones. The spatial depth of zone 1 in the North Sea and the Baltic Sea is consistent in such a way that the transfer of the spatial dimension of zone 1 of the North Sea covers the whole area of the coastal waters and the EEZ of the Baltic Sea. As a result, the coastal waters and the German EEZ of the Baltic Sea are completely within distance zone 1 of the O-NDP (see Figure 2 and Figure 3).

Table 1: Overview of offshore connecting cables by the end of 2025 and connected offshore wind farm projects

Connecting cables by the end of 2025	Transmission capacity	Offshore wind farm projects connected by the end of 2025
North Sea		
NOR-0-1 (Riffgat)	113 MW	Riffgat
NOR-0-2 (Nordergründe)	111 MW	Nordergründe
NOR-1-1 (DolWin5/epsilon)	900 MW	Borkum Reef Ground II, OWP West, Borkum Reef Ground I
NOR-2-1 (alpha ventus)	62 MW	alpha ventus
NOR-2-2 (DolWin1/alpha)	800 MW	Borkum Reef Ground 1, Trianel Wind Farm Borkum
NOR-2-3 (DolWin3/gamma)	900 MW	Borkum Reef Ground 2, Merkur Offshore
NOR-3-1 (DolWin2/beta)	916 MW	Gode Wind 01, Gode Wind 02, North Sea One
NOR-3-3 (DolWin6/kappa)	900 MW	Gode Wind III, Gode Wind 04
NOR-4-1 (HelWin1/alpha)	576 MW	Meerwind South/East, North Sea East
NOR-4-2 (HelWin2/beta)	690 MW	Amrum Bank West, KASKASI II
NOR-5-1 (SylWin1/alpha)	864 MW	Butendiek, Dan Tysk, Sandbank
NOR-6-1 (BorWin1/alpha)	400 MW	BARD Offshore 1
NOR-6-2 (BorWin2/beta)	800 MW	Albatros, German Bight, Veja Mate
NOR-7-1 (BorWin5/epsilon)	900 MW	EnBW He Dreiht
NOR-8-1 (BorWin3/gamma)	900 MW	EnBW High Seas, Global Tech I
Baltic Sea		
OST-3-1 (Baltic1)[10]	51 MW	EnBW Baltic1, EnBW Baltic 2, GICON-SOF
OST-3-2 (Baltic2)[8]	339 MW	
OST-1-1 (Ostwind 1)	250 MW	Arkona Basin South East, Wikinger, Wikinger South
OST-1-2 (Ostwind 1)	250 MW	
OST-1-3 (Ostwind 1)	250 MW	
OST-2-1 (Ostwind 2)	250 MW	ARCADIS East I
OST-2-2 (Ostwind 2)	250 MW	Baltic Eagle
OST-2-3 (Ostwind 2)	250 MW	

[10] The OST-3-2 connection system is based on the OST-3-1 connection system, so that the specified transmission capacity of 339 MW covers the total transmission capacity of both connection systems (see O-NDP 2030, version 2017, p. 30, footnote 16).

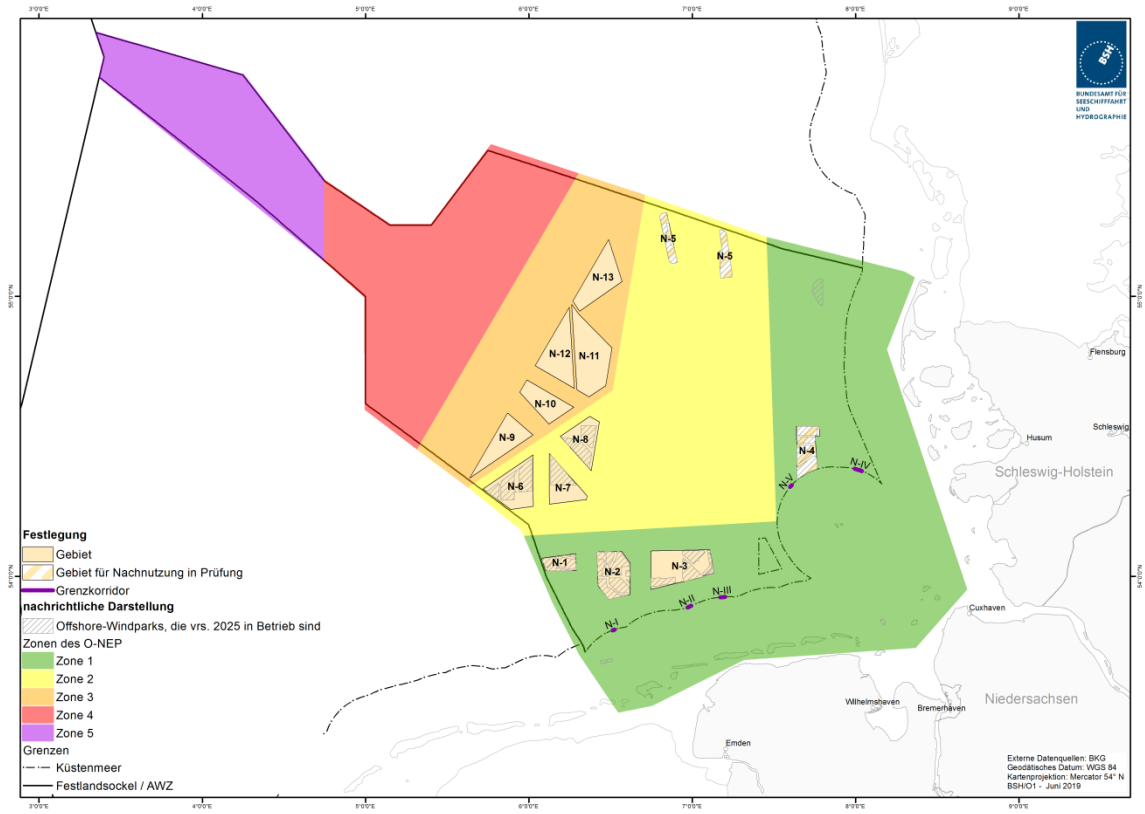

Figure 2: Offshore wind farms in the German EEZ of the North Sea that are expected to be in operation by the end of 2025, as well as gates to the coastal waters and the zone division of the O-NDP for the North Sea.

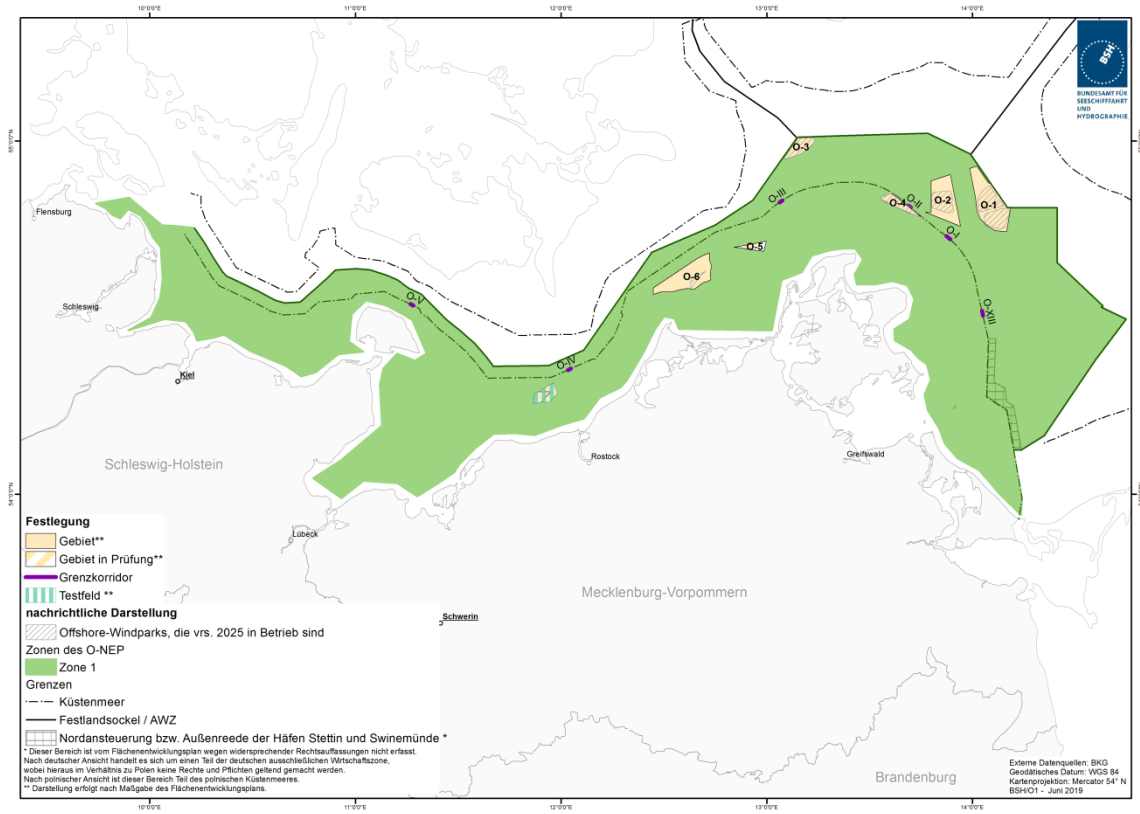

Figure 3: Offshore wind farms in the German EEZ of the Baltic Sea that are expected to be in operation by the end of 2025, as well as gates to the coastal waters and the zone division of the O-NDP for the Baltic Sea.

3.2 Legislative trajectory of offshore wind energy

According to the climate change mitigation strategy of the Federal Government to expand offshore wind energy use, which was drawn up in 2002, offshore wind energy already had special significance then. The proportion of wind energy provided in total power consumption is set to grow to at least 25% within the next three decades. The aim was then to install a capacity of a total of 25 GW in the North Sea and the Baltic Sea by 2030.

According to the energy concept of the Federal Government dated 28 September 2010, the share of renewable energy sources in the electricity supply is set to rise to 35% by 2020 and to 80% by 2050.

As part of the energy reform passed in 2011, renewable energy gained additional significance. On 6 June 2011, the Federal Government adopted an energy package that supplemented the measures of the energy - concept and aimed to accelerate implementation.

As part of the latest reform of the Renewable Energy Act in 2016, according to section 1 subsection 2 of the Renewable Energy Act 2017, the aim is to increase the share of electricity generated by renewable energy sources in the gross electricity consumption to

- 40 to 45% by 2025,
- 55 to 60% by 2035, and
- at least 80% by 2050.

This objective also has the purpose of increasing the proportion of renewable energy of the entire gross final consumption of energy by 2020 to at least 18%. The aim is to provide a steady, cost-efficient and grid-compatible expansion.

In section 4 No. 2 Renewable Energy Act, the expansion trajectory for offshore wind energy is regulated in that the increase in the installed capacity of offshore wind turbines is to be 6,500 MW by 2020 and 15,000 MW by 2030.

To what degree the implementation of the Paris Climate Agreement, the adoption of the national climate action plan 2050 by the Federal Cabinet on 14 November 2016, and the implementation of the coalition agreement dated 14 March 2018 of the governing parties are reflected in specific statutory measures, and what effect they have on the legislative expansion trajectory, remains to be seen.

3.2.1 Increased expansion trajectory of the scenario framework 2019-2030

The scenario framework 2019-2030 approved by BNetzA on 15 June 2018 contains, under the terms of the coalition agreement of 14 March 2018, the development of offshore wind energy which deviates from the goals of the Renewable Energy Act and thus from the legal requirements of the Site Development Plan. In statements on the preparation process of the Site Development Plan, it was requested with reference to the scenario framework 2019-2030 that the Site Development Plan present a corresponding scenario before a legal modification. To comply with this requirement, scenarios B/C 2030 and A 2030 of the scenario framework 2019-2030 and a long-term expansion scenario are presented in Annex (chapter 13) for informational purposes only.

4 Leading lines and Basic Principles

4.1 Introduction

The strategic planning of the expansion of offshore wind energy as well as the associated network topology for the transmission of electricity is of utmost significance for the supply with renewable energy. With the increase in different utilisations in the German EEZ, the available space for future utilisation and infrastructure becomes less and less.

For the purpose of systematic and efficient planning, the Federal Maritime and Hydrographic Agency received a statutory request to allocate areas and sites for offshore wind energy as well as corresponding routes and locations for the required network topology. The result of these coordinated processes will be that the actions in the German EEZ will be stipulated bindingly in terms of space and time.

The determination of planning principles and standardised engineering principles for the EEZ of the North Sea and the Baltic Sea is a mandatory prerequisite for the definite determination of the space requirement of the entire network topology within the scope of the Site Development Plan. The aim of specifying standardised engineering principles and planning principles is to provide a basis for a systematic and coordinated overall planning process. Otherwise it would not be possible to determine the required space with the necessary accuracy in the planning process. Apart from determining the space requirement as precisely as possible, the standard technical principles also help with cost efficiency and the needs-based expansion of connecting cables, which is in the economic interest of the country.

The starting point for determining standardised engineering principles (4.3) is the technical grid connection concept, details of which are described in Chapter 4.2.

The planning principles build upon the aims and principles of the Spatial Plan. During preparation of the spatial development plan, an overall assessment of the different uses has already been carried out. The relevant aims and principles are largely included in the Site Development Plan as planning principles and, with respect to applicability concerning objects of regulation touched on in the Site Development Plan, are checked, substantiated and assessed amongst each other concerning their significance based upon the interests and rights presented.

The standardised technical principles and planning principles were determined based upon a consideration of possibly affected public interests and legal positions (see justification of individual provisions and principles), so that the determination of standardised technical - principles and planning principles already contains a "pre-assessment" of possible alternatives.

4.2 Connection concepts

According to section 17d subsection 1 p. 1 Energy Industry Act, the responsible TSO must ensure the grid connection of offshore wind farms or construct and operate this connection in accordance with the NDP and the Site Development Plan according to section 5 WindSeeG. The function of this plan is to specify the necessary routes and locations for the entire grid topology in the German EEZ up to the boundary of the 12 n.m. zone within the scope of the existing framework conditions in spatial and temporal terms with regard to the calendar years of commissioning.

The definition of the connection concept is central to determining and securing the spaces necessary for the grid to connect the offshore wind turbines. For the components of the connecting lines, spatial planning is then carried out based on standard technical principles (4.3) and planning principles (4.4).

Already in the context of the initial preparation - process of the Spatial Offshore Grid Plan, it became clear that the definition of standardised technical specifications is an indispensable prerequisite for the spatial planning of the grid connections in order to determine the space required with the necessary precision for spatial planning that uses as little space as possible. According to section 5 subsection 1 no. 11 WindSeeG, standardised technology principles must be defined in the Site Development Plan for planning purposes. In addition to the main objective of defining the standardisation of the planning of the turbines by means of standardised specifications in order to use the space in the area as efficiently as possible and to create planning security for grid and wind farm operators and suppliers, costs must also be reduced as much as possible.

The Site Development Plan also distinguishes between the North Sea and the Baltic Sea with regard to the technical connection concepts, as was previously the case with the Spatial Offshore Grid Plan.

4.2.1 Standard concept North Sea: DC system

The standard concept in the North Sea is a DC system similar to the Spatial Offshore Grid Plan. Please see chapter 4.3.1.

The length of the route for connecting a site or area to the onshore grid connection point generally appears to be the decisive factor for the selection of suitable transmission technology for grid connection of offshore wind farms. In the case of route lengths of more than 100 km, additional reactive power compensation devices are to be provided regularly for three-phase connections. Transmission losses also increase with the length of the cable system. These are significantly lower in the case of the HVDC. Route lengths of more than 100 km are to be expected in the future for the North Sea EEZ, and also significantly greater than that with increasing distance from the coast.

When the HVDC is used, several offshore wind farms can generally be connected with a single HVDC grid connection system – consisting of a converter platform and a DC submarine cable system – due to the relatively high system capacity of the collective connection. This means that a significantly smaller number of cable systems is required compared to a connection using three-phase technology, thereby reducing the space required for the cable systems.

The grid connections of offshore wind farms in the EEZ of the North Sea are therefore implemented in HVDC as standard; see the summarised description of the connection concept in Figure 4.

4.2.1.1 Connection between converter platform and offshore wind farms: standard concept 66 kV

Contrary to the connection concept of the BFO-N 16/17, what is called the 66 kV direct connection concept is defined as the standard in the Site Development Plan. In the 66 kV direct connection concept, the lines for connecting the converter platform with the offshore wind turbines (known as cabling within the wind farm) are designed based on three-phase technology with a voltage of 66 kV. This eliminates the transformer platform and the 155 kV or 220 kV intermediate voltage level between the transformer and converter platforms. A connection to the onshore grid connection point will be established from the converter platform by means of direct current transmission. However, despite the possible decision not to use a transformer platform, a separate platform may be required for maintenance and housing purposes for the offshore wind farm.

The suitable transmission technology for the connections between the converter platform and the OWP generally depends on the length of the route. To date, route lengths of about 20 km have frequently been seen for the EEZ. In the case of longer distances and the resulting longer cable lengths, the disadvantages of three-phase technology outweigh the disadvantages due to the increasing losses and the associated warming of the seabed as the cable length increases. In addition, the space requirement on the converter platform increases with the length of the cable system due to the reactive power compensation required. In combination with the cost differentials between direct current (DC) and three-phase (AC) cable systems specified in the O-NDP, a central location of the converter platform with the shortest possible three-phase cables is therefore advisable.

BFO-N 16/17 envisaged the 155 kV connection concept to connect offshore wind farms (in this case, however, connecting the transformer platform of the offshore wind farm) to the converter platforms. In the context of the consultation on the update of BFO-N 16/17, a request was made to allow project developers, associations and manufacturers of offshore wind farms to open up standardised technical specifications for the possible implementation of new connection concepts. In particular, implementation of the concept of direct connection of offshore wind turbines with 66 kV submarine cable systems to the converter platform was required. As a result, the 66 kV direct connection concept was included in the update of BFO-N 16/17 (see BFO-N 16/17 section 5.1.2.7) as an alternative concept subject to clarification of several issues. Already with the preliminary draft and in the subsequent draft documents of the Site Development Plan, the 66 kV direct connection concept was used as the standard concept.

With a view to the areas that will be considered from 2026 onwards (see chapter 5.1) and the sites that are close to one another in these areas, the 66 kV direct connection concept appears to be advantageous in most cases from a spatial, environmental and nature conservation perspective compared to the connection concept with a transformer platform, as they are no longer required. In addition, a study commissioned by the TSOs showed that the 66 kV direct connection concept is more cost-efficient as an overall concept than the connection concept with a transformer platform (at voltage 155 kV) (Transmission System Operator, 2018).

The project developer of the offshore wind farm is responsible for connecting the wind turbines to the converter platform. The primary interface or ownership boundary between the Transmission Grid Operator and the project developer of the offshore wind farm is the entry point of the 66 kV submarine systems on the converter platform (cable termination of the 66 kV submarine cable). The 66 kV submarine cable systems are

fed into the platform using the direct pull-in concept, which guides the submarine cable systems to the switchgear. The project developer of the offshore wind farm guarantees an unrestricted submarine cable length of up to 15 m after cable has been pulled in on the platform, depending on the requirements of the TSO.

It is likely that the 66 kV direct connection concept will require an increased level of coordination in the preparation and implementation of the respective individual approval procedures. Due to the shared use of the converter platform as a result of the interface between the TSO and the project developer of the offshore wind farm at the entry point of the 66 kV submarine cable systems, close coordination and clear responsibilities are required for planning, construction, operation, maintenance and repair, the possible case of repair and dismantling between the TSO and the project developer of the offshore wind farm as well as between different projects developers of the offshore wind farms who connect their offshore wind turbines to the same converter platform. For those involved, there is an unlimited need for cooperative collaboration. This applies in particular to the exchange of information on project dates, and the reciprocal transfer of necessary information and details on the platform and the components to be installed on it. In all phases, the two sides must inform one another about project-relevant developments and coordinate deadlines. See the implementation timetable pursuant to section 17d subsection 2 Energy Industry Act.

It should be noted that the shared use of the converter platform by the project developer of the offshore wind farm only includes the shared use necessary due to the technical interface on the converter platform. The project developer of the offshore wind farm must therefore be able to implement the measures required for grid connection on the converter platform on schedule. On the other hand, the TSO must coordinate and implement the measures necessary to prepare the grid connection at an early stage with the project developer of the offshore wind farm. A separate platform of the project developer of the offshore wind farm for housing and maintenance purposes may therefore be necessary.

If at least two sites to be connected are located far apart in an area, the BFO-N 16/17's connection concept with transformer platform seems to be advantageous, since a smaller number of submarine cable systems is required and the increased voltage results in less transmission losses than with the 66 kV direct connection concept. In order to further reduce transmission losses and the number of submarine cables required, however, a connection using the 220 kV voltage level is defined as an alternative to the 66 kV direct connection concept. This connection concept generally corresponds to the 155 kV connection concept with transformer platform familiar from BFO-N 16/17, but the transmission voltage is increased to 220 kV for the reasons mentioned.

For individual areas, it is therefore possible to - deviate from the standard concept and define a connection concept with transformer platforms if the corresponding spatial conditions are available. See the rules in section 5.2.1. With regard to the definition of the standard transmission voltage of +/- 525 kV for the sites starting from area N-10 (see chapter 4.3.1.2), it can be assumed that the AC connection systems will have to provide much higher capacity on a larger site than is the case with 900 MW or 1,000 MW. This leads to an increase in the number of cable harnesses used to connect the wind turbines to the platform and its length. According to the current state of knowledge, however, it is expected that the direct connection concept is appropriate and can be pursued further even if the transmission voltage is higher. Another conceivable long-term solution would be to

further increase the voltage level for the direct connection concept, for example to 110 kV. Particularly in the case of large, interconnected sites in combination with the standard capacity of 2,000 MW and future wind turbines with higher rated capacity, it would appear advisable to reduce the required submarine cable systems. However, it would be necessary to test the direct connection of wind turbines with a voltage greater than 66 kV required for this purpose. The Site Development Plan will monitor this issue and, if necessary, address it again in an update.

It must be assessed to what extent a connection to converter platforms with a 155 kV or 220 kV connection concept is also possible when using the 66 kV direct connection concept. It should be possible for connection systems to be connected to each one, and the appropriate spatial and technical provisions should be made on the platforms. In this case, (partial) redundancies and thus safeguardsto prevent outages could be created in the system. See the procedure described in section 5.11 for providing proof of cost-effectiveness.

Summary

- Determination of the 66 kV connection concept as standard for the EEZ of the North Sea
- The cable end plug of the 66 kV submarine cable systems serves as the interface between transmission network operator and the project developer of the offshore wind farm
- Deviation from the standard concept is possible in case of spatial requirements in an area
- If a deviation is required, determination of the connection concept of the BFO-N 16/17 with transmission voltage of 220 kV

4.2.2 Standard concept Baltic Sea: Three-phase system

The TSO, which is obliged to connect the offshore wind farms in the Baltic Sea to the grid, has so far pursued a connection concept based on three-phase technology. When using the three-phase technology, offshore wind farms are connected to the grid by combining the electricity generated by the individual wind turbines from one or more wind farms at a transformer platform, and from here it is routed directly ashore via AC cable and on to the grid connection point. In contrast to the standard concept in the North Sea (HVDC), this means that no separate converter platform is required for the grid connection itself. However, in order to transmit a specified capacity, a higher number of cable systems is required when using three-phase technology due to the lower transmission capacity of three-phase submarine cable systems. Due to the expected low wind farm capacity in the German EEZ of the Baltic Sea for commissioning activities from 2026 compared to the capacity of an HVDC system, a connection by means of a direct current system would probably lead to permanent vacancies. Offshore connecting lines in the Baltic Sea will thus be designed according to the connection concept known from the BFO-O Federal Law Gazette 16/17 based on three-phase technology. See the summarised description of the connection concept in Figure 5.

In contrast to BFO-O 16/17, the transformer platform is not planned and constructed by the project developer of the offshore wind farm or the successful bidder on a site, but by the TSO subject to connection obligations. The project developer of the offshore wind farm is responsible for connecting the wind turbines to the transformer platform. The primary interface or ownership boundary between the transmission system operator and the offshore wind farm project developer is the entry point of the submarine cable systems within the wind farm on the transformer platform (cable termination of the submarine cable). The 66 kV submarine cable systems are fed into the platform using the direct pull-in concept, which guides the submarine cable systems to the switchgear. The project developer of the

offshore wind farm guarantees an unrestricted submarine cable length of up to 15 m after cable has been pulled in on the platform, depending on the requirements of the TSO. In the case of compelling technical reasons, a deviation is possible if the TSO and the project developer of the offshore wind farm agree.

It is likely that this changed connection concept will require an increased level of coordination in the preparation and implementation of the respective individual approval procedures. Due to the shared use of the transformer platform as a result of the interface between the TSO and the project developer of the offshore wind farm at the entry point of the submarine cable systems within the wind farm, close coordination and clear responsibilities are required for planning, construction, operation, maintenance and repairs, the possible case of repair and dismantling between the TSO and the project developer of the offshore wind farm as well as between different projects developers of the offshore wind farms who connect their offshore wind turbines to the same transformer platform. For those involved, there is an unlimited need for cooperative collaboration. This applies in particular to the exchange of information on project dates, and the reciprocal transfer of necessary information and details on the platform and the components to be installed on it. In all phases, the two sides must inform one another about project-relevant developments and coordinate deadlines. See the implementation timetable pursuant to section 17d subsection 2 Energy Industry Act.

It should be noted that the shared use of the transformer platform by the project developer of the offshore wind farm only includes the shared use necessary due to the technical interface on the transformer platform. The project developer of the offshore wind farm must therefore be able to implement the measures required for grid connection on the transformer platform on -schedule. On the other hand, the TSO must coordinate and implement the measures necessary to prepare the grid connection at an early stage with the project developer of the offshore wind farm.

Due to the planning and construction of the transformer platform by the TSO, it is necessary that the voltage level of the submarine cable systems within the wind farm of the project developer of the offshore wind farm on the transformer platform is known at an early stage. For this reason – as in the North Sea – the voltage level of the submarine cable systems within the wind farm is set at 66 kV.

Summary

- Determination of the three-phase connection concept as standard for the EEZ of the Baltic Sea
- Responsibility for the planning, construction and operation of the transformer platform and the submarine cable system for transmissionsystem operator.
- The cable termination of the submarine cable systems within the wind farm serves as the interface between transmission system operator and the project developer of the offshore wind farm
- Voltage level of the submarine cable systems within the wind farm 66 kV

4.3 Standard technical principles

4.3.1 DC system North Sea

For the grid connection of the offshore wind farm in the North Sea for the area of the EEZ, a connection concept based on the HVDC is used similar to the previous grid connections; see chapter 4.2.1.

4.3.1.1 DC system: Voltage sourced technology

The existing grid connection systems and those planned under the Site Development Plan in the North Sea will be implemented with self-guided (VSC – voltage sourced converter) technology. This variant was already defined as the standard in the BFO-N and can be considered established.

In contrast to the conventional grid-guided technology, the self-guided HVDC can rebuild a grid without the need to provide reactive power from the connected three-phase system. This property is necessary to automatically restore the transmission after a network error, to control it in normal operation and to stabilise the surrounding three-phase network. See section 5.1.2.2 of BFO-N 16/17 for further justification on the determination of the self-guided technology.

4.3.1.2 DC system: transmission voltage +/- 320 kV for zone 1 and 2; transmission voltage +/- 525 kV for zone 3

The existing grid connection systems and those planned under the Site Development Plan in zones 1 and 2 of the North Sea will be implemented with a transmission voltage of +/- 320 kV. This variant was already defined as the standard in the BFO-N and can be considered established. For future grid connection systems for offshore sites in zone 3, a transmission voltage of +/- 525 kV is defined. The DC systems for connecting the sites in area N-9 constitute a deviation from this. A transmission voltage of +/- 320 kV is defined for these grid connection systems.

The definition of a uniform voltage level for DC systems (consisting of the converter on the converter platform and the DC submarine cable system) serves to create a standard for the connection systems, particularly also for the converter platform. Based on the definition of framework parameters, manufacturers and grid operators can develop standardised solutions and advance planning at an early stage – if necessary also independent of location. The aim is to achieve a certain degree of standardisation in the planning of the turbines by means of standardised specifications and thus to accelerate the planning process, to achieve planning security for grid and wind farm operators and suppliers and to reduce costs. A uniform voltage level also makes a possible cross-connection between the offshore connecting lines possible.

To enable the spatially compatible planning and implementation of cross-connections between the offshore connecting lines, the aim is to achieve the highest possible capacity of the DC system and therefore the highest possible system voltage. A standard transmissionvoltage of +/- 320 kV has developed on the market independent of manufacturer. Limitations in capacity are mainly due to the available cable technology and the space requirements of the converter platform.

Due to the possibility of also increasing the transmission capacity with an increased voltage level and thus making connection systems more efficient, it seems advisable to reduce the number of systems as far as possible and maximise their respective transmission capacity, in particular with a view to large interconnected sites in zone 3 of the EEZ of the North Sea and the considerable spatial restrictions in the routing of onshore connecting lines.

The consultations on the Site Development Plan each addressed the future availability of components for an increased transmission voltage of +/- 525 kV with consultation questions. In summary, it can be concluded from the comments received that the technology is expected to be available from around 2030. In their joint statement on the second draft of the Site Development Plan, the TSOs pointed out that implementation in 2029 was "not feasible" and that implementation in 2030 was "critical". In addition, according to the current status of NDP 2019-2030, not enough onshore grid connection points will be available by 2030 to accommodate grid connection systems with transmission - capacity of 2,000 MW.

For these reasons, a standard transmission voltage of +/- 525 kV is defined for DC systems for connecting sites in zone 3 of the North Sea (areas N-10 to N-13).

4.3.1.3 DC system: standard capacity 900 MW for zones 1 and 2; standard capacity 2,000 MW for zone 3

The definition of a standardised transmission capacity of the DC connection systems formed the central basis for spatial planning in the BFO-N. The BFO-N was designed to meet the requirements of the German Federal Ministry of Education and Research (BFO-N). The space - required for the transmission of the installed wind energy capacity was determined based on a standard capacity of 900 MW.

A standard capacity for HVDC systems in the North Sea is also defined in the Site Development Plan. However, for zones 1 and 2 in particular, a heterogeneous picture of the availability of areas emerges, which in some cases can lead to an individual determination of the transmission capacity of a connection system for these areas. However, a standard transmission capacity of 900 MW per connection system is to be assumed, which may not be fallen short of. With regard to the areas and sites in zone 3, however, it seems advisable to define the highest possible standard capacity in order to minimise the number and thus the space for converter platforms and routes for the transmission of wind energy capacity.

For the HVDC systems in zones 1 and 2 of the EEZ of the North Sea, a standard transmission capacity of 900 MW is defined.

Following extensive consultations on the availability of technology, an increase in the standard transmission capacity to 2,000 MW in conjunction with an increase in transmission - voltage to +/- 525 kV appears feasible and advisable in the context of the limited route corridors. Since this voltage level is defined for the sites from area N-10 onwards in zone 3 and these are not expected to go into operation until 2030 at the earliest, it can be assumed that technology will be available at the right time.

Accordingly – as well as after testing the onshore grid connection points suitable for accommodating the increased capacity – the +/- 525 kV system is defined for the areas in zone 3 starting with area N-10, whereby in this area a capacity of only 1,700 MW is required due to the available site potential. For the intended NOR-9-1 connection system and the downstream NOR-9-2 system, an individual transmission capacity of 1,000 MW at a voltage of +/- 320 kV is specified.

The goal of increasing the standard capacity in comparison to the BFO-N 16/17 is to minimise the number and thus the space required for converter platforms and routes for transmitting the wind energy capacity. Based on this specification of framework parameters, manufacturers and grid operators can develop standardised solutions and advance planning at an early stage – if necessary also independent of location.

There are indications from the TSOs that the transmission capacity of +/- 525 kV HVDC

connection systems is limited to less than 2,000 MW if the maximum permissible sediment warming (2K criterion) is complied with. A relevant assessment with heating calculations was carried out as part of an accompanying research project commissioned by the Federal Maritime and Hydrographic Agency. Thus, the transmission of 2,000 MW with cable cross-sections already in use today appears possible in the EEZ in compliance with the 2K criterion. At the same time, the results indicate that the greater restrictions in coastal waters areas would require larger cable cross-sections (Prognos, 2019). The evaluation of these results is still ongoing; see section 4.4.4.8.

HVDC systems with a transmission voltage of +/- 525 kV and a transmission capacity of 2,000 MW can be implemented as bipoles with metallic return conductors to increase fail-safe operation and improve controllability. This design allows the system to be operated with the remaining pole as a monopoly in the event of failure or unavailability of one pole, which allows at least transmission of a maximum of 50% of the transmission capacity. In contrast to the DC connection systems installed to date in the EEZ of the North Sea, the bipolar design with metallic return conductor would require an additional cable, so that three cable systems would have to be installed in the bundle.

4.3.1.4 DC system: prerequisites for cross-connections between connections / control panels to be provided

The Site Development Plan defines spatial rules for connections between converter platforms, refer to chapter 5.11.

Cross-connections can contribute to system reliability. A connection of the connecting lines by three-phase or by DC systems can generally be considered, but currently only three-phase - technology can be used for the connections. The necessary components for direct current cross-connections are not yet available.

Control panels are used to connect the AC cables from the offshore wind farm or the three-phase connection of connecting lines to one another. These control panels must be designed for the respective use, especially with regard to any necessary reactive power compensation, and must meet the technical requirements for connections between platforms. In order to ensure a possible three-phase connection between platforms, two control panels must therefore be provided on each platform for each connection. Please see chapter 5.11.

In order to be able to use these control panels and to pull the corresponding submarine cables onto the platform, the appropriate technical prerequisites must be met (e.g. sufficient j-tubes).

At the time of publication of the Site Development Plan, no detailed information on the technology or voltage level of the respective cross-connections can be provided. These depend, among other things, on the transmission capacity and the connection - concept. This specification is therefore further defined in the update procedure.

4.3.1.5 DC system: 66 kV direct connection concept

As outlined in chapter 4.2.1.1, the 66 kV direct connection concept is defined as the standard connection concept for connecting offshore wind turbines to the converter platform. In this case, the connections are implemented in three-phase technology with a transmission voltage of 66 kV.

Since the concept involves a direct connection of offshore wind turbines to the converter platform without an intermediate transformer platform, the offshore wind turbines must fulfil the requirements for connection to the converter platform, for example by having an output voltage of 66 kV. For other technical connection

requirements, refer to the offshore grid connection regulations of VDE (VDE-AR-N 4131).

Summary

- Implementation of the HVDC transmission systems in voltage sourced (VSC) technology
- Standard transmission voltage: +/-320 kV in zones 1 and 2; +/- 525 kV in zone 3
- Standard transmission capacity: 900 MW in zones 1 and 2; 2,000 MW in zone 3
- Deviation for connection of area N-9: transmission voltage +/- 320 kV and transmission capacity 1,000 MW
- Fulfil prerequisites for cross-connections by providing two control panels per connection
- Connection of offshore wind turbines to the converter platform in 66 kV three-phase technology

4.3.2 Three-phase system Baltic Sea

For the grid connection of the offshore wind farm in the Baltic Sea for the area of the EEZ, a connection concept based on three-phase technology is used similar to the design of the previous grid connections; see chapter 4.2.2.

4.3.2.1 Three-phase system: Transmission voltage 220 kV

The existing grid connection systems and those planned under the Site Development Plan in the Baltic Sea will be implemented with a transmission voltage of 220 kV using three-phase technology. This variant was already defined as the standard in the BFO-O 16/17 and can be considered established (see section 4.2.2).

The definition of a uniform voltage level for the three-phase system serves to create a standard for the connection systems both with regard to the components of the transformer platform and the submarine cable systems. In addition, a clear planning basis is also created for the project developers of the offshore wind farm. This is intended to accelerate planning procedures, achieve planning reliability for grid and wind farm operators and suppliers and – also in the interests of consumers – reduce costs.

Two of the grid connection systems already implemented by the TSO in the Baltic Sea area for the connection of offshore wind energy projects in the area of cluster 3 of the BFO-O 16/17 and in coastal waters are based on a transmission voltage of 150 kV. For the other three systems implemented to connect offshore wind farm projects in area O-1, an increase in the transmission voltage to 220 kV was implemented.

The design for a voltage level of 220 kV enables the highest possible transmission capacity per cable system – for the three-phase connection – to be achieved and allows transmission to take place with as few cable systems as possible.

4.3.2.2 Three-phase system: standard capacity 300 MW

In contrast to the North Sea, neither the BFO-O 16/17 nor the (preliminary) draft of the Site Development Plan defined a standard capacity for the three-phase system of the Baltic Sea. Nevertheless, standardisation in the Baltic Sea can offer the same advantages as in the North Sea.

The three-phase systems currently in operation and under construction in the Baltic Sea have a transmission capacity of 250 MW with a transmission voltage of 220 kV. During the consultations on the preliminary draft and draft of the Site Development Plan, it was argued on the one hand that projects with transmission capacities of 350 MW to 400 MW at the same transmission voltage were already being implemented internationally. On the other hand, the TSO responsible for the Baltic Sea emphasises that there is no operational

experience for these service areas and that planning restrictions such as what is known as the 2K criterion (see planning principle 4.4.4.8) must also be taken into account, particularly in the case of the heterogeneous soil conditions prevailing in the Baltic Sea.

A standard capacity of 300 MW has therefore been defined for the three-phase systems in the Baltic Sea.

4.3.2.3 Three-phase system: prerequisites for cross-connections between connections / control panels to be provided

The Site Development Plan defines spatial rules for connections between transformer platforms; see chapter 5.11. Cross-connections can contribute to system reliability. For three-phase systems in the Baltic Sea, only a connection of the connecting lines using three-phase technology can be considered.

Control panels are used to connect the AC cables from the offshore wind farm or the three-phase connection of connecting lines to one another. These control panels must be designed for the respective use, especially with regard to any necessary reactive power compensation, and must meet the technical requirements for connections between platforms. In order to ensure a possible three-phase connection between platforms, one control panel must therefore be provided on each platform for each connection. See the procedure described in section 5.11 for providing proof of cost-effectiveness. In order to be able to use this control panel and to pull the corresponding submarine cables onto the platform, the appropriate technical prerequisites must be met (e.g. sufficient j-tubes).

Since only a connection between platforms using the 220 kV transmission voltage can be considered for three-phase systems in the Baltic Sea, the additional control panel to be provided for this voltage level must be implemented.

Summary

- Standard transmission voltage 220 kV
- Standard transmission capacity 300 MW
- Fulfil prerequisites for cross-connections by providing one control panel per connection

4.3.3 Cross-connections between converter/transformer platforms

The Site Development Plan defines spatial rules for connections between converter platforms (in the EEZ of the North Sea) or transformer - platforms; see chapter 5.11. Cross-connections can contribute to system reliability. In the EEZ of the Baltic Sea only three-phase systems can be used to connect the connecting lines. A connection by means of three-phase systems is also possible in the EEZ of the North Sea. According to the current state of information, the components required for a DC connection are currently not available.

At present, no detailed information on the technology of the respective cross-connections cannot yet be provided. These depend, among other things, on the transmission capacity. This specification is therefore further defined in the update procedure.

4.3.4 Cross-border cables (interconnectors)

4.3.4.1 Bundled DC Subsea Cable

Interconnectors are to be implemented in HVDC. Due to the significantly lower losses and the eliminated need for reactive power compensation compared to the AC Subsea Cable, all known projects for cross-border submarine cable connections are already being planned as DC connections through the German EEZ of the North Sea.

The connections must be designed with forward and return conductors, which are laid in bundles so that the magnetic fields of the conductors largely compensate one another. This generally allows a magnetic flux density to be achieved that is well below the average strength of the earth's magnetic field and excludes significant impacts on the factors. Due to the development of offshore wind energy, in addition to "traditional" cross-border submarine cable systems that connect terrestrial networks, cross-border connections between offshore wind farms such as the "Kriegers Flak Combined Grid Solution" are now also being established. These connections can be implemented as three-phase connections due to the shorter route length and the need for the corresponding connection concept (see chapters 4.2.1 and 4.2.2) and are therefore not covered by this specification.

4.3.4.2 Consideration overall system

The planning and construction of cross-border submarine cable systems must take into account the various rules in this plan, in particular for the connection of offshore wind farms to the grid. To this end, it must be outlined in the approval - procedure for cross-border submarine cable systems how they can be incorporated into the network planning without adversely affecting the expansion targets for offshore wind energy. From this perspective, it makes sense to examine whether and to what extent cross-border submarine cables can connect offshore wind farms on a case-by-case basis. For this reason, the technology used in particular must be reviewed and its compatibility with the overall network weighed against other advantages (such as higher transmissioncapacity).

In the course of the update of the Site Development Plan, the development of an international offshore grid will be further supported, including both the cross-border - submarine cable systems and the connecting lines for offshore wind energy. Before any integration of the interconnector systems into a meshed offshore network could take place, technical and regulatory issues would have to be clarified in addition to the question of cost-effectiveness.

Table 2: Overview of the technical principles

Standard technical principles	North Sea		Baltic Sea
	Zones 1 and 2	Zone 3	Zone 1
Grid connection system			
Standard connection concept	Direct current (DC)	Direct current (DC)	Alternating current (AC)
Converter technology	Self-guiding (VSC converter)	Self-guiding (VSC converter)	-
Standard transmission voltage	+/- 320 kV DC	+/- 525 kV DC[1)]	220 kV AC
Standard transmission capacity	900 MW	2,000 MW[2)]	300 MW
Number of control panels to be provided per connection	2	2	1
Connection offshore wind farm			
Standard connection concept	Direct connection (AC)	Direct connection (AC)	Direct connection (AC)
Standard transmission voltage	66 kV	66 kV	66 kV
Alternative concept	Connection via transformer platform	Connection via transformer platform	-
Transmission voltage alternative concept	220 kV	220 kV	-
Interconnectors			
Transmission technology	Direct current (DC)		
Laying	Bundled cable laying		

[1)] in area N-9: +/- 320 kV

[2)] in area N-9: 1,000 MW; in area N-10: 1,700 MW

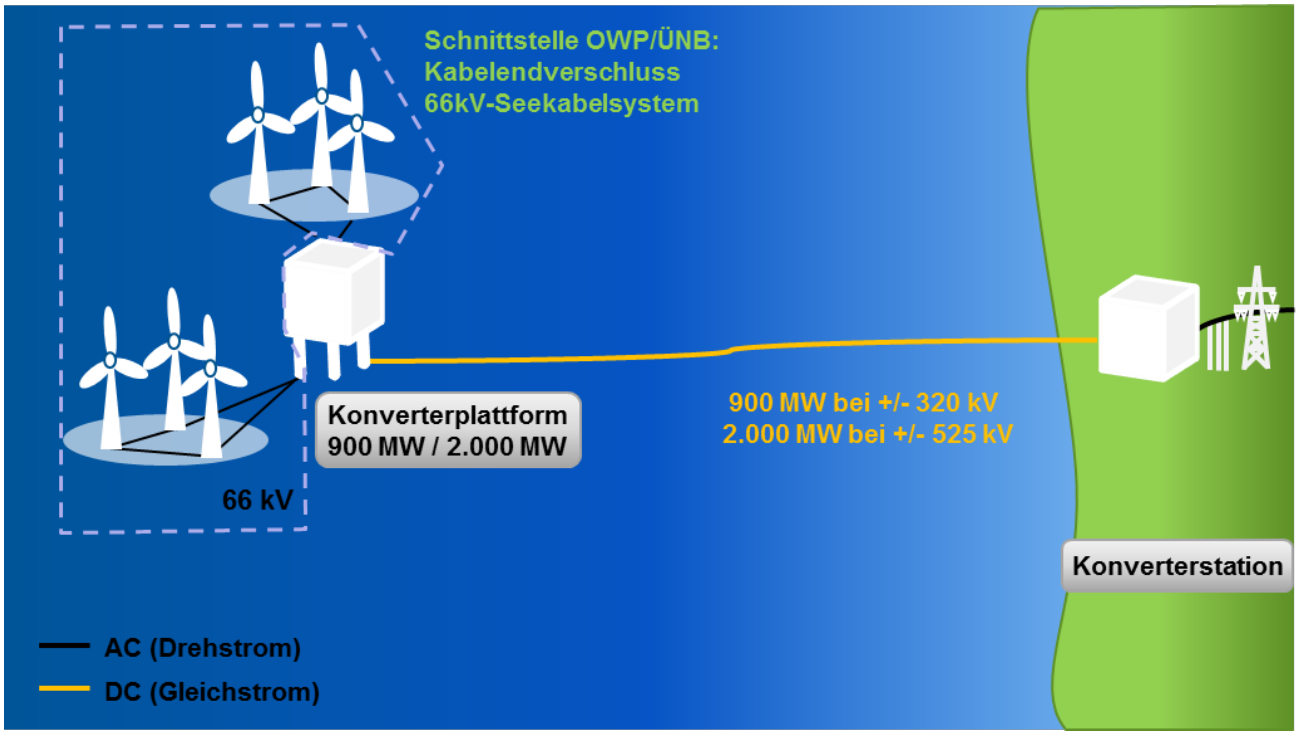

Figure 4: Schematic diagram of the connection concept for the North Sea

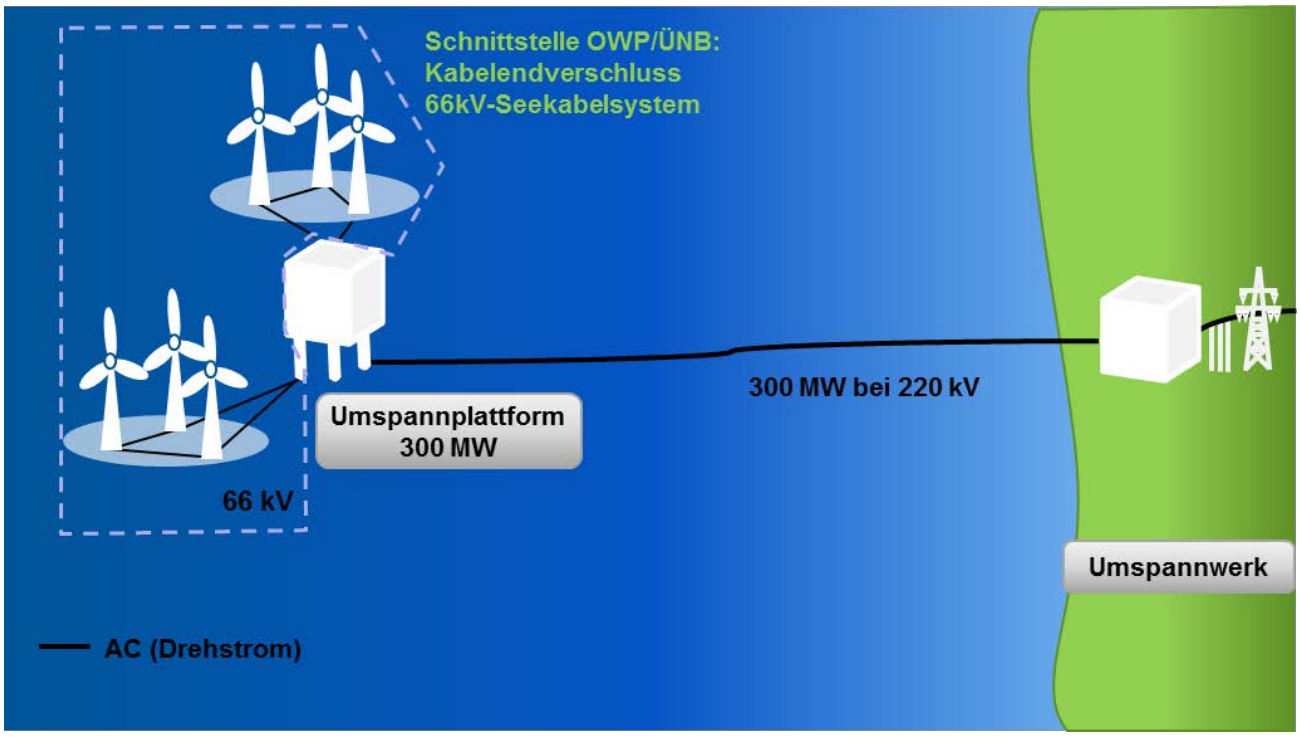

Figure 5: Schematic diagram of the connection concept for the Baltic Sea

4.4 Planning principles

According to section 5 subsection 1 No. 11 WindSeeG, the Site Development Plan contains determinations concerning planning principles.

The planning principles apply for the sector of the German EEZ and build upon the aims and principles of the Spatial Plan.

General planning principles will now be specified.

4.4.1 General principles

Planning principles for offshore wind turbines, platforms and submarine cable systems are listed below.

Summary

- Chronological overall coordination of construction and installation work
- Consideration of nature conservation and environmental protection concerns
- Safety and efficiency of shipping may not be impaired.
- Safety and ease of air traffic must not be diminished
- The security of national and alliance defence may not be impaired.
- Obligation to dismantle and security deposit
- Consideration of all existing and approved usages
- Consideration of cultural assets
- Noise mitigation
- Minimisation of scour protection
- Consideration of regulatory standards, specifications and concepts
- Emission mitigation
- Consideration of ordnance locations
- Installation of sonar transponders

4.4.1.1 Chronological overall coordination of construction and installation work

In order to prevent or mitigate cumulative effects, overall coordination of the timetable for construction and installation work must be carried out taking into account the underlying project-specific conditions.

The definition complies with the principle of spatial planning 3.3.1 (11) (Baltic Sea) and 3.3.1 (13) (North Sea) according to which, in order to prevent or reduce cumulative effects, the overall timetable for laying submarine cables to transmit the energy generated in the EEZ is to be coordinated.

In the case of cable systems that are installed in close proximity to each other, efforts should be made to coordinate the overall timetable. This reduces the number of interventions and prevents or reduces possible cumulative effects.

To reduce the impact on the marine environment, similar efforts should also be made to coordinate the overall timetable for the construction of offshore wind farms, platforms and submarine cable systems in close proximity to one other.

This also includes reducing to a minimum shipping traffic for construction and operation and the associated acoustic and visual impairments through optimal planning of construction and scheduling.

4.4.1.2 No negative impact on safety or ease of shipping traffic

The safety and efficiency of shipping must not be compromised as a result of the construction and operation of offshore wind turbines, platforms and submarine cables.

This rule is derived from the objective of spatial planning 3.5.1 (2), according to which the safety of transport may not be impaired by the construction and operation of electricity generation systems in priority areas for wind energy, and from the principle of spatial planning 3.5.1 (6) (Baltic Sea) or 3.5.1 (7) (North Sea), according to which the safety and efficiency of traffic should not be impaired by electricity generation even outside priority areas for wind-energy.

In order to ensure the safety of shipping, but also the integrity of the turbines, safety zones are established around the turbines in accordance with section 53 WindSeeG – in particular in the case of adjacent priority or reserved areas for shipping – usually 500 m around the wind turbine or platform. Within the defined areas, the safety zone is to be defined in such a way that it is continuous and gaps are avoided. The safety zone is to be established outside the priority and reserved areas for shipping (Spatial Plan for the EEZ of the Baltic and North Seas).

The safety zone not only ensures that commercial shipping does not take place in these areas but also that proper shipping operated in accordance with the rules of good seamanship continues to be generally possible without danger. The safety zone of the offshore wind turbines and platforms is regularly created for both.

The structure must be designed in such a way that, in the event of a ship collision, the hull is damaged as little as possible, including the working vehicles used during construction and operation. The requirements of the design standard must be taken into account.

Wind turbines and platforms on the periphery of an area should be integrated in terms of transport into the overall development of an area.

During the installation and operation phases, appropriate measures are to be taken to ensure the safety of shipping traffic, including for example:

- Safety measures during the construction phase, including temporary identification, buoys and optical-mobile transport safety (ship transport safety)
- Visual and radio identification including proper implementation
- Marine observation
- As necessary, provision of additional trailing capacity

Refer to the planning principles 4.4.1.10 and 4.4.3.1.

4.4.1.3 No negative impact on safety or ease of air traffic

The safety and ease of air traffic must not be compromised as a result of the construction and operation of offshore wind turbines, platforms and submarine cables.

Offshore platforms must be planned by the project developer in such a way that access to them by ship is reliably possible. A helicopter landing deck (HLD) may also be provided on converter platforms (mother/primary platform) and on all other types of offshore platforms. Areas for winch operation can also be set up offshore platforms to prevent risks to the life and limb of people. However, these areas may not be used for regular access.

The project developer must prevent existing and/or planned helicopter landing decks on offshore platforms in the wind farm area of the project from becoming unusable due to the construction of aviation obstacles (i.e. in particular offshore wind turbines) or the resulting shipping traffic in their vicinity.

Nothing may be built on approach and departure corridors for offshore platforms over their entire length above the water surface.

Approach and departure corridors[11] for offshore platforms may not exceed the EEZ limits. The project developer must take this into account when planning flight corridors.

Approach and departure corridors for the offshore platforms are to be at least 150° apart and must be defined along the predicted main wind direction. They are to be planned in a straight line over their entire length. When aligning the approach and departure corridors for the offshore platforms, it is important to avoid overlapping with adjacent corridors. These aspects must be taken into account by the project developer when planning approach and departure corridors for the offshore platforms.

Along the flight corridors of an offshore platform with HLD, it must be ensured that enough free space is available for the exercise of an emergency flight manoeuvre. Guaranteeing this open space can lead to restrictions in shipping. Within the safety zone of an offshore wind farm, appropriate measures must therefore be taken to avoid collisions between ships and air traffic. Rules are necessary. The same applies to the security zone of an offshore platform with HLD outside an offshore wind farm. Excluded from this are the ships, official vehicles and, in the case of emergencies or drills, the equipment of search and rescue teams which serve to construct, supply, operate and dismantle the platform or the offshore wind farm.

The wind turbines along the flight corridors are equipped with tower lighting by the project developers of the offshore wind farm in accordance with the framework specifications to ensure the proper implementation of the traffic requirements in the vicinity of offshore facilities, here: identification, to be provided.

The safety of air traffic must not be adversely affected by the construction, operation and dismantling of offshore wind turbines and offshore platforms or by the laying and repair of submarine cables: wherever possible, the competent authority must set up helicopter traffic zones (HTZ) or helicopter protection zones (HPZ) or helicopter traffic areas (HTA) around offshore platforms with HLDs.

[11] The primary flight paths – especially at night – to and from an HLD within an offshore wind farm must ensure a safe approach and departure.

4.4.1.4 No impairment of the security of national and Alliance defence

The security of national and alliance defence may not be impaired as a result of the construction and operation of offshore wind turbines, platforms and submarine cable systems.

In the course of minimising conflicts, the choice of locations for offshore wind turbines and platforms or the routing of submarine cable systems should take account of national defence and alliance commitments.

The designation of areas, sites and platforms within areas for military training for floating units or flight exercise areas starting at sea level are to be avoided. To the extent that the specific exercise procedures are not restricted by the designation, designation in these areas is not excluded in individual cases. Routing of submarine cable systems is to be pursued outside the military training areas for floating units.

If the construction or operational work involves military training or restricted areas, or if the use of acoustic, optical, optronic, magnetic-sensory, electrical, electronic, electromagnetic or seismic measuring equipment as well as unmanned underwater vehicles is planned, this generally has to be communicated at least 20 working days in advance to the Marine Command, stating the coordinates of the respective area of operation and the period of operation. The use of measuring instruments must also be limited to the extent necessary.

4.4.1.5 Obligation to dismantle and security deposit

After ceasing utilisation, the offshore wind turbines, platforms and submarine cables should be dismantled. Should the dismantling pose greater environmental consequences than leaving the equipment, dismantling should not take place, or not to the full extent, unless it is required due to reasons of safety and ease of traffic. Should the equipment remain, suitable monitoring measures are to be taken concerning possible future hazards. If dismantling takes place, reuse of the components should be the aim before recycling, and recycling before thermal recycling or any other – proven – appropriate waste management on land. A security must be provided to meet the dismantling obligation.

On the one hand, the stipulation on dismantling implements the objective of spatial planning 3.5.1 (4) (Baltic Sea) and 3.5.1 (5) (North Sea), according to which, after discontinuation of use, offshore wind turbines are to generally be dismantled. On the other hand, the stipulation implements the objective of spatial planning 3.3.1 (3) (Baltic Sea) and 3.3.1 (5) (North Sea), according to which pipelines and submarine cables are to be dismantled after discontinuation of use.

In accordance with the spatial planning guideline stipulating that stationary uses must be reversible, i.e. may only take place temporarily and for a limited time, offshore wind turbines, platforms and submarine cable systems must also be dismantled after their use has been discontinued. It is possible that it is not necessary to completely remove the foundations for reasons of safety and efficiency of traffic. Removal could have a greater impact on the marine environment than partial removal. However, dismantling must be carried out to such an extent that the upper edge of the remaining foundation lies below the moving

lower edge of the sediment and below the area of contact with fishing gear. This must be verified for an appropriate period of time depending on the location to ensure that there is no obstacle to navigation and fishing. The excavation trenches created during dismantling must be filled with existing material; rockfill must be avoided. With respect to submarine cable systems, dismantling is also necessary if the submarine cable systems would cause toxic substances to remain in the marine environment in a way or quantity relevant to their impacts. In the event that the cable systems remain in place, the operator should be required to take appropriate monitoring measures to ensure that no risks to other uses can be expected from the remaining submarine cable systems in the future. For example, the position and sufficient cover should be verified on a regular basis. This rule is consistent with international and national regulations, in particular article 79 subsection 4 UNCLOS, which allows the coastal state to determine conditions for cables or pipelines leading into its territory or coastal waters.

This dismantling obligation allows long-term options for land use to be kept open, since subsequent uses are facilitated and thus a contribution to sustainability can be made. It also serves to protect the marine environment. The exact rules for dismantling are reserved for the individual procedure in order to adapt the requirements to the respective location, among other things.

The security serves to guarantee the dismantling obligation according to section 58 subsection 1 WindSeeG. The requirements for the security arise from the annex to the WindSeeG.

4.4.1.6 Consideration of all existing and approved usages

A distance of 500 m shall be maintained from existing and approved pipelines as well as existing, approved and, within the scope of this plan, specified submarine cables, offshore wind farms and other high structures, unless the construction site conditions require greater distances. When selecting locations for offshore wind turbines and platforms, the routing of submarine cable systems, existing and approved usages and usage rights, and the interests of maritime traffic, national and Alliance defence and the fishing industry must be taken into consideration.

The planning, construction and operation of offshore wind turbines, platforms and submarine cable systems shall be carried out in close coordination with the transmission system operator and the offshore wind farm project developers.

The rule implements the objective of spatial planning 3.5.1 (10) (North Sea) and 3.5.1 (9) (Baltic Sea), according to which, in the case of electricity generation measures, due consideration must be given to existing pipelines and submarine cables and an appropriate distance must be maintained. In addition, this rule is also derived from the principles and objectives of spatial planning laid down in 3.3.1 (6) and 3.3.1 (7) (North Sea) or 3.3.1 (5) (Baltic Sea). In particular, the rule further pursues the aim of minimising conflict in line with the objectives and principles of spatial planning.

In the course of minimising conflicts, the choice of locations for offshore wind turbines and platforms or the routing of submarine cable systems should take into account the interests of shipping (in particular with regard to priority and reserved areas), national defence and alliance - commitments as well as existing and approved uses/rights of use (e.g. offshore wind farm). Routing outside of these areas is to be pursued. Fishing interests should also be taken into account at an early stage.

In order to reduce the risk of damage during the construction and operation phases of the platforms and to prevent impairment of the possibilities of necessary maintenance and service work, due consideration must be given to existing and approved structures in future planned platforms. A reasonable distance must be maintained from these structures. The distance to be maintained depends, among other things, on the position of the platform in the area, in relation to on-site structures, the subsoil conditions and the water depth. As a rule, a distance of 500 m must be maintained between the platform and the infrastructure of third parties. Reference is made to the planning principle 4.4.3.2. In addition, smooth operation of existing systems (e.g. radio or radar systems) must be ensured.

In order to reduce the risk of damage to existing pipelines and submarine cables and to avoid impairing the possibilities for repair, the choice of route for new submarine cables systems must take due account of existing structures and maintain a distance of 500 m in these areas, provided that the subsoil conditions do not require greater distances. See the planning principle4.4.4.2. In the case of pipelines, this is consistent with the priority or reserved areas laid down in the Spatial Plan. With this distance, a smaller distance is defined for the shallower water depths of up to 45 m in the planned area compared to the relevant internationally agreed industrial guidelines, which apply for example to water depths of up to 75 m.

The distance of 500 m between submarine cable systems and wind turbines is necessary to allow work to be carried out on the TSO's submarine cable systems while the offshore wind farms is in operation. Even if work is being carried out on cable systems and the wind farm at the same time, sufficient space must be available for the construction ship of the wind turbine and the cable-laying ship. The international guidelines also require a minimum distance of 500 m from wind turbines and state that larger distances are required for installation and repair. See the details under 4.4.4.2. Reducing this distance would limit the repair options to certain types of ships and thus possibly delay them. The repairs would also not be possible while the wind farms are in operation. Due to the high importance of the connection systems for Germany's electricity supply, fundamentally reducing the distances is not reasonable.

For wind turbines whose energy is transmitted with a 155 kV or 220 kV AC cable between the transformer and converter platforms, a distance of at least 350 m is to be complied with. The cabling within the wind farm and the jack-up zones for construction and maintenance of the wind turbines on the side facing away from the connecting line must be planned in such a way that wind farm operators do not perform any work in the cable corridor of the connecting lines. It became clear in the context of approval procedures by offshore wind farms that reducing the distance to 350 m between the wind turbine and a 155 kV or 220 kV AC cable without including ancillary provisions to protect the grid user from unjustified additional costs for e.g. necessary repair/maintenance costs is possible. Although at a distance of less than 500 m it is necessary for wind farm operators and cable owners to coordinate in order to reduce possible risks, and that the wind turbines be switched off along the route of the electricity-conducting cable systems and rotated out of the route insofar as the owner of the cable systems has to carry out the necessary work in the effective area of the respective wind turbine However, these necessary agreements appear appropriate, in particular with regard to space-saving and efficient use of land pursuant to section 4 subsection 2 no. 2 WindSeeG. In individual cases, depending on the location of the planned offshore wind farm, it must be ascertained whether it is necessary for the offshore wind farm operator to bear any additional costs caused by distances of less than 500 m.

In the area of the transformer platform, it must be ensured that sufficient space is available to guide the AC cable of the TSO due to the fact that a large number of cable systems are pulled in. For this reason, a distance of at least 500 m must be maintained between the transformer platform and the nearest wind turbine in the area in which the three-phase submarine cable - systems of the transmission system operator are guided to the transformer platform.

If a distance of less than 500 m is envisaged between the 155 kV or 220 kV AC cable and the wind turbines whose energy is transmitted by this submarine cable system, a distance of 200 m must be established between the AC cable located next to the wind turbines and the nearest AC cable to permit repairs to be made to the cable systems in this area. This means, e.g. For the area within a wind farm, for example, this means that a corridor of 900 m must be kept clear for two three-phase submarine cable systems, 1,100 m for three submarine cable systems, 1,200 m for four AC cables and 1,400 m for five AC cables.

Due to the physical proximity between offshore wind farm projects and the connecting lines, including the TSO platforms, there is a strong need for coordination between the offshore wind farm developer and the TSO. Accordingly, it is imperative that there is close coordination between TSOs and offshore wind farm developers at a very early stage of the projects. There is an unqualified need for cooperation between the project developer of the wind farm and the TSO. This applies in particular to the exchange of information on project dates, the mutual transfer of necessary information and details on planning, construction and commissioning of the platform and the submarine cable systems, but also during operation, any repair and maintenance work and during dismantling. Construction in particular must be coordinated and optimised at an early stage in the spirit of neighbourly cooperation.

With regard to the distances between sites or to wind turbines, see the planning principle 4.4.2.3.

4.4.1.7 Consideration of cultural assets

Known locations of cultural assets should be taken into account when choosing locations and routes. If during the planning or construction of the wind turbines, platforms or submarine cable systems, previously unknown cultural assets located in the seabed are found, appropriate measures must be taken to protect the cultural asset.

This definition corresponds to the principles of spatial planning 3.3.1 (7) and 3.5.1 (12) (Baltic Sea) and 3.3.1 (9) and 3.5.1 (13) (North Sea), according to which known locations of cultural assets are to be taken into account when selecting locations for offshore wind farms and routes for laying pipelines and submarine cables, and appropriate measures are to be taken to protect the cultural assets if cultural assets previously unknown in the seabed are found during planning or construction/cable laying.

The seabed may contain cultural assets of archaeological value, such as archaeological monuments, remains of settlements or historical shipwrecks. According to article 149 of the United Nations Convention on the Law of the Sea (UNCLOS), all objects of an archaeological and historical nature found in the area are to be preserved or used for the benefit of mankind as a whole.

A large number of these shipwrecks are known and recorded in the underwater database of the Federal Maritime and Hydrographic Agency. The information available from the competent authorities should be taken into account when selecting locations for the construction of wind turbines and platforms or for the actual routing of submarine cable systems. However, the possibility cannot be ruled out that previously unknown cultural assets may be found during closer investigation of planned locations or a suitable route or during construction. In order not to damage these, suitable precautionary measures must be carried out in this case in consultation with the competent authority (with the involvement of monument and heritage preservation authorities). The findings are to be scientifically examined and documented. The aim is to maintain and preserve archaeological or historical artefacts either on site or through recovery. The preservation of cultural heritage, in particular archaeological heritage under water, is in the public interest within the meaning of section 48 subsection 4 sentence 1 no. 8 WindSeeG.

4.4.1.8 Noise mitigation

For the purpose of noise mitigation, the use of alternative, low-noise forms of foundations are to be considered. If wind turbines or platforms are installed with pile foundations, effective technical noise mitigation measures are to be taken during the foundation ramming process. The noise protection concept of an approved project must be integrated at an early stage in the design of the foundation structure. The noise protection concept for the North Sea of the Federal Minister for the Environment, Nature Conservation, and Nuclear Safety must be complied with.

During pile driving work for foundations of wind turbines or platforms, effective technical noise mitigation systems are to be deployed to comply with wildlife conservation and area protection law requirements. In the individual approval procedures, a maximum sound event level of 160 dB re 1µPa² s and a maximum peak sound pressure level of 190 dB re 1µPa are defined at 750 m distance from the pile driving point. Blasting for foundations is not permitted. Noise protection measures, which include technical noise mitigation, deterrence and monitoring of effectiveness, are specified in detail for each individual location and in relation to the foundation design used in the individual case. This takes place on a project-specific basis within the scope of the approval procedures. The best available method or a combination of the

best available methods according to state-of-the-art science and technology must be used to reduce underwater noise emissions to comply with applicable noise protection values during installation of foundation piles, e.g. large bubble curtain, cladding tube or hydro silencer. When designing suitable noise mitigation systems, the respective subsoil conditions must be taken into account. In addition to the actual noise mitigation system, the use of additional extensive noise protection measures and monitoring measures, in particular by recording the underwater noise emissions during the installation of foundations, is necessary.

If blasting is unavoidable to remove munitions that cannot be transported, a noise protection concept must be submitted to the Federal Maritime and Hydrographic Agency well in advance.

In order to minimise the possible considerable impact of ships on the marine environment during their construction and operation and the associated acoustic impairment the use of these ships must be reduced to a minimum through optimal planning of construction and scheduling. See the planning principle 4.4.1.1.

The strategic environmental assessment concludes that only if the applicable noise protection values are complied with and the requirements of the noise protection concept for the North Sea of the Federal Minister for the Environment, Nature Conservation, and Nuclear Safety are implemented can it be ensured with the necessary certainty that the requirements for wildlife conservation are met and that nature conservation areas are not significantly impaired in their components relevant to the conservation objective.

4.4.1.9 Minimisation of scour protection

Scour protection measures must be reduced to a minimum.

Measures to prevent scour formation are required in certain areas to ensure the long-term stability and positional stability of structures on the seabed.

In the case of any scour protection measures, the introduction of hard substrate must be reduced to a minimum to limit the impact on the marine environment.

Preference is to be given to fills made of natural stone or inert and natural materials as scour protection. The use of alternatives based on plastic or plastic-like materials (e.g. geotextile sand containers, nets filled with natural stones made of (recycled) plastic, concrete mats coated with plastic) is to be avoided.

4.4.1.10 Consideration of regulatory standards, specifications and concepts

The applicable versions of statutory standards, specifications and concepts must be taken into consideration for the planning, construction and operation of wind turbines, platforms and submarine cable systems.

This includes, in particular:

- the standard investigation into the impacts of offshore wind turbines on the marine environments (StUK),
- the standard subsoil surveys for offshore wind farms,
- the standard design,
- the VGB/Federal Waterways Engineering and Research Institute Standard for corrosion protection of offshore structures for the use of wind energy,

- the framework specifications to ensure the proper implementation of traffic - requirements in the vicinity of offshore installations (identification),
- the Implementing Directive on Maritime Observation of the Federal Ministry for Transport and Digital Infrastructure,
- the Offshore Installations Directive to ensure the safety and efficiency of shipping,
- the Offshore Wind Energy – Safety Framework Concept
- the framework concept for waste and operating materials for offshore wind farms and their grid connection systems in the German EEZ,
- the concept for the protection of harbour porpoises from noise pollution during the construction of offshore wind farms in the German North Sea
- and the Federal Agency for Nature Conservation mapping instructions for legally protected biotopes.

4.4.1.11 Emission mitigation

Emissions must be minimised.

Overall, the provisions of the regulation to promote environmentally friendly behaviour in maritime transport must be complied with.

The structure must be designed in such a way that

- no avoidable emissions of pollutants, sound and light enter the marine environment during construction or operation in accordance with the state of the art or, where required and unavoidable as a result of the safety requirements of shipping and air traffic, that the impairments are as low as possible, including vehicles used during construction and operation;
- no electromagnetic waves are generated which are likely to interfere with the functioning of conventional navigation and communication systems and the frequency ranges of correction signals.

The standard approval practice for OWP projects as well as systems to transmit electricity from these projects in the EEZ includes the binding regulation that no substances may be discharged into the sea during the construction, operation and maintenance of the systems in order to prevent pollution and hazards to the marine environment. In particular, no waste water containing pollutants may be discharged into the sea untreated unless this is compatible with safety-relevant regulations. If system-specific emissions into the marine environment are unavoidable for technical reasons during regular operation, this must be immediately applied for and justified to the Federal Maritime and Hydrographic Agency by submitting an environmental assessment. Examinations of alternativesfor specific systems are to be carried out. The minimisation requirement for material discharges applies.

An emissions study must be carried out to record the emissions caused by the design and equipment variant in question and to avoid them. The emissions study forms the basis for the waste and fuel concept to be drawn up as part of the protection and safety concept. The minimum requirements of the "Waste and fuel framework concept for OWPs and their grid connection systems in the German EEZ" published by the BSH, in its currently valid version, must be taken into account for the development of the waste and fuel concept. Emergency plans must be compiled for accidents involving water-polluting substances during the construction and operation phase and other unexpected events giving rise to pollution of the marine environment.

Environmental compatibility of fuels

The environmental compatibility of the fuels used at the installations must be ensured by comprehensive alternative tests. Biodegradable fuels (e.g. oils, greases) must be used as far as possible.

Structural/operational precautionary and safety measures

All technical installations fitted to the wind turbines and platforms must be secured and monitored by structural safety systems and measures in such a way that accidents involving harmful substances and environmental inputs are avoided (e.g. enclosures, double walls, room/door surrounds, collection trays, drainage systems, collection tanks, leakage monitoring and remote monitoring). This applies in particular to installations which contain or carry larger quantities of fuels and/or water-polluting substances (e.g. diesel tanks, pipelines).

As fuel changes and refuelling measures present an increase in the risk potential in the offshore area, special organisational and technical precautionary measures must be implemented for these activities (e.g. preparation of method statements, self-sealing breakaway couplings (emergency disconnection couplings), dry couplings, collection trays, overfill protection solutions, spill kits, precautionary measures for crane work).

Waste management

Waste is to be avoided. Unavoidable waste and spent fuels must be prepared in such a way that they can be 1. recovered or 2. disposed of on land in accordance with applicable waste legislation and transferred to land for this purpose. The introduction and discharge of waste, including plastics, is prohibited.

Cathodic corrosion protection (CCP), coatings

Corrosion protection must be pollutant-free and as low-emission as possible.

Attempts are to be made to implement external power systems as CCP on foundation structures. Use of galvanic anodes (sacrificial anodes), typically consisting of aluminium-zinc-indium alloys, is only permissible in combination with coatings suitable for CCP (see BSH design standard).
Only alloys where production-related levels of particularly environmentally critical secondary components (in particular cadmium, lead, copper and mercury) have been reduced to a minimum may be used in the selection of galvanic anodes. The zinc content required for the functionality of the anodes must also be limited to the minimum technically necessary. The CCP system must be dimensioned in such a way that the use of galvanic anodes is limited to a necessary minimum.
Use of zinc anodes (in the sense of zinc as the main component of the anodes) in the external area of the foundation structures is prohibited. If necessary, external current systems should be used as CCP systems in the interior areas of the foundation structures.

The minimum requirements for corrosion protection in the design standard must be observed. The VGB/BAW corrosion protection standard has been introduced with regard to parts 1-3 as a technical supplement to the BSH design standard and must be taken into account during implementation. Use of TBT (tributyltin) and other anti-fouling agents is prohibited. The (underwater) structure must be provided with oil-repellent paints in the area of the splash zone; regular removal of marine vegetation is not required in this context. Attempts must be made to ensure freedom from solvents for coating - materials.

The exterior paint must be as glare-free as possible, without prejudice to the regulations on aeronautical and marine identification.

(Seawater) cooling systems

Closed cooling systems which do not lead to cooling water discharges and/or other material discharges (anti-fouling agents and chemicals) are preferred for installation cooling (e.g. cooling transformers on platforms). Seawater cooling systems with discharges in regular operation are only permitted in justified exceptional cases (e.g. if the required cooling capacity can demonstrably not be achieved with closed systems/system variants). The use of anti-fouling chemicals in seawater cooling systems to ensure continuous operation must be kept to a minimum and requires a comprehensive environmental assessment in advance.

Grey water and black water, wastewater treatment plants

Professional collection of wastewater (grey water and black water), including onshore transport and proper disposal, is preferable to treatment on platforms. Wastewater treatment plants on unmanned platforms or platforms manned only during maintenance work are generally not eligible for approval. In these cases, appropriately dimensioned collection tanks must be kept available or other solutions can be used (e.g. "combustion toilets"). Evidence that a wastewater treatment plant is absolutely necessary must be provided by the project developer. For permanently manned platforms, only a state-of-the-art wastewater treatment plant, including reduction of nitrogen and phosphorus compounds (e.g. at least according to MARPOL MEPC.227(64)), is permissible. If these types of installations are not available on the market due to insufficient predicted wastewater volumes, certified installations without elimination of nitrogen and phosphorus compounds can be used (e.g. MARPOL MEPC.227(64). Proof of non-availability must be provided by the applicant. Chlorination of wastewater (e.g. using sodium hypochlorite) to achieve the MEPC "coliform standard" cannot be approved because chlorination processes result in environmentally harmful secondary compounds. Therefore, other techniques must be used that are demonstrably more eco-friendly (e.g. UV systems).

Appropriate sampling points must be provided at platform wastewater treatment plants so that sampling and subsequent analysis of wastewater can be carried out to ensure proper operation/checking of discharge values in the operating phase.

Drainage systems and oil separators

Oil separators installed and operated on platforms must ensure that the oil content of the drainage water does not exceed a limit of 5 ppm. For this reason, sensors for monitoring the oil content in the drain must be provided (including remote monitoring) in order to ensure proper operation. If the limit of 5 ppm is exceeded, appropriate valves must be used to ensure that the drainage water is not discharged into the sea (e.g. via collection tanks, recirculation). Drainage systems / oil separators connected to helicopter landing decks must also have appropriate bypass systems so that the environmentally hazardous extinguishing foam produced when the firefighting system is activated is discharged directly into a collection tank, i.e. without passing through the oil separator.

Fluorinated greenhouse gases in switchgear, cooling and air-conditioning systems and fire protection systems

The requirements of Regulation 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases must be met. According to Art. 3 of the Regulation, these measures are essentially the prevention and limitation of emissions of fluorinated greenhouse gases. Moreover, the operator must observe, implement or document the requirements with regard to leak checks for technical installations, if necessary by means of leak detection systems (Art. 4-6).

Emergency power systems, diesel generators, diesel fuel

The use of diesel generators on structural installations which are not certified according to at least MARPOL Annex VI, Tier III with regard to emission values is not permitted. Alternative emission standards are also permitted if they are demonstrably equivalent to or better than MARPOL Annex VI, Tier III. The emission values of the diesel generator type in question are relevant. If the relevant IMO regulations of Annex VI are not applicable due to insufficient generator power (e.g. for temporary diesel generators on wind turbines), emission standards applicable elsewhere must be used (e.g. EU standard 97/68/EC and its amendments, here: stage III/IV). The installation of permanent diesel generators for the emergency operation of individual wind turbines is not permitted, as extensive refuelling measures will therefore be required and hence there is a greater risk to the environment due to possible oil spills. Therefore, the diesel generators (emergency power systems) of the transformer platform in question or other safety systems should be used for the temporary supply of the wind turbines within the scope of ensuring general operational safety.

To reduce SO_2 emissions to a minimum, low-sulphur fuel must be used (e.g. low-sulphur heating oil according to DIN 51603-1 or diesel according to DIN EN 590 ("land diesel")), taking into account the shelf life of the product in question. This applies to temporary generators during installation work on wind turbines and platforms, as well as to permanent diesel generators (emergency power systems) on platforms. Suitability for the fuel type in question must be ensured in good time when selecting the appropriate diesel generators.

Light emissions

The lighting should be as nature-compatible as possible during operation of the wind turbines and converter platforms in order to reduce attraction as far as possible while taking into account the requirements of safe shipping and air traffic and occupational safety, e.g. switching obstruction lighting on and off as required, selecting suitable light intensities and spectra or lighting intervals.

4.4.1.12 Consideration of ordnance locations

Known locations of munitions should be taken into account when choosing locations and routes. If during the planning or construction of the wind turbines, platforms or submarine cable systems, as yet unknown explosive ordnance is found on the seabed, appropriate protectivemeasures must be implemented.

A federal-state working group published a basic report on ammunition pollution in German marine waters in 2011, and this is updated annually. According to current knowledge, explosive ordnance contamination in the German Baltic Sea is estimated at levels of up to 0.3 million tonnes, and up to 1.3 million tonnes in the German North Sea. Overall, there is insufficient data to refer to, so it is necessary to assume that explosive ordnances are also to be expected in the area of the German EEZ (e.g. remnants of mine barrages and combat operations). The locations of the known munitions dumping areas can be found in the official nautical charts and the report from 2011 (with additional information on areas suspected of being contaminated with munitions) (Böttcher et al., 2011). The reports by the federal-state working group are available from www.munition-im-meer.de.

Detailed historical research into the possible presence of explosive ordnance is recommended as part of the specific planning of a project. The relevant details of any protective measures that may become necessary will be laid down in the individual authorisation procedures.

The project developer is responsible for identifying and investigating explosive ordnance, as well as for all resulting protective measures. Findings must be documented immediately and reported to the BSH. If explosive ordnance is picked up, the project developer is also responsible for recovery or disposal. Ammunition finds and their further handling must also be reported to the Maritime Safety and Security Centre in Cuxhaven (Gemeinsame Leitstelle der Wasserschutzpolizeien der Küstenländer, Zentrale Meldestelle für Munition im Meer). Blasting is not permitted. If blasting is unavoidable to remove munitions (for munitions that cannot be transported), a noise protection concept must be submitted to the Federal Maritime and Hydrographic Agency well in advance. Reference is made to the planning principle 4.4.1.8.

Transportable explosive ordnance may not be dumped again after recovery, but must be disposed of properly on land in consultation with the responsible explosive ordnance clearance services of the countries. The explosive ordnance clearance service will take over all the explosive ordnance offered to it at the nearest port in order to dispose of it properly.

4.4.1.13 Installation of sonar transponders

Sonar transponders must be installed at suitable corner positions of wind farms and platforms.

The arrangement and specification of the sonar transponders must be adapted to meet the requirements of the Federal Office of Bundeswehr Infrastructure, Environmental Protection and Services (BAIUDBw) / Navy Command in terms of functionality.

During exercises for the purpose of national and alliance defence, the installation of sonar transponders should use acoustic signals to prevent sources of danger due to collisions between submarines and structures.

4.4.2 Offshore sites and offshore wind turbines

The following lists the planning principles for sites, primarily for the construction and operation of offshore wind turbines. Reference is made to chapter 4.4.3 in which planning principles are laid down for platforms, as well as for transformer and residential platforms.

Summary

- Consideration of nature conservation areas and legally protected biotopes
- Economic area use
- Distances between sites and from wind turbines
- Obligation to provide evidence for installation of additional wind turbines

4.4.2.1 Consideration of conservation areas and regard to legally protected biotopes

The construction of offshore wind turbines in nature conservation areas is prohibited. When constructing and operating offshore wind turbines, significant adverse impacts on the marine environment, in particular the natural functions and the marine ecosystem, must be prevented.

Known occurrences of legally protected biotopes according to section 30 of the Federal Nature Conservation Act are to be avoided during the construction of wind turbines.

Section 45 a of the Water Resources Management Act (WHG)[12] states that best environmental practice in accordance with the Helsinki Convention and OSPAR Conventions and the relevant state of the art must be taken into account and specified in individual procedures.

This definition implements the objectives of spatial planning 3.5.1 (3) and the principles of spatial planning 3.3.1 (8) (North Sea) and 3.3.1 (6) (Baltic Sea), which stipulate that offshore wind turbines are not permitted in Natura 2000 areas[13] outside the designated priority areas.

Construction of offshore wind turbines is not permitted in conservation areas. This serves to safeguard the protective purposes of conservation areas, in particular with regard to potential adverse impacts on the marine environment. The specific implementation for the construction of offshore wind turbines in close proximity to conservation areas, e.g. for the protection of marine mammals that are sensitive to noise, must be ensured by the licensing authority within the framework of the licensing procedure, taking into account the special features of the project area and the circumstances of the case in question. Due to the impact on the marine environment to be expected during the construction phase of the offshore wind turbines, a minimum distance of 500 m from conservation areas must be routinely maintained, unless the areas – in particular the local habitats nearby and their protection targets – require larger distances; this must be clarified in the approval procedure.

Depending on the location and foundation design of the offshore wind turbine and the conservation objective of the conservation area, further considerations may lead to greater

[12] Act dated 31 July 2009, Federal Law Gazette I p. 2585, last amended by article 2 of the Act dated 4 December 2018, Federal Law Gazette I p. 2254.

[13] By ordinances of 22 September 2017, the existing nature conservation and FFH areas were designated as conservation areas and partially regrouped within this framework.

distances in individual cases; in particular, additional protective measures may become necessary. The impact assessment carried out as part of the strategic environmental assessment concludes that the construction of the wind turbines in strict compliance with the avoidance and mitigation measures to be ordered as part of the specific approval procedures will not lead to any significant impairment of the protective purposes of the conservation areas in the EEZ as things stand at present.

Should occurrences of structures referred to in section 30 of the Federal Nature Conservation Act be found during more detailed investigations in the specific approval procedure, these must be analysed and given particular weight in the decision-making process. At present, however, it is not possible to make any specific spatial allocation of the said structures.

Pursuant to section 2 subsection 2 no. 6 of the Federal Spatial Planning Act, the significance of the space for the functioning of the soil, water resources, flora and fauna, and climate, including their respective interactions, must be developed, secured, or restored where necessary, possible and appropriate. The importance of space for the functioning of the soil, water resources, flora and fauna and climate, including the relevant interactions with the requirements of the biotope network system, must be maintained. The aim is to ensure that the dispersal processes and long-range ecological interactions of species and their habitats are taken into account.

4.4.2.2 Economic area use

The individual wind turbines are to be arranged in the most space-saving manner possible.

On the one hand, this rule implements the principle of section 2 subsection 2 no. 6 of the Federal Spatial Planning Act. Economical use of land should be attempted in order to secure and utilise the potential of the EEZs in the long term. This also corresponds to the guiding principle of sustainable spatial development. The principles of spatial planning 3.5.1 (6) North Sea and 3.5.1 (5) Baltic Sea will also be implemented, according to which the individual wind turbines at the corresponding wind farms are to be arranged in a manner that saves as much space as possible.

According to section 4 subsection 2 no. 2 of the Offshore Wind Energy Act, the objective of orderly and space-saving power generation from offshore wind turbines is particularly relevant for the advance development of land that is key to the Site Development Plan. This objective should not only be related to the overall large scale specifications, but should also be reflected in the planning within the sites.

The growing importance of economical area use is also reflected in the Environmental Impact Assessment Act (UVPG), which, as part of the 2017 reform, now includes land as a protected asset.

4.4.2.3 Distances between sites and from wind turbines

Wind turbines must maintain a distance of at least five times the rotor diameter to wind turbines in adjacent sites.

In principle, the distance between the sites defined in the Site Development Plan and between the wind turbines of approved and existing OWPs must be at least 750 metres.

Construction of wind turbines is only possible within the defined sites. To limit shading effects and ensure stability, a minimum distance of five times the rotor diameter of the new installation to be erected must also be maintained to the wind turbines of the adjacent OWP project (minimum distance between the centres of the installations, based on the largest rotor diameter). The minimum distance requirements apply only to installations at adjacent OWPs. This planning principle does not apply to the distances of the wind turbines within a site.

When it comes to two adjacent sites put out to tender by the Federal Network Agency in the same year and hence planned by the relevant project developers in the same period, early close coordination between the project developers is necessary in the interests of good neighbourly cooperation with regard to the installation locations and distances, taking into account the rotor diameters. It is therefore stipulated that the individual authorisation procedure must be subject to production of proof of consultation.

If a site is located next to a site that has already been put out to tender but not yet approved, it is not possible for the project that is already in the approval process to take into account the planning of the site that will be put out to tender at a later date due to the different progress of planning. Therefore, submission of the plans for the site previously put out to tender, in particular for installation locations and distances, taking into account the rotor diameters, as well as immediate information in the event of changes, is the basic prerequisite for preparation of the planning approval documents for the later site.

4.4.2.4 Deviation of actual installed capacity from allocated grid connection capacity

According to the explanatory memorandum to section 24 subsection 1 no. 2 of the Offshore Wind Energy Act, the successful tenderer has the option of installing additional wind turbines beyond the allocated grid connection capacity, provided this is permitted by the decision on planning permission. However, an excess infeed in excess of the allocated grid connection capacity is not permissible at any time.

Determination of the number of wind turbines to be installed on the site and, where applicable, generation capacity exceeding the allocated grid connection capacity is carried out within the framework of the planning permission procedure.

If the actual installed capacity deviates from the allocated grid connection capacity, the maximum permissible heating of the sediment (see planning principle 4.4.4.8) must not be exceeded. In the context of the application for the planning permission procedure, the successful tenderer must explain the extent to which additional turbines are to be installed beyond the allocated grid connection capacity. The successful tenderer must demonstrate that the wind load profile of the wind farm changed by the infeed of the additional turbines installed will not lead to exceeding of the maximum permissible heating of the sediment in the vicinity of the entire grid connection system up to the landing point. This must be demonstrated by the successful tenderer submitting a heating calculation as part of the application for the planning permission procedure. An agreement on the costs of producing the evidence must be concluded between the successful tenderer and the responsible TSO.

The additional wind turbines are to be erected spatially within the subsidised site.

The technical design of the grid connection system by the TSO will take place prior to the allocation of a site, so the technical design and the proof of the maximum permissible sediment warming by the TSO must be based on the expected generation capacity as stated in the Site Development Plan and the wind load profile of the subsidised site and, accordingly, additional wind turbines beyond the allocated grid connection capacity must not be taken into account.

4.4.3 Platforms

The following states the planning principles for platforms. Platforms include converter platforms, collector platforms, transformer platforms as well as accommodation platforms.

Summary

- Consideration of nature conservation areas and regard to legally protected biotopes
- Required area and additional manoeuvring space
- The platform design should take into consideration the requirement for temporary living quarters; not to be utilised for longer than three years

4.4.3.1 Consideration of nature conservation areas and regard to legally protected biotopes

The construction of platforms in nature conservation areas is not permitted. When constructing and operating platforms, significant adverse impacts on the marine environment, in particular the natural functions and the marine ecosystem, must be prevented.

Known occurrences of legally protected biotopes according to section 30 of the Federal Nature Conservation Act are to be avoided during the construction of platforms.

Section 45 a of the Water Resources Management Act states that best environmental practice in accordance with the Helsinki Convention and OSPAR Conventions and the relevant state of the art must be taken into account and specified in individual procedures.

This definition implements the objectives of spatial planning 3.5.1 (3) and the principles of spatial planning 3.3.1 (8) (North Sea) and 3.3.1 (6) (Baltic Sea), which stipulate that offshore wind turbines are not permitted in Natura 2000 areas outside the designated priority areas.

Construction of platforms is not permitted in conservation areas. This serves to safeguard the protective purposes of conservation areas, in particular with regard to potential adverse impacts on the marine environment during the construction phase. The specific implementation for the construction of platforms in close proximity to conservation areas, e.g. for the protection of marine mammals that are sensitive to noise, must be ensured by the licensing authority within the framework of the licensing procedure, taking into account the special features of the project area and the circumstances of the case in question.
Due to the impact on the marine environment to be expected during the construction phase of the offshore wind turbines, a minimum distance of platforms of 500 m from conservation areas must be routinely maintained, unless the areas – in particular the local habitats nearby and their protection targets – require larger distances; this must be clarified in the approval procedure.

Depending on the location and foundation design of the platforms and the conservation objective of the conservation area, further considerations may lead to greater distances in individual cases; in particular, additional protective measures may become necessary. The impact assessment carried out as part of the strategic environmental assessment concludes that the construction of the planned platforms in strict compliance with the avoidance and mitigation measures to be ordered as part of the specific approval procedures will not lead to any significant impacts on the protective purposes of the conservation areas in the EEZ as things stand at present.

Should occurrences of structures referred to in section 30 of the Federal Nature Conservation Act be found during more detailed investigations in the specific approval procedure, these must be analysed and given particular weight in the decision-making process. At present, however, it is not possible to make any specific spatial allocation of the said structures.

Pursuant to section 2 subsection 2 no. 6 of the Federal Spatial Planning Act, the significance of the space for the functioning of the soil, water resources, flora and fauna, and climate, including their respective interactions, must be developed, secured, or restored where necessary, possible and appropriate. The importance of space for the functioning of the soil, water resources, flora and fauna and climate, including the relevant interactions with the requirements of the biotope network system, must be maintained. The aim is to ensure that the dispersal processes and long-range ecological interactions of species and their habitats are taken into account.

4.4.3.2 Required area

A site of 100 m by 200 m must be provided for a converter platform. A site of 100 m by 100 m must be provided for the transformer platform. Additional manoeuvring space must be provided for platforms placed side by side.

Based on the findings to date, it can be assumed that a converter or collector platform requires a base area of 100 m x 200 m for safe construction and reliable operation. A base area of up to 100 m x 100 m is required for transformer platforms with regard to safe construction and reliable operation. This is necessary because the Site Development Plan only provides for areas for platform locations: no detailed study of the site is carried out. Besides the platform, areas for construction of the platform and for repair work (jack-up zones), which are expected to be approx. 40 m wide, are to be kept permanently clear. Depending on the construction ship, space may also be required for anchor chains, etc.

In the case of converter platforms with 66 kV technology, an area of 1,000 m must be kept free of further structures in order to accommodate the converter platform for the cable system approach. Within this zone, work may only be carried out in agreement with the responsible TSO.

4.4.3.3 Accommodation on platforms

Personnel on platforms should essentially be accommodated in accommodation provided for this purpose during the planning of the platform. When planning and designing the platform, particular attention must be paid to structural safety, supply and disposal, including the provision of drinking water and wastewater treatment, as well as occupational health and safety, including escape routes and means.

The requirements of the planning principle 4.4.1.11 (emission reduction) must be complied with, in particular with regard to supply and disposal as well as wastewater treatment.

Subsequent installation of temporary or permanent residential units which were not provided for in the planning and design of the platform is to be avoided.

4.4.4 Submarine cabling systems

The following states the planning principles for submarine cable systems, which in the sense of this plan include electrical cable systems such as offshore pipeline links, cross-border submarine cable systems and cross-connections between converter/transformer platforms. The following planning principles 4.4.4.5, 4.4.4.6, 4.4.4.8 and 4.4.4.9 apply to interconnecting submarine cable systems within the farm.

Summary

- Parallel bundling as far as possible
- Spacing in case of parallel installation: 100 m; 200 m after every second cable system
- Routing through gates
- Perpendicular crossing of shipping priority and shipping reservation areas
- Prevent crossings; if absolutely necessary, then, as much as possible, at right angles; distance between turning points 250 m
- Careful installation
- Covering
- Mitigation of sediment heating (compliance with 2 K criteria)
- Consideration of nature conservation areas and legally protected biotopes

4.4.4.1 Bundling

When installing submarine cable systems, the aim is to run cables as much as possible in parallel bundles. Moreover, the routes should be parallel to existing structures as far as possible.

This rule implements the principle of spatial planning 3.3.1 (5) (Baltic Sea) and 3.3.1 (7) (North Sea), which aims to achieve the greatest possible bundling in the sense of parallel laying when laying submarine cables. Moreover, a route that is as parallel as possible to existing structures and installations should be selected.

Submarine cable systems should be bundled as far as possible in order to minimise impacts on other applications and the need for coordination between and with other applications and to create as few constraints as possible for future applications. Bundling in the sense of parallel routing also reduces fragmentation effects. These can be further reduced if cable routing is selected parallel to existing structures and installations.

4.4.4.2 Spacing in case of parallel installation

A distance between systems of 100 m must be maintained when installing submarine cable systems in parallel. A distance of 200 m must be maintained after every second cable system. In this respect the actual subsoil conditions are to be taken into consideration, particularly in the Baltic Sea.

There are various international recommendations, such as those of the International Cable Protection Committee (ICPC) and the European Submarine Cables Association (ESCA), for determining appropriate distances between submarine cable systems. The ICPC's "Recommendation No. 2" dated 3 November 2015 requires at least three times the water depth as the distance in the case of parallel installation. If this is not possible under all circumstances, the distance can be reduced to twice the water depth using modern navigation equipment and installation/repair procedures (ICPC, 2015). A study updated by DNV GL in 2018 on minimum distances for submarine cables determined the technically minimum possible distances and the corresponding hazard potential for the cable systems. A description is given of the conditions under which these values can be achieved (e.g. ships, weather conditions, water depths). The study recommends a distance of at least 50 m between two systems at water depths up to 50 m (DNV GL, 2018). However, a distance of 100 m is estimated to be reasonable in order to facilitate on-site repairs. For more than two parallel cable systems, a distance of 150 m is recommended between the second and third cable systems (DNV GL, 2018). According to a statement on the second draft of the Site Development Plan, this study is currently being revised. The issueof "distances" will, if necessary, be taken up again in the context of a future update of the Site Development Plan.

The ICPC recommendations refer mainly to the subsoil conditions in the North Sea, which are very different to the subsoil conditions in the Baltic Sea. As hardly any empirical values are available for the laying and repair of submarine cable systems in the subsoil conditions occurring in the area of site O-2 in particular, it is currently impossible to estimate whether the distances specified here are sufficient. If necessary, these must be adapted to the subsoil conditions.

The exclusion of mutual thermal influences, safe installation and a sufficient safe distance in the event of repair measures are of importance when determining the required distances within the framework of this plan. Due to the large number of submarine cable systems required and the already very confined spatial conditions in the North Sea EEZ, especially in the region between the traffic separation areas, a distance of at least 100 m between the cable systems is specified in this plan for water depths of up to 60

m. For repair work in particular, a distance of 200 m must be provided after every second cable system. The distances between the submarine cable systems are determined by the water depth, the subsoil conditions and the distances technically required for installation and repair, among other things. The distances technically required are also dependent on the type of ship used for installation and repair. It is likely that these distances will be sufficient for all ships currently available on the market (self-positioning ships, but also anchor barges) under appropriate weather conditions. With regard to mutual spacing, it should be borne in mind that the omega loops required for repairs are also dependent on the water depth, the subsoil conditions and the length of the damaged area, especially in the case of extensive bundling. Accordingly, a larger distance of 200 m is required after every second submarine cable system. These distances must be adapted to geological conditions where necessary.

Moreover, the Site Development Plan defines only corridors, not the actual submarine cable routes. The exact planning of the submarine cable route ("fine routing") is reserved for the respective approval or implementation procedure. Implementation of the planning principles must be taken into account as early as possible during the routing and associated arrangement of the cable systems. The implementation sequence of the grid connection systems also has a decisive influence on the arrangement of the cable systems in the route corridor. This principle may reduce the amount of land required and the environmental impact of laying and dismantling.

4.4.4.3 Routing through gates

Submarine cable systems landing in Germany must essentially pass through the N-I to N-V and O-I and O-III boundary corridors established at the EEZ and 12 nm zone boundaries.

Cross-border submarine cable systems must also pass through the N-VI to N-XVII and O-I to O-XIII boundary corridors established at the EEZ and 12 nm zone boundaries.

Interconnectorsthat do not land in Germany should not be routed through the gates N-I to N-V due to the limited availability of routes in coastal waters.

In the North Sea and the Baltic Sea, this specification – modified – implements the objective of spatial planning 3.3.1 (10) in the Spatial Development Plan for the North Sea and the objective of spatial planning 3.3.1 (8) for the Baltic Sea, according to which submarine cables are to be routed via defined target corridors at the transition to territorial sea and at the crossing of the traffic separation area off the East Frisian coast for the discharge of energy generated in the EEZ.

The border corridors envisaged here are derived from the target corridors defined in the Spatial Development Plan and the needs identified in the interim. Due to the considerably higher demand for power lines, additional corridors to coastal waters have been included in the planning compared to the Spatial Development Plan, and the existing corridors have also been extended. Border corridors from which a route within the German EEZ appears possible were also defined at the external boundaries of the EEZ with neighbouring states. To an extent, these existing infrastructures – such as submarine cable systems or pipelines already installed – continue. The specification was agreed with neighbouring countries.

4.4.4.4 Crossing of shipping priority and

shipping reservation areas

Shipping priority and shipping reservation areas specified in the EEZ Spatial Development Plan should be crossed by submarine cable systems by the shortest possible route insofar as parallel routing to existing structural installations is not possible.

This rule implements the objective of spatial planning 3.3.1 (2) (Baltic Sea) and 3.3.1 (4) (North Sea), according to which the priority areas defined for shipping are to be crossed by submarine cables by the shortest possible route for the discharge of the energy generated in the EEZ, where parallel routing to existing structures and structural installations is not possible.

In order to minimise mutual interference between shipping and network infrastructure, it is necessary for the cable routes to cross the priority areas for shipping by the shortest possible route, insofar as parallel routing of existing structures and structural installations is not possible. Due to the large number of cable systems to be expected, this applies in particular to the submarine cable systems for connecting OWPs, but also to all other submarine cable systems. Parallel routing to existing structures can reduce area use and – to the advantage of shipping – the devaluation of the manoeuvring space as anchorage.

4.4.4.5 Crossings

Mutual crossings of submarine cable systems as well as crossings with existing pipelines and existing submarine cables, or those proposed in this plan, should be prevented as far as possible. If crossings cannot be avoided, they must be implemented according to the current state of the art and at right angles as far as possible.

The intersection must be designed based on ground conditions. The two intersecting cable systems must be mechanically separated from one another. This is usually done by constructing an intersection. Artificial hard substrate is introduced into the soil when building crossings. Intersections should therefore be avoided from the outset as far as possible with a view to minimising impact on the marine environment.

If intersections cannot be avoided, the crossing must be implemented according to the current state of the art and at right angles as far as possible. If this is not possible, the crossing angle should be no less than 45°. This principle reduces the size of the intersection. Within the intersection, the two crossing submarine cable systems are usually separated from one another by means of concrete mats. These extend approx. 30 m to either side beyond the submarine cable to be crossed. The narrower the crossing angle, the longer the required intersection will be. These structural measures mean it is not possible to repair the lower cable system within the intersection. A new intersection may be necessary if there are defects in the lower cable system.

The subsoil conditions must be taken into account when planning an intersection. It is also necessary to take into account the fact that the coverage required for compliance with the 2K criterion cannot be maintained in the area of the intersection. It is to be expected that the upper cable system will have to be additionally covered over a length of at least 100 m. If necessary, the

intersection should be covered with inert natural materials and remain overfishable.

The bend radii of the submarine cable must also be taken into account in the case of crossings. When crossing existing cables, a distance of at least 250 m from the existing cable is required between two turning points of the new cable to be laid.

In the alternative connection concept, the route between the transformer platform and the converter must always be free of crossings; the cabling within the OWP must be designed accordingly.

4.4.4.6 Careful installation

The installation method used for installing submarine cable systems should be as gentle as possible to protect the marine environment.

The rule complies with the principle of spatial planning 3.3.1 (12) (Baltic Sea) and 3.3.1 (14) (North Sea), according to which as careful a laying method as possible should be chosen so as to protect the marine environment when laying submarine cables for the discharge of energy generated in the EEZ.

To minimise possible adverse impacts on the marine environment caused by laying submarine cable systems, a laying method must be chosen in the individual procedure, in particular depending on geological conditions, which allows the least interference and impacts on the marine environment while also ensuring that safe attainment of the specified coverage can be expected.

Any anchor positions must be selected outside the occurrence of legally protected biotopes.

Avoid clearing large areas when clearing rocks. Individual rocks must be cleared within an effective zone no more than 20 m wide (10 m to the right and left of the route, respectively), or 30 m in curve areas. The rocks must be placed as close as possible to their salvage location, at most 20 m outside the working strip within the biotopes, while not lifting them out of the water body. Applications for clearing large areas and clearing operations outside the effective zone must be submitted separately and approved by the BSH.

In the case of reef occurrences, a distance of 50 m must be maintained where this is technically possible. Particularly sensitive regions (section 30 biotopes) must be avoided as far as possible during fine routing.

4.4.4.7 Covering

When determining the permanent coverage of submarine cable systems, the interest of the protection of the marine environment, shipping traffic, defence, the fishing industry as well as system safety must be taken into consideration.

According to BFO-N 16/17, the cable system in the North Sea had to be laid at a depth that would ensure permanent coverage at a depth of at least 1.5 m. Reference is made to the justification for this in planning principle 5.3.2.7 in BFO-N 16/17.

The specification of the coverage to be created in the Baltic Sea was based on planning principle 5.4.2.7 of BFO-O 16/17 in the individual approval procedure or in the implementation procedure based on a comprehensive study.

As no comprehensive findings from the submarine cable systems laid to date are available in the Site Development Plan's installation procedure for the Baltic Sea at the present time, no general abstract depths can be specified for characteristic route conditions. The specification of the coverage for submarine cable systems in the Baltic Sea is thus carried out in the individual procedure based on the comprehensive study described in agreement with the GDWS and with the involvement of the BfN. The study and the proposed coverage of the various route sections based on it must be

submitted to the BSH together with the application documents.

As soon as corresponding findings are available, the planning principle for coverage will be developed further, if necessary within the framework of an update of the Site Development Plan.

Coverage of at least 1.5 m will continue to be specified in the North Sea EEZ area.

4.4.4.8 Sediment heating

When installing submarine cable systems, potential adverse effects on the marine environment through cable-induced sediment heating is to be reduced as much as possible. The precautionary limit with respect to nature conservation is the so-called "2 K criteria", which specifies a maximum tolerable temperature increase of the sediment by 2 degrees (Kelvin) at 20 cm sediment depth.

For this purpose, the cable system must be laid during installation at a depth that ensures compliance with the 2K criterion. Reference is made to the planning principle 4.4.4.7.

Significant heating of the surrounding sediment occurs radially around the cable systems during operation of the submarine cable systems. Heat will be released due to thermal losses in the cable system during energy transmission. The temperature cannot exceed 70°C for DC conductors and 90°C for AC conductors.

What is known as the "2K criterion", i.e. a maximum temperature increase of 2 degrees (Kelvin) 20 cm below the surface of the seabed, has been established as a nature conservation-related precautionary value in the current official approval practice for all submarine cable systems laid in the EEZ area. The 2C criterion represents a precautionary value which, according to the assessment of the Federal Agency for Nature Conservation (BfN), ensures with reasonable certainty, based on available information, that considerable adverse impacts of cable heating on the marine environment or the benthic community are prevented Stronger warming of the uppermost layer of seabed sediment may lead to a change in the benthic communities in the area of the submarine cable route. Cold stenothermal species that are bound to a low temperature range and are sensitive to temperature fluctuations may thus be displaced from the area around the cable routes, particularly in deeper waters. There is also the possibility that sediment warming could lead to colonisation of new alien species. An increase in seabed temperature could also alter the physical and chemical properties of the sediment, which in turn could alter oxygen or nutrient profiles.

Besides the ambient temperature in the vicinity of the submarine cable systems and the thermal resistance of the sediment, the cable type and the transmission power have a significant influence on the extent of the sediment warming. Compliance with the 2K criterion must therefore be ensured when dimensioning the cable systems. The depth or coverage of the cable systems is also crucial for temperature development in the near-surface sediment layer.

Evidence of the maximum sediment warming to be expected or compliance with the 2K criterion must be provided within the framework of the individual approval procedure. Sediment warming must be calculated in accordance with the requirements of the StUK4 supplement to benthos as a protected asset, Table 1.7.

Within the framework of the Site Development Plan set-up procedure, a working group was set up at the BSH to deal with the issue of whether the above-mentioned verification procedure is suitable for mapping maximum temperature development at the reference point.

As an intermediate result, it can be stated that there are three calculation input parameters which have a major influence on the results. These are the depth of the cable system, the assumptions in respect of the thermal resistance of the sediment and the assumptions in respect of the load profile of the cable system, in particular on the mean time value of the current (what is known as preload). Sensitivity studies on these parameters were used to determine the fact that the values usually assumed for these parameters in the procedures to date represent a conservative but conclusive assumption with regard to the maximum values.

The depth of submarine cable systems is largely determined by the requirements of the coverage planning principle 4.4.4.7. A greater depth would be advantageous with regard to temperature development at the reference point. At the same time, there may be technical restrictions for maintaining maximum conductor temperature at depths of more than 1.5 m, for example, due to poorer temperature discharge in deeper sediment. Moreover, the cost of laying submarine cable systems increases significantly as the depth increases. For these reasons, a generalised requirement of a greater depth does not appear to make sense.

With regard to the thermal resistance of the sediment, it became clear based on specific measured values from the Baltic Sea that the value of 0.7 Km/W referred to in the StuK4 supplement on benthos as a protected asset, Table 1.7, represents a meaningful value for various sediment types typically occurring over the course of the route. At the same time, the working group discussed the possibility of deviating from the standard value if measured thermal resistance values were available, and of using the individual thermal resistance values measured on the route for verification purposes.

As a reference load profile for mapping maximum transmission losses occurring in offshore wind turbine connection systems, a profile is assumed in the verification procedure based on the StuK4 supplement on benthos as a protected asset, Table 1.7, which is based on a typical stationary preload of 77% and superimposed by a transient maximum load of 99% over a period of 7 days before the preload of 77% is again assumed for a period of 45 days. This profile was formed based on long-term wind data from the FINO1 platform in the North Sea EEZ and is well suited for mapping unusual cable loads during strong wind phases. Basic - transferability for the Baltic Sea is given, albeit with slightly changed values where appropriate. This conclusion was confirmed based on current investigations both within the framework of the working group referred to above and by expert opinions commissioned separately by the BSH.

The extent to which this load profile will still be suitable for future wind farm layouts and grid connection systems requires further investigation. This includes, for example, the issues of additional occupancy (see planning - principle 4.4.2.4), according to which additional wind turbines would be installed without exceeding the allocated capacity at the grid connection point, and a subsequent increase in the capacity of the wind turbine. As no comprehensive information on the applicability of the load profile is available at the present time, reference is made to a future update of the Site Development Plan with regard to possible adjustments to the verification procedure within the framework of the sediment warming planning principle.

Besides the verification of the 2K criterion using the calculation method described, there is theoretically also the option of proving compliance with the 2K criterion using permanent temperature measurements. For this purpose, temperature measurements over the entire route can be used directly at the submarine cable, from which the temperature at the test point can be deduced using an appropriate seabed model. Temperature measurement directly at the submarine cable is not yet used throughout the whole area at present, and to date it has mainly been used for fire detection or cable fault detection. However, the working group has found that permanent temperature measurements for the purpose of demonstrating compliance with the 2K criterion are not yet state-of-the-art. Here, too, reference is made to possible future adjustments as soon as reliable information is available on the useful applicability of the measurement.

4.4.4.9 Consideration of nature conservation areas and legally protected biotopes

When installing submarine cable systems, possible adverse effects on the marine environment are to be minimised. Thus, submarine cable systems should be installed outside nature conservation areas as far as possible.

Known areas of legally protected biotopes according to section 30 of the Federal Nature Conservation Act or corresponding structures should be prevented where possible when installing submarine cable systems.

This rule implements the principles of spatial planning 3.3.1 (8) (North Sea) and 3.3.1 (6) (Baltic Sea), according to which the crossing of sensitive habitats is to be avoided in periods in which specific species are particularly susceptible to disturbance.

Laying submarine cables in sensitive habitats and adverse impacts on the marine environment must be avoided by laying, operating, maintaining and, possibly, remaining after cessation of operation or dismantling.

Laying submarine cable systems may lead to impairments of sensitive habitats. To limit potential adverse impacts on sensitive habitats and preserve the protective purposes of the conservation areas, submarine cable systems within the EEZ should primarily be operated outside conservation areas. If this is not possible, effects on the protection and conservation objectives of the conservation areas must be examined in the individual approval procedure.

Best environmental practice in accordance with the Helsinki Convention and OSPAR Convention and the relevant state of the art should be taken into account and specified in individual procedures.

Should occurrences of structures referred to in section 30 of the Federal Nature Conservation Act be found during more detailed investigations in the specific approval procedure for the submarine cable systems, these must be analysed and given particular weight in the decision-making process. A spatial alternative in the immediate vicinity which is more capable of preserving the relevant protected assets is to be determined where appropriate. For submarine cable systems, the route must be optimised within the framework of fine routing so as to prevent as far as possible and not affect known occurrences of particularly sensitive biotopes in accordance with section 30 of the Federal Nature Conservation Act. At present, however, it is not possible to make any specific spatial allocation of the said structures.

Pursuant to section 2 subsection 2 no. 6 of the Federal Spatial Planning Act, the significance of the space for the functioning of the soil, water resources, flora and fauna, and climate, including their respective interactions, must be developed, secured, or restored where necessary, possible and appropriate. The importance of space for the functioning of the soil, water resources, flora and fauna and climate, including the relevant interactions with the requirements of the biotope network system, must be maintained. The aim is to ensure that the dispersal processes and long-range ecological interactions of species and their habitats are taken into account.

4.5 Possible deviations

4.5.1 Standard technical principles

According to section 5 subsection 1 no. 11 WindSeeG, standardised technology principles must be defined in the Site Development Plan for planning purposes. Moreover, an essential objective of the definition is to achieve standardisation in the planning of the installations through standard technical principles in order to use the space in the area as efficiently as possible, to create planning security for grid and wind farm operators as well as suppliers and, where applicable, to reduce costs.

It can also be assumed that due to the differing planning and implementation progress of the offshore pipeline link and the OWP or the site to be put out to tender, a deviation from the standard technical principles is not possible in principle. Otherwise, the impact on the interfaces between TSOs and OWP project developers, for example, could be significant only at a very late stage, e.g. after the site has been put out to tender.

In principle, it is not possible to deviate from the standard technical principles in order to achieve the objectives associated with the specification. This is only possible if a deviation is necessary in a specific individual case or it makes sense based on new findings. Particularly because of the possible impacts of a deviation on interfaces between TSOs and OWPs, but also because of differing planning and implementation progress, deviations must be introduced at a very early stage – before the announcement of the invitation to tender for the relevant site(s) or before the award of the offshore pipeline link.

4.5.2 Planning principles

The option of deviating from planning principles depends on factors such as whether the planning principles are based on binding regulations from specific legislation. Deviation from such principles is not possible. The same applies to principles which adopt the objectives of spatial planning. Here, deviation is not possible due to the binding nature of the objectives according to section 4 subsection 1 of the Federal Spatial Planning Act and thus the obligation to observe them during spatially significant planning operations as stated in the Spatial Development Plan.

With regard to existing official standards, specifications and concepts, it should be noted that the Site Development Plan does not define any new specifications in this respect, but merely refers to existing rules. Accordingly, it makes no statements on possible deviations regulated within this framework.

In addition, it is possible in justified individual cases to deviate from planning principles that are not based on mandatory technical law or do not represent spatial planning objectives. This relates to cases in which compliance cannot be guaranteed or can no longer be guaranteed due to special circumstances. Furthermore, some situations are conceivable in which not all principles are implemented at the same time as they serve opposing interests to an extent and therefore have to be brought into balance.

Project developers submitting applications to the BSH for the construction and operation of offshore wind turbines, including corresponding ancillary installations, pipeline links, interconnections or cross-border submarine cable systems may, exceptionally and in justified individual cases, deviate from flexible planning principles, provided that simultaneous compliance with all flexible planning principles is not possible.

From an overall point of view, it is necessary for the deviation to meet or not significantly affect the pursued objectives and purposes of the principle in question and the plan in an equivalent manner. The main features of planning must not be affected. In accordance with the principles developed within the framework of the Federal Spatial Planning Act, atypical individual case designs in particular may provide an indication of such deviations.

Any deviation from flexible planning principles must be requested in the relevant approval process. Every deviation from any planning principle must be justified in a transparent and plausible manner in the specific approval procedure. Compliance with the statutory requirements must be presented in the specific approval procedure. In particular the following must be stated and presented for examination:

- Justification of every deviation for each planning principle and proof of compliance with statutory requirements
- Representation of instances in which public and private interests may be affected
- Agreement or consent with or from affected third parties
- Regard to space-saving and considerate use of the site in the sense of section 2 subsection 2 No. 6 Spatial Development Act (ROG)

4.6 Planning horizon

The Site Development Plan will lay down technical planning specifications from 2026 until at least 2030 for the expansion of offshore wind turbines and the offshore pipeline links required for this purpose.

Renewable Energy Sources Act target: 15 GW by 2030

The planning horizon is based on the Renewable Energy Sources Act target of achieving 15,000 megawatts in 2030 in accordance with section 4 no. 2b of the Renewable Energy Sources Act (see chapters 1.3 and 3.2).

This means that in areas N-1 to N-9 and O-1, areas with an expected generation capacity in order to achieve the Renewable Energy Sources Act target will be specified, taking into account factors such as the criteria for the specification of areas in accordance with section 5 subsection 4 of the Offshore Wind Energy Act and section 5 subsection 5 of the Offshore Wind Energy Act. In this context, it should be noted that the Site Development Plan specifies the expected generation capacity at the specified sites. Please see chapter 1.4.

Specifications beyond 2030

In addition, a planning horizon is used as a basis which is oriented towards a reasonable medium to long-term perspective for spatial planning in accordance with section 2 subsection 2 sentence 4 of the Federal Spatial Planning Act and section 7 subsection 1 of the Federal Spatial Planning Act. The fact that the task of forward-looking, orderly and coordinated planning can be taken into account more appropriately is a particular argument in favour of using such a planning horizon as a basis. The more potential areas are included in the planning, the more coordination can be brought to bear in the planning of the expansion of offshore wind energy and offshore pipeline links.

Within the framework of the planning horizon beyond 2030, areas N-10 to N-13 are defined in the continuous planning space up to shipping route 10, defined spatially. Due to the long-term planning perspective, there is currently no designation of sites to be put out to tender.

Scenario framework, 2019-2030: 17 GW or 20 GW by 2030

The scenario framework 2019-2030 approved by BNetzA on 15 June 2018 contains (see chapter 2.5.1), under the terms of the coalition agreement of 12 March 2018, the development of offshore wind which deviates from the goals of the Renewable Energy Act and thus from the legal requirements of the Site Development Plan. For information purposes, scenarios B/C 2030 and A 2030 of the scenario framework 2019-2030 and a long-term outlook for the period after 2030 are presented in the annex (chapter 13).

4.7 Determination of expected generation capacity

4.7.1 Aim of the power output determination

When determining the expected generation capacity, the aim is to ensure that the offshore wind turbines and the offshore connection systems are extended in parallel and, as a result, to achieve the expansion target for offshore wind energy as set out in the Renewable Energy Sources Act. Based on this specification, the required capacity of the offshore pipeline link can thus be determined for orderly and efficient use and exploitation of offshore pipeline links and a corresponding specification can be provided for the connection of this site.

Furthermore, the tender volume for the site in question will be sketched out by the specification of the expected generation capacity. However, the proportion of the site in question in the tender volume is actually only specified in the context of the preliminary investigation or suitability test of the site in question according to section 12 subsection 5 of the Offshore Wind Energy Act. Therefore, the generation capacity determined during the preliminary investigation may deviate from the specifications of the Site Development Plan in individual cases.

Compared to BFO 2016/2017, the requirements for the accuracy of the performance determination are significantly more stringent for these reasons. Moreover, the characteristics of the various sites differ considerably. Whereas the more coastal sites in zones 1 and 2 of the EEZ are mainly smaller, the sites in zone 3 of the EEZ in the North Sea are subject to special conditions. These are significantly larger sites where efficiency is determined primarily by internal shading effects. The approach of the methodology described below is to take sufficient account of the different conditions on the sites in question and, at the same time, to facilitate a simple and transparent procedure for determining the expected generation capacity.

In the (preliminary) draft of the Site Development Plan, a different methodology was proposed initially which provided for categorisation of the sites based on two different criteria (geometry and shading by external wind farms) in order to determine the power density to be applied. Based on the feedback from the consultation, this methodology was also checked for its suitability in the context of the accompanying assignment (Prognos, 2019). Based on this analysis, what is known as the alternative methodology was developed within the framework of the assignment, presented within the framework of the first interim report and in the draft Site Development Plan and discussed at a specialist workshop. In the comments on the draft Site Development Plan and at the specialist workshop, the vast majority of consultation participants were in favour of using the alternative methodology. This is why the final version of the Site Development Plan solely uses the alternative power determination methodology, which is described in greater detail below.

4.7.2 Power determination methodology

The power density of a wind farm (expressed in MW/km²) results from the ratio of the nominal output of the wind turbine to its base area, which is spanned by the external wind turbines. The power density is therefore the determining parameter for determining the expected generation capacity on any site. The distance between the individual wind turbines is an important factor that influences the power density. The power determination methodology, which is described further below, is described schematically in Figure 6. This methodology applies equally to the North Sea and Baltic Sea EEZs.

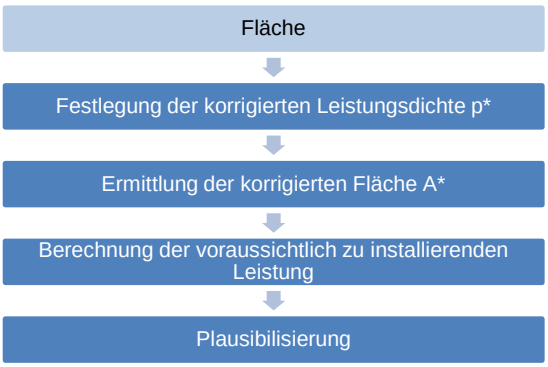

Figure 6: Schematic representation of the power determination methodology

4.7.2.1 Specification of the corrected power density

The power densities of wind farms already implemented in European waters were analysed in greater detail in (Borrmann, Rehfeldt, Wallasch & Lüers, 2018). This revealed a very wide range in the power densities achieved, the deviations being partly attributable to differences in the regulatory framework conditions in the countries in question. Moreover, the wind farms analysed showed strong deviations to an extent from the values specified in the literature. These deviations result from the different site definitions, which make it very difficult to compare sites of differing sizes and geometries with regard to their power density. To permit comparability of sites of different geometry and size, the corrected power density parameter was introduced in the context of the study referred to above. To calculate the corrected power density, the area of the wind farm is extended mathematically by an additional margin of half the mean distance between the installations. This means that for each wind turbine located on this site, the same area is calculated as the base area and different sites can be compared. The corrected power density now relates the total installed power of the wind farm to the corrected area and is thus always lower than the nominal output density, as the former always refers to a correspondingly larger area. Unless stated otherwise, the term "power density" in the chapters below refers to the corrected power density.

Figure 7 shows the nominal area (blue border) which is spanned by the specific installation locations in relation to the corrected area (red border).

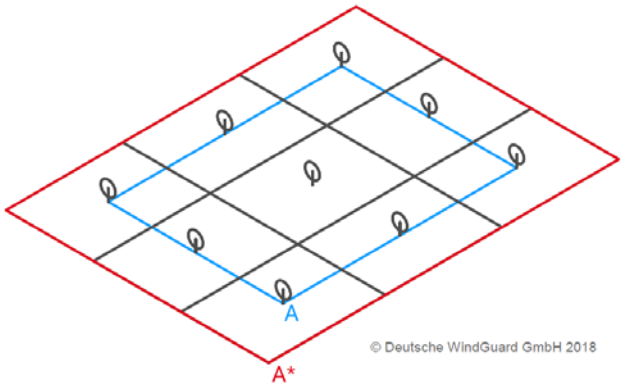

Figure 7: Depiction of the corrected area A* in relation to the nominal area A (Prognos, 2019)

The Offshore Wind Energy Act can be used to derive the following competing targets for determining the expected generation capacity, which must be weighed up against one another in order to determine the power density to be applied:

- Cost-effectiveness: according to section 1 subsection 2, the expansion of offshore wind energy should be cost-effective. A lower power density leads to a reduction in shading effects within the wind farm, and hence to a reduction in electricity generation costs in a certain range. From a cost-effectiveness standpoint, therefore, a lower power density within a certain range is advantageous.
- Space-saving: according to section 4 subsection 2 no. 2, the Site Development Plan defines specifications with the aim – among other things – of expanding electricity generation from offshore wind turbines in a space-saving manner. The expected amount of electricity produced per site area (energy density) is a possible

parameter for spatial efficiency. The energy density increases with a higher power density, even taking into account increasing shading effects.

The electricity generation cost and energy density parameters were analysed within the scope of the accompanying assignment as a function of the power density for various model wind farms. This showed that the energy density indicator reacted much more sensitively to an increase in power density than the electricity generation cost indicator.

Feedback on the consultation on the draft Site Development Plan showed that the methodology should continue to allow differentiated consideration of the sites in zones 1 and 2, as well as in zone 3. Efficient utilisation of the existing and planned grid connection systems is crucial to determination of the expected generation capacity for the sites in zones 1 and 2. For this reason, a higher corrected power density of 10 MW/km² is assumed for sites in zones 1 and 2. If there is strong shading from surrounding wind farms in individual cases, the corrected power density can be reduced to 9.5 MW/km².

Areas N-9 to N-13 in zone 3 of the North Sea EEZ must be developed entirely within the framework of the target system. The specified sites in zone 3 are characterised by the fact that they are large, continuous areas, which are usually developed as one unit. Compared to the small sites in zones 1 and 2, the importance of internal shading effects increases due to the large number of installations, while the influence of external wind farms decreases proportionally. This is why the corrected power density for sites in zone 3 is set correspondingly lower, to 9 MW/km².

Considering the above objectives, the power density to be applied for the site categories in question is determined as follows:

Table 3: Power density to be applied

Site category	(Corrected) power density to be applied [MW/km²]
Sites in zones 1 and 2	10
With case of strong shading due to surrounding wind farms	9.5
Sites in zone 3	9

4.7.2.2 Determination of the corrected area

The corrected area is calculated in order to make the different sites comparable. For this purpose, the area defined in the Site Development Plan is extended by an additional margin that corresponds to half the mean distance of the wind turbines from one another.

To calculate the corrected area, it is therefore assumed that the reference installations are positioned in a regular grid on the site. Besides power density as the determining factor, the rotor diameter and the ratio of nominal output to rotor circuit area (specific wind turbine output, in W/m²) are also input variables for the calculation. The buffer distance is calculated as follows:

Calculation of the buffer distance x

$$x = \frac{1}{4} \cdot d_{Rotor} \cdot \sqrt{\pi \cdot \frac{p_{WEA}}{p^*}}$$

d_{Rotor}	Rotor diameter in m
p_{WEA}	Specific wind turbine capacity [Watts/m² of rotor area]
p^*	Corrected power density in MW/km²

Besides the corrected power density, the definition of the rotor diameter and the specific output of the reference installations are therefore required in order to calculate the buffer distance. For this purpose, technology scenarios were examined within the framework of the accompanying expert opinion, and participants were asked about the possible development of installation technology from 2026 onwards during the consultation on the Site Development Plan.

The consultation resulted in relatively high bandwidth with regard to the expected rotor diameter of the installations to be constructed in the target system. Taking into account the feedback from the consultation and the results of the accompanying research assignment, the rotor diameter of the reference installation will be set at 220 m.

As already analysed in (Borrmann, Rehfeldt, Wallasch & Lüers, 2018), the specific output of the offshore wind turbines constructed in the past at European wind farms ranges from 300 to 500 W/m². No clear tendency towards systems with a very high or very low nominal output in relation to the rotor diameter could be determined to date. The consultation did not produce a consistent picture, either. To calculate the corrected area, therefore, the specific capacity of the reference installation is set at 400 W/m². The assumptions used to calculate the corrected area are summarised in the following table:

Table 4: Input parameters for calculating the corrected area

Parameter	Value
Corrected power density	Site-specific
Rotor diameter	220 m
Specific wind turbine capacity	400 W/m²

Depending on the categorisation according to Table 3, this results in the buffer distance by which the site in question is extended in order to calculate the corrected area. The corrected area must be reduced accordingly if the corrected areas overlap with other corrected areas or with the areas of existing wind farms.

The expected generation capacity for the site in question can now be found by multiplying the corrected area by the relevant corrected power density.

4.7.2.3 Plausibility verification of expected generation capacity

The plausibility of the expected generation capacity, determined according to the procedure described above, is verified in the next step. This check is carried out in three steps:

Available grid connection capacity

The first step is to check whether the determined capacity can be discharged via the existing or planned grid connection systems. If the determined capacity of the sites exceeds the possible grid connection capacity, the expected generation capacity of the site in question must be reduced accordingly.

Similarly, a reduction in the expected generation capacity would be achieved if the maximum annual tender volume were exceeded and division of the site into different tender years were out of the question due to the small size of the remaining sites.

Review of possible wind farm layouts

It may not be possible to achieve the full capacity determined for the individual sites due to specific restrictions, e.g. by maintaining distances between the installations and adjacent wind farms, existing or planned cable systems, etc. For this reason, implementation of the expected generation capacity is tested for the sites defined in the Site Development Plan using the installation parameters shown in Table 4 with a uniform distribution of the installations over the site, while maintaining the distances between the installations that are usual in practice. If this does not appear to be possible, the determined capacity is reduced accordingly.

Modelling of operating results

When modelling the operating results, the objective is to avoid extreme differences in the operating results to be expected for the individual sites when determining the expected generation capacity.

For this purpose, the operating results (yield, park efficiency, etc.) of the wind farm layouts provided by way of example above are modelled based on long-term wind speed time series. The shading losses both inside the wind farm and from surrounding wind farms are taken into account in this regard.

The parameters of the corrected energy density and the capacity factor of the wind farm are used to weigh up the criteria of spatial efficiency and cost-effectiveness, and thus the underlying power density to be applied is validated. With regard to the capacity factor, the modelled wind farms are compared in order to avoid extreme differences between the operating results to be expected from the individual sites.

4.8 Criteria for determining the sites and the chronological sequence of their call for tenders

The WindSeeG provides in section 5 subsection 4 the criteria that are to be applied for determining the sites in the Site Development Plan as well as the chronological sequence of their call for tenders. The primary aim of the specification is to ensure that the expansion of offshore wind turbines and the corresponding connection systems at these sites is synchronised, and that the existing pipeline links are utilised and loaded sufficiently. This ensures that all offshore wind turbines are connected in good time and that there are no voids in the pipeline links. This is to ensure that the expansion of the utilisation of wind energy takes place as cost-effectively as possible. This aim, as well as the general aim of the act to ensure a cost-effective expansion of the utilisation of offshore wind energy, is to be observed in the application of the criteria stated in section 5 subsection 4 sentence 2 WindSeeG. The listing in sentence 2 is not definitive.

Moreover, according to section 5 subsection 5 of the Offshore Wind Energy Act, the areas and sites and the chronological sequence of their tenders are determined such that offshore wind turbines with an expected generation capacity of 700 to 900 MW and of no more than an average of 840 MW are put out to tender at each tender deadline according to section 17 of the Offshore Wind Energy Act and brought into operation per calendar year from 2026 onwards.

4.8.1 Methodology for the application of the criteria

In principle, the following criteria will be applied gradually; initially to define sites, and then to determine the chronological order in which they will be put out to tender. Thus, one or more criteria may result in regions within areas not being defined as sites in chapter 5.2. Reference is also made to chapter 7.

With regard to the basic objectives set out in section 4.8, criterion no. 1 is defined as the main criterion in the application to determine the chronological order of the sites. This results from section 5 subsection 4 sentence 1 of the Offshore Wind Energy Act, which accentuates the completion of the pipeline links required to connect the sites and the efficient use and exploitation of the existing offshore pipeline links as the primary objective prior to listing the criteria. The criterion in section 5 subsection 4 sentence 2 no. 1 forms the central basis for this, as it is a matter of using the existing pipeline links in order to prevent voids as far as possible and ensure the most efficient procedure possible. Existing lines should primarily be used to full capacity.[14]

Thus the sites will initially be sorted according to this criterion when applying the criteria for determining the chronological order. The order of the sites for further arrangement is determined below by means of criteria 2 to 8.

4.8.2 Description of the criteria to be applied

4.8.2.1 Criterion 1: Efficient utilisation and loading of the offshore connecting cables including commissioning by the end of 2025

This criterion takes into account the principle that first and foremost, existing offshore pipeline links must be utilised in full so as to prevent voids. This includes all grid connection systems that

- already exist at the time of publication of the Site Development Plan or
- are confirmed unconditionally in the O-NEP and will thus be completed by the end of 2025.

As regards determination of the chronological order of the sites defined in 5.2, criterion 1 will apply to the effect that, in order to utilise existing offshore pipeline links, sites that are to be connected to the grid connection system referred to in Table 5 should preferably be put out to tender, taking into account section 5 subsection 5 of the Offshore Wind Energy Act.

Table 5: Existing grid connection systems or grid connection systems confirmed unconditionally in the O-NEP, with commissioning by the end of 2025 and available transmission capacity

Name	Year of commissioning	Available transmission capacity
North Sea		
NOR-3-3 (DolWin6/kappa)	2023	658.25 MW
Baltic Sea		
--		

[14] BT-DrS. 18/8860 of 21 June 2016, draft bill of the CDU/CSU and SPD parliamentary groups, draft bill on the introduction of tenders for power from renewable energies and further amendments to the law on renewable energies, p. 275.

4.8.2.2 Criterion 2: Orderly and efficient planning, installation, commissioning, utilisation and loading of the offshore connecting cables including commissioning from 2026 onwards

This criterion ensures that the development of offshore wind turbines and their grid connection systems is synchronised. Therefore, when determining the sites and their chronological order, orderly and efficient planning, construction, commissioning, use and exploitation of pipeline links which will become operational from 2026 onwards must also be taken into account. With realistic planning in mind, the onshore grid connection points and the planning and actual development of onshore networks must also be taken into account. Moreover, specification of the planning status must be taken into account when determining the spatial security of the access route.

On the one hand, criterion 2 is used to prevent voids.

On the other hand, when determining the chronological order based on criterion 2, a check is performed to see whether the corresponding pipeline links and grid connection points are likely to be available during the years for commissioning the sites, taking into account the planning and actual expansion of onshore networks. The information provided by the TSOs on the planning and implementation periods for the grid connection points and connectivity systems form a basis for this assessment. If an offshore pipeline link and a grid connection point are unlikely to be completed in time, the site to be connected will be classified later.

This criterion can also be applied in the sense of orderly planning of the connection systems so as to minimise route lengths and the number of crossings. For this purpose, individual sites may be brought forward in time so as to ensure efficient and orderly installation of the connection systems.

4.8.2.3 Criterion 3: Spatial proximity to the coast

There is a direct dependency between the distance from the coast of the areas to be connected and the investment required to connect them to the grid: the longer the sea and land cable link between the area and the coast, the higher the investment required to establish the grid connection. For cost-effectiveness reasons, therefore, and subject to other predominant criteria, the site closer to the shore will normally be the first to be put out to tender.

The O-NEP zones shown in chapter 3.1 are adopted in order to determine of the spatial proximity to the coast. The North Sea is divided into five distance zones: the entire area of the territorial sea and the German Baltic Sea EEZ are in zone 1 (see chapters 3.1, as well as Figure 2 and Figure 3). All sites within a zone are treated equally with regard to the coastal distance criterion.

When determining the sites in chapter 5.2, preference must be given to sites that are closer to the coast based on this classification. Reference is made to the planning horizon (see chapter 4.6).

When determining the chronological order, the sites that are closer to the coast based on this classification must be given priority; i.e. sites in zone 1 must be given preference over sites in zone 2 or 3.

4.8.2.4 Criterion 4: Usage conflicts on a site

If conflicts of use are expected in a site based on the information available, this site can be deferred or excluded from use by offshore wind turbines. See chapter 7. Possible conflicts of use may include:

- Competing applications (e.g. fishing, national and alliance defence, shipping, aviation, research, mining of raw materials, existing pipelines)
- Impacts on fauna, flora and biodiversity
- Damage to cultural heritage
- Interactions between the various concerns

4.8.2.5 Criterion 5: Probable actual development potential of a site

When applying this criterion, the expected actual development potential of the site is assessed in relation to the geological formation. If the information available to the BSH on geological conditions and sediment distribution indicates that development of a site with wind turbines and grid connection systems is significantly more difficult or impossible according to the current state of the art, this site will be permanently deferred or not be specified.

The geological conditions on the seabed and in the subsoil on the site that can probably be expected based on the available information provide the crucial evaluation criterion for assessment of the development potential of a site. For example, the thick, mushy silt, which is several metres thick in places and can be found in parts of the southern Arkona Basin, is classified as problematic.

4.8.2.6 Criterion 6: Expected generation capacity

Subject to other criteria, very small sites in particular may be set aside or no longer taken into account. This applies in particular to sites where (economic) operation of an independent wind farm cannot be expected.

4.8.2.7 Criterion 7: Balanced distribution between North Sea and Baltic Sea

This criterion can be used to achieve balanced distribution of the tender volume over sites in the North Sea and the Baltic Sea against the background of the total economic costs and other factors, taking into account the total potential available. Subject to other criteria, application of this criterion may result in the tendering procedure being brought forward or postponed for a site.

4.8.2.8 Supplementary criterion coastal waters: Actual availability of the site

As the catalogue of criteria in section 5 subsection 4 page 2 of the Offshore Wind Energy Act includes only a non-exhaustive list, a supplementary criterion was included for the actual availability of the site. This criterion is used to determine the extent to which the site in question is actually available for the specifications in the Site Development Plan and the tendering procedure. Possible reasons that may prevent availability are:

- Existing permit or permit applied for according to the Federal Immission Control Act for the site in question in coastal waters
- Pending spatial planning procedures in coastal waters

Please see chapter 5.4.

5 Rules

5.1 Areas for the installation and operation of offshore wind turbines

According to section 5 subsection 1 no. 1 of the Offshore Wind Energy Act, the Site Development Plan contains specifications concerning areas for the construction and operation of offshore wind turbines.

According to the following, a total of 13 areas for offshore wind farms in the North Sea EEZ are currently identified in the plan, along with three areas in the Baltic Sea EEZ, and areas N-4 and N-5 are being considered for possible continued use. Please see chapter 4.6. The areas are labelled with the letter N or O for the North Sea or Baltic Sea and the numbers 1 to 13 in order to provide a better overview.

The rule and delimitation of the areas is based in particular on the determinations of spatial planning and the consideration of further public and private interests.

Summaries of approved usages and protected areas as well as areas specified through spatial planning may be found in BFO-N 16/17 (Chapter 12) and BFO-O 16/17 (Chapter 11). Please see chapter 7. The rule of areas was largely transferred from the O-NDP or the BFO respectively. Areas N-1 to N-4 and all areas in the Baltic Sea are located in zone 1 of the O-NDP. Areas N-5 to N-8 are located in zone 2, areas N-9 to N-13 in zone 3 of the O-NDP.

Table 6: Overview of areas for offshore wind energy

Area	Size [km²]	The O-NDP zone arrangement
North Sea		
N-1	approx. 79	1
N-2	approx. 223	1
N-3	approx. 311	1
N-4	approx. 152	1
N-5	approx. 125	2
N-6	approx. 249	2
N-7	approx. 163	2
N-8	approx. 170	2
N-9	approx. 196	3
N-10	approx. 162	3
N-11	approx. 346	3
N-12	approx. 237	3
N-13	approx. 228	3
Baltic Sea		
O-1	approx. 134	1
O-2	approx. 101	1
O-3	approx. 30	1

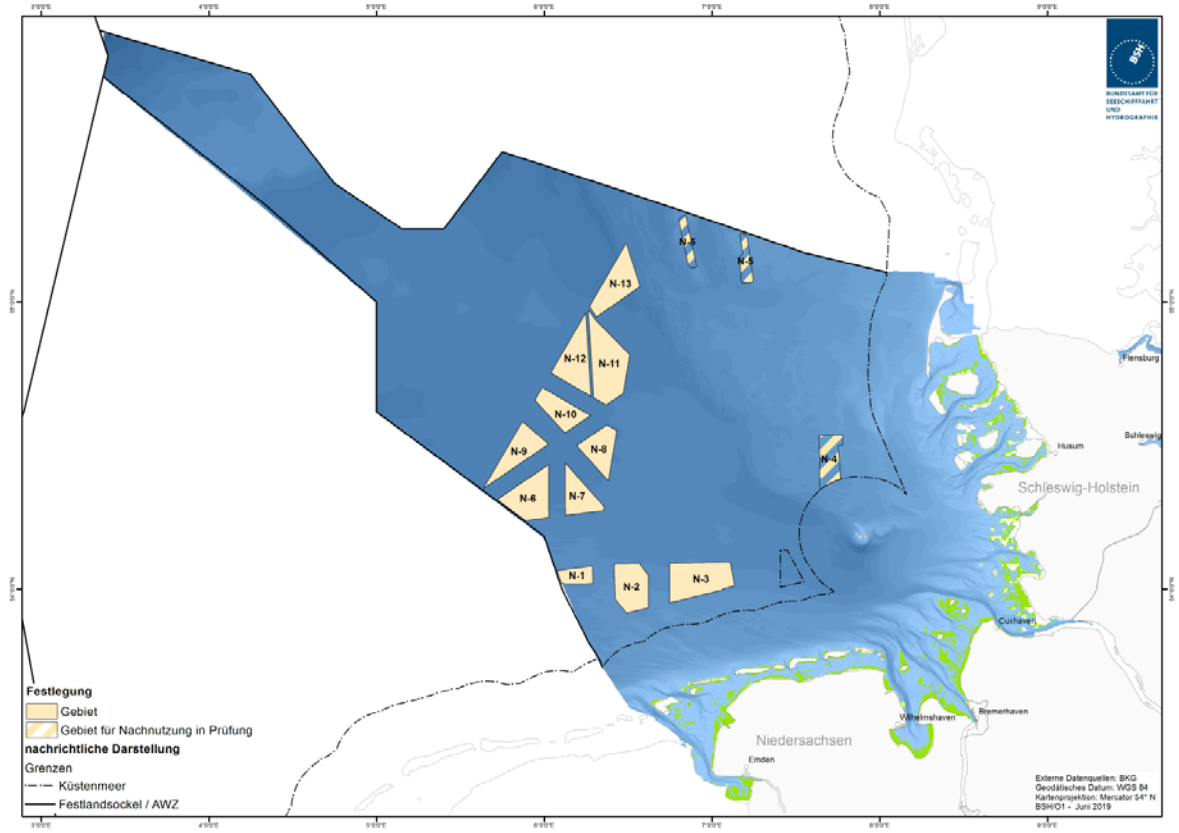

Figure 8: Areas of the German EEZ of the North Sea

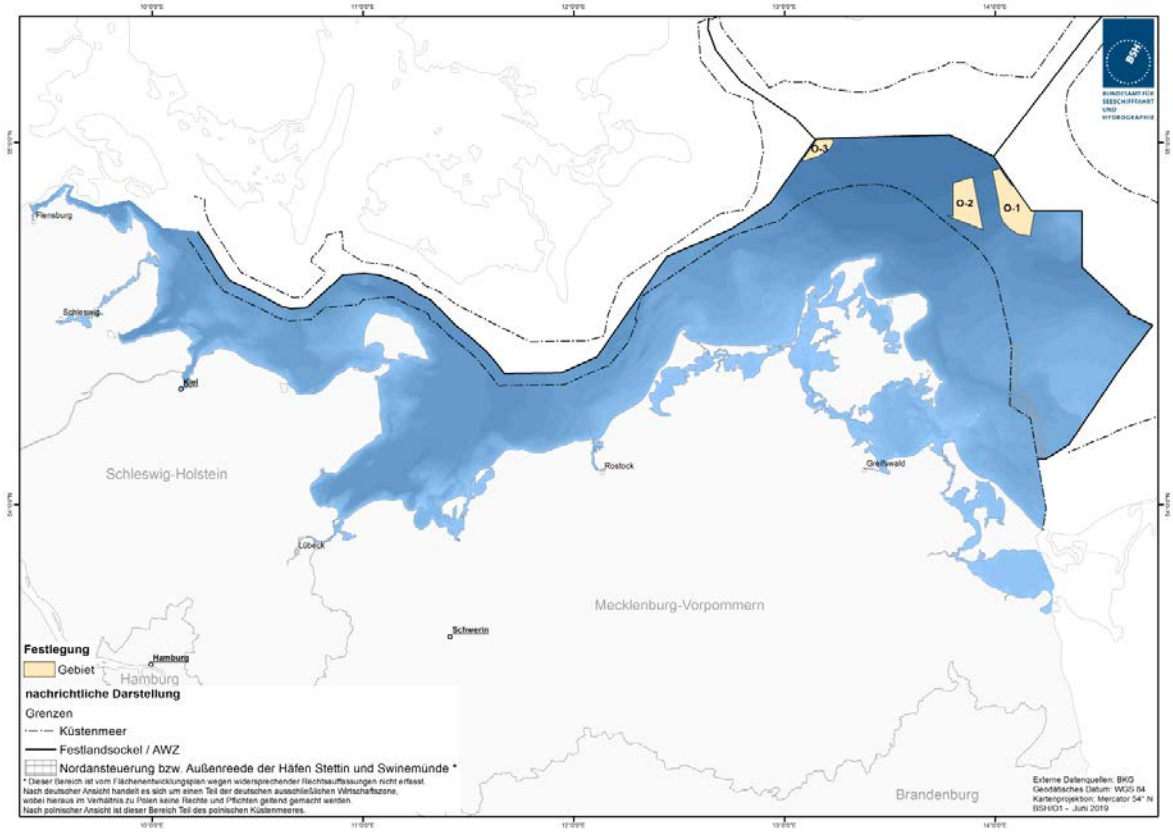

Figure 9: Areas of the German EEZ of the Baltic Sea

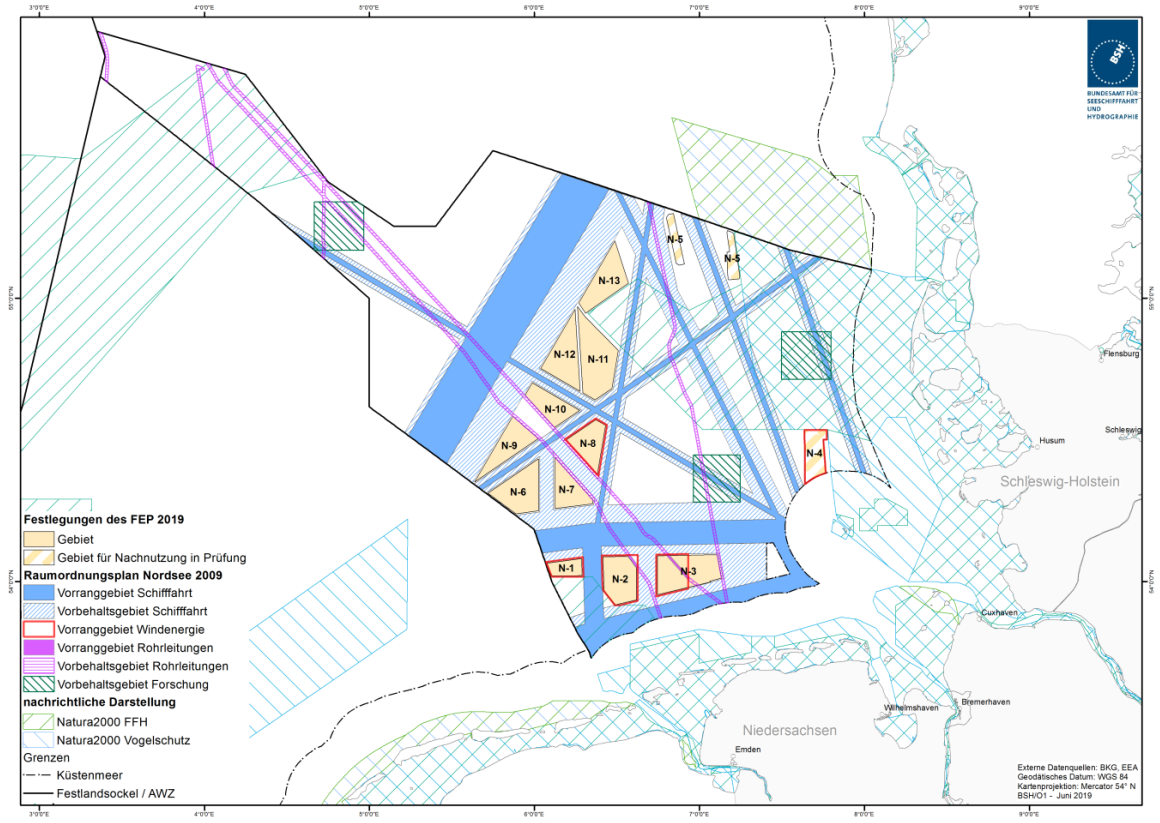

Figure 10: Specification of areas and Spatial Development Plan for the North Sea EEZ

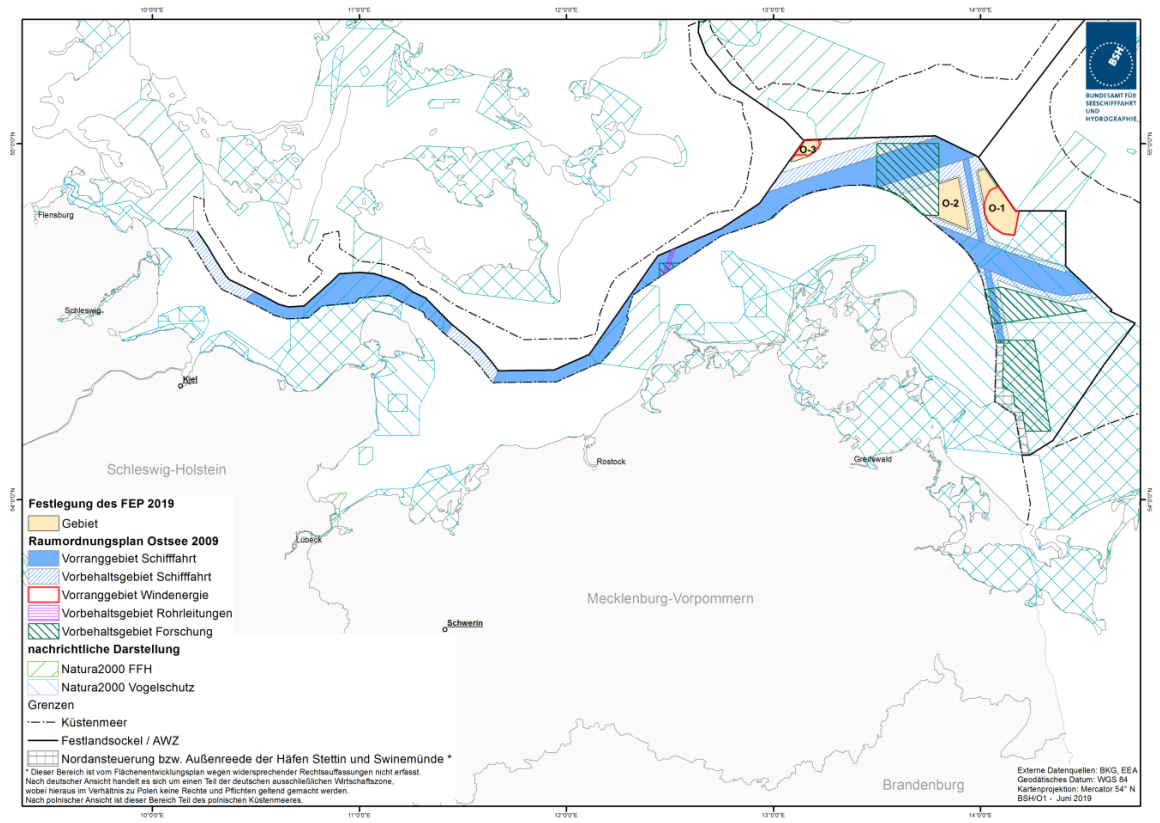

Figure 11: Specification of areas and Spatial Development Plan for the Baltic Sea EEZ

5.1.1 Specification of areas and sectoral planning framework

In principle, the existing Spatial Development Plans for the EEZs define the framework, primarily for the specification of the areas. The North Sea EEZ is governed by the Spatial Development Plan adopted by ordinance of 21 September 2009 (see Figure 10). The Baltic Sea EEZ is governed by the Spatial Development Plan adopted by ordinance of 10 December 2009, application (see Figure 29). The priority and restricted areas for shipping, pipelines, research and wind energy were taken into account when selecting and defining the 13 areas in the North Sea EEZ and the three areas in the Baltic Sea EEZ. In accordance with the specifications of the Spatial Development Plan, no wind energy areas have been designated in conservation areas or naval training areas (see Figure 10 and Figure 11).

Furthermore, the specifications of the areas are based on the clusters identified in the Spatial Offshore Grid Plans, which essentially continue to apply.[15] Thirteen clusters for offshore wind energy were identified and described in the Offshore North Sea 2012 Spatial Offshore Grid Plan, which is why other areas are not being considered for use for offshore wind energy; see chapter 4.2 of BFO-N 2012. This was explained further in BFO-N 13/14. Reference is made to the explanations in chapter 4.2 of BFO-N 13/14 in this regard.

Besides the general spatial planning conditions, the legal objectives pursuant to section 4 subsection 2 of the Offshore Wind Energy Act also play a decisive role in the location and selection of the areas. The objective is to achieve the expansion target pursuant to section 4 no. 2 letter b of the Renewable Energy Sources Act in order to expand power generation from offshore wind turbines in a spatially organised and space-saving manner, ensure an orderly and efficient use and exploitation of the offshore pipeline links, and plan, build, commission and use offshore pipeline links in line with the expansion of the power generation from offshore wind turbines.

According to section 5 subsection 3 sentence 3 of the Offshore Wind Energy Act, the permissibility of the specifications of an area is initially assumed as a matter of principle if the area is located in a cluster defined by the Spatial Offshore Grid Plan in accordance with section 17a of the Energy Industry Act or in a priority, restricted or suitable area of a spatial development plan in accordance with § 17 subsection 1 sentence 1 of the Federal Spatial Planning Act. This means that the permissibility of the specification of areas for offshore wind energy only needs to be examined if additional or other significant aspects can be identified, or if updates and further details are necessary for the examination.

Pursuant to section 5 subsection 3 sentence 2 no. 5b of the Offshore Wind Energy Act, it is generally inadmissible to define areas or sites outside North Sea clusters 1 to 8 and Baltic Sea clusters 1 to 3 in the Spatial Offshore Grid Plan or areas or sites designated by a coastal country in coastal waters. Pursuant to section 5 subsection 3 sentence 2 no. 5b of the Offshore Wind Energy Act, this does not apply if sufficient areas and sites cannot be defined in these clusters, areas and sites in coastal waters in order to achieve the expansion target according to section 4 no. 2b of the Renewable Energy Sources Act (15 GW in 2030).

When specifying and examining the areas, and according to the following comments on the individual areas, either no new findings have

[15] Can be downloaded at https://www.bsh.de/DE/THEMEN/Offshore/Meeresfachplanung/Bundesfachplaene_Offshore/bundesfachplaene-offshore_node.html.

essentially emerged with respect to the clusters identified in the Spatial Offshore Grid Plan, so there is nothing to prevent a specification in the Site Development Plan based on the currently available information; or else additional significant identifiable aspects or updates and further details in the examination have confirmed the designation of the clusters in the Spatial Offshore Grid Plan.

Reference is made to the following explanations with regard to areas N-4 and N-5.

Although the criteria set out in section 5 subsection 4 sentence 2 nos. 1 to 7 of the Offshore Wind Energy Act, such as the orderly and efficient planning, construction, commissioning, use and exploitation of the offshore pipeline links still to be completed, the spatial proximity to the coast and conflicts of use according to the wording of the Act, are to be applied to the specification of sites and the order in which they are tendered, and although the sites are located within the areas, the areas are already determined according to their meaning and purpose with regard to the criteria to be applied to sites, or are not only checked for additional or other significant identifiable aspects and for updates and further details, but also – in particular – with regard to spatial proximity to the coast (criterion 3) and the existence of conflicts of use (criterion 4).

Development of coastal areas should begin and the distance to the coast should be gradually increased in the interests of cost-efficient development of wind energy. The zoning of the seas according to the O-NEP (see Figure 2 and Figure 3) is used as a benchmark for distance from the coast. If zone 4 is developed in the North Sea EEZ, the crossing of shipping route 10 will result in significant extension of the connection systems required in each case. Moreover, the area northwest of shipping route 10 would have to be examined with regard to its suitability for wind energy. The available data and information base for this part of the external EEZ is significantly worse than for the area designated in the Site Development Plan. Current AIS data analyses show possible conflicts with shipping here, even outside the spatially defined shipping route. In this respect, reference is made to the continuation of the Spatial Development Plan for the North Sea EEZ. At this point in time, however, conflicts with shipping in this area cannot be excluded.

In addition, it is not currently necessary to define areas to achieve the mandatory trajectory of 15 GW by 2030, nor is it apparent that the specification of areas north-east of shipping lane 10 would result in less operating conflicts than the specifications that have been made since BFO 2012.

5.1.2 The areas in detail

Area N-1 is located between the shipping separation areas "German Bight Western Approach" and "Terschelling German Bight". The area is bordered to the south by the nature conservation area "Borkum Reef Ground", and to the east by the spatially defined shipping priority area 3. On the western side of the area runs the EEZ border to The Netherlands. The area is located in the spatially defined wind energy priority area "North Borkum". The area is expected to be fully constructed by the end of 2025.

Area N-2 is located north-east of the nature conservation area "Borkum Reef Ground" and is bordered in the north-eastern section by the "Norpipe" pipeline. To the south and north, it is bordered by areas reserved for shipping, which are parallel to the shipping separation areas. The same applies to the eastern side. The area is located in the spatially defined wind energy priority area "North Borkum". The area is expected to be fully constructed by the end of 2025.

Area N-3 is also located between the two shipping separation areas to the west of the priority area for pipelines "Europipe 2",

determined through spatial planning. The western half of the area lies in the wind energy priority area "North of Borkum", determined through spatial planning. The pipeline "Europipe 1", which is secured by corresponding pipeline priority and reservation areas, runs through this area in a north-easterly direction. The area is expected to be partially constructed by the end of 2025; refer to Figure 13.

Area N-4 is north of Helgoland. On the eastern side, it boundarieson the "Eastern German Bight" bird sanctuary and area II of the nature conservation area "Sylt Outer Reef – Eastern German Bight". The area corresponds to the wind energy priority area "Südlich Amrumbank" as defined in the Spatial Plan. A large part of the area is in the main concentration area of diver bird species and is almost fully constructed. The area is expected to be fully constructed by the end of 2025.

In comparison with the designation of clusters 4 and 5 of the BFO 2012 - 17, there are significant additional considerations in respect of the strictly protected species of red- and black-throated divers for the entire area off the Schleswig-Holstein North Sea coast. In particular, the analysis and assessment of the cumulative impacts of the OWPs revealed that the deterrence effects acting on divers are much more pronounced (Garthe, et al., 2018) than was originally assumed in BSH decisions for individual approval procedures and in the position paper of the BMU (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2009).

The OWPs "Amrumbank West", "Nordsee Ost" and "Meerwind Südost" contribute to the identified displacement of divers from a hitherto preferred feeding and stopover habitat and the concentration in another, in the opinion of the experts, possibly less favoured habitat. Furthermore, because of the identified wind farm avoidance behaviour, the main concentration zone can only be used to search for food to a limited extent. Evidence indicates that familiarisation has not occurred.

Based on the consultation reports and the data and information available to BSH, the investigation has shown that diver populations- are biologically highly sensitive and that the main concentration area is of high functional importance for conserving the local population and that the adverse effects of the avoidance behaviour are intense and permanent.

To avoid a deterioration of the conservation status of the local population of divers due to the cumulative effects of wind farms, the site of the main concentration area currently available to the divers outside the impact zones of already constructed wind farms must be kept clear of the new wind farm projects which are being commissioned from 2026 onwards.

Due to the fact that the cumulative adverse effects on divers are intense and permanent, the monitoring actions must be continued while the relevance of the cumulative effects of continued use of the area for offshore wind energy in the coming years must also be investigated. In addition to strict monitoring measures, mitigation measures must also be implemented to safely prevent the occurrence of circumstances leading to the disturbance in the sense of section 44 subsection 1 no. 2 BNatSchG. An extension of area N-4 for the exploitation of offshore wind energy beyond the size of the priority area identified in the spatial planning for the German North Sea EEZ (RO-V 2009) is excluded in order to ensure species protection for the diver group of species.

A specific statement on the approved service life of the OWP projects present in area N-4 or any measures taken in the context of the implementation is not linked to the presentation of area N-4 under investigation in respect of any continued use, rather remains reserved solely for the procedure in question. The same applies to the project, which is subject to the regulations

of the transitional regime. Treatment of this subject is reserved for the approval procedure.

Refer to chapter 4.6 of the North Sea Environmental Report.

In addition, reference is made to the following remarks about area N-5.

The **area N-5** is located west of Sylt in or on the edge of the nature conservation area "Sylt Outer Reef – Eastern German Bight". The area lies entirely in the main concentration area of the divers.

Area N-5 has been reduced in size compared to the designation of cluster 5 in BFO because the operating wind farm project "Butendiek" is located in the nature conservation area "Sylt Outer Reef – Eastern German Bight". A specification of this eastern part of cluster 5 as an area would be inadmissible in respect of any continued use in accordance with section 5 subsection 3 sentence 2 no. 5a WindSeeG. This also results from Objective 3.5.1. (3) of the EEZ North Sea ROV. The "Butendiek" project is described for information only.

In addition, compared to the designation of cluster 5 in BFO-N 2012 - 17, the area now only includes the already operating "Dan Tysk" and "Sandbank" projects.

The whole N-5 area is of very high importance for stopover populations of divers. To the north, area N-5 boundaries the Danish "Southern North Sea" bird sanctuary, which also has a high incidence of divers.

The long-term data series from the environmental compatibility studies, OWP monitoring and monitoring of the Natura 2000 sites show that high densities were frequently recorded in this area. The interannual variability of the distribution patterns, which were also found in the surroundings of area N-5 prior to construction of the wind farm, can be related to the dynamic availability of food or the search for suitable avoidance habitat in the event of disturbances.

The results from monitoring as well as from research projects show that the disturbance of the divers and/or the loss of habitat is significantly greater than expected (Welcker & Nehls, 2016, Dierschke, Furness, & Garthe, 2016, Garthe, et al., 2018, Mendel, et al., 2019). Where the wind farm projects in area N-5 and its surroundings are concerned, current results from the ongoing operational monitoring indicate significant mean avoidance distances between 10 and approximately 15 km (BIOCONSULT SH GMBH & CO.KG, 2017; 2018; IFAÖ INSTITUT FÜR ANGEWANDTE ÖKOSYSTEMFORSCHUNG GMBH, 2018).

In particular, the analysis and assessment of the cumulative impacts of the OWPs revealed that the deterrence effects acting on divers are much more pronounced (Garthe, et al., 2018) than was originally assumed in BSH decisions for individual approval procedures and in the position paper of the BMU (2009). The OWPs "Butendiek", "Dan Tysk" and "Sandbank" in area N-5 contribute to the identified displacement of divers from a hitherto preferred feeding and stopover habitat and the concentration in another, in the opinion of the experts, possibly less favoured habitat. Furthermore, because of the identified wind farm avoidance behaviour, the main concentration zone can only be used to search for food to a limited extent.

Evidence indicates that familiarisation has not occurred. Due to the fact that the cumulative adverse effects on divers are intense and permanent, the monitoring actions must be continued while the relevance of the cumulative effects of continued use of the area for offshore wind energy in the coming years must also be investigated.

In addition to strict monitoring measures, mitigation measures must also be implemented to safely prevent the occurrence of circumstances leading to the disturbance in the sense of section 44 subsection 1 no. 2 BNatSchG.

A specific statement on the approved service life of the OWP projects present in area N-5 or any measures taken in the context of the implementation is not linked to the presentation of area N-5 under investigation in respect of any continued use, rather remains reserved solely for the procedure in question.

An extension of area N-5 for the exploitation of offshore wind energy beyond the "Butendiek", "Dan Tysk" and "Sandbank" OWPs in operation at the time of this investigation and specifically in relation to the site N-5.4 presented in the drafts of the Site Development Plan is, according to the current state of knowledge, not consistent with the prohibition of section 44 subsection 1 No. 2 BNatSchG, as well as with section 5 subsection 3 sentence 2 no. 2 WindSeeG. The exclusion of site N-5.4 is justified by the extent of the already identified cumulative adverse effects of the OWPs in the region of the main concentration area of divers in the German North Sea EEZ. The observed 19% loss of the valuable feeding and stopover habitats within the main concentration area, in conjunction with the identified statistically significant decrease in the abundance of divers, prohibits any increase in the exploited area for species protection reasons relating to the diver species group.

Based on the precautionary principle in the sense of section 3 UVPG and to avoid any substantial disturbance according to section 44 subsection 1 no. 2 BNatSchG with the required degree of certainty, further cumulative effects due to the construction of more offshore wind turbines in area N-5 are to be avoided.

The precautionary principle is an environmental law principle of primary importance. It requires that risk reduction measures are not just taken in the event of imminent harm due to specific environmental hazards, but rather start before the risk even emerges. This results in the obligation to implement planning as far-sighted as possible and anticipatory environmental precautions that are aimed at preventing environmental hazards or indeed environmental damage from occurring in the first place. Particularly in the case of complex or not yet fully explored interrelationships, a cumulative summation of factors can occur. While these are potentially harmless individually, they may pose an environmental hazard when combined. For example, the construction of just one wind turbine, or even just one OWP, may well be regarded as problem-free in all respects, yet a different approach and treatment must be applied when a multiplicity of turbines or projects is involved. The application of the precautionary principle raises the possibility of taking action based on actual evidence as soon as there is a concern that environmental degradation might occur (Kuhbier & Prall, 2010).

Based on the previous remarks, area N-5 will be reduced to the size of the already operating projects outside the Natura 2000 sites and will not be designated as an area, but will instead be subject to investigation in respect of any continued use. Site N-5.4, which remains under consideration in the drafts of the Site Development Plan, will be excluded from the further plans for offshore wind turbines to be commissioned from 2026 based on the results of the evaluation of the cumulative adverse effects on the conservation status of the local population of divers.

The investigation of the area or an applicable site in this area has shown that diver populationsare biologically highly sensitive and that the main concentration area is highly important for maintaining the local population and that the adverse effects of the avoidance behaviour are intense and permanent.

To avoid a deterioration of the conservation status of the local population due to the cumulative effects of wind farms, the site of the main concentration area currently available to the divers outside of the impact zones of already constructed wind farms, must be kept clear of the new wind farm projects which are being commissioned from 2026 onwards.

The BSH concludes that a significant disruption as a result of the implementation of the plan, in the sense of section 44 subsection 1 No 2 BNatSchG, can be safely excluded if it is ensured that no additional habitat loss will occur in the main concentration area.

Due to the not to be excluded significant cumulative effects on the diver population that would arise from the construction of further wind farm projects in the main concentration area, there already exists a threat to the marine environment, irrespective of the question of admissibility under species protection law, section 5 subsection 3 sentence 2 no. 2 WindSeeG. This is due to the fact that, amongst other things, the main concentration area is an important functional component of the marine environment in respect of seabirds and stopover birds. For this reason, a designation of site N-5.4 is not permitted.

Refer to chapter 7 of the Site Development Plan and to chapters 4.12.4 and 5.2.2.1 of the North Sea Environmental Report.

In any event, in respect of a possible site designation in this area, a usage conflict in the sense of section 5 subsection 4 sentence 2 no. 4 WindSeeG between the use of offshore wind energy and functional nature protection and legal environmental concerns has become apparent. See chapter 5.2.2.

The requirement for investigation of the area in respect of any continued use is based on the fact that according to section 8 subsection 3 WindSeeG in the context of a continuation of the Site Development Plan beyond the year 2030, agreements can be reached about continued use. According to the legal justification, it is only possible to specify whether the then released project areas of the wind farms in operation will either be used to generate electricity from offshore wind energy and accordingly a new tender issued for this site, or that these sites will no longer be used for this purpose.[16] A statement on the approved service life of the OWP projects present in area N-5 or any measures taken in the context of the implementation is not linked to the presentation of area N-5 under investigation in respect of any continued use, rather remains reserved solely for the procedure in question.

Area N-6 is located north of the shipping separation area "German Bight Western Approach". To the east the area is bordered by shipping reservation area 12 and in the northerly direction by shipping route 6. To the west of the area runs the EEZ border to The Netherlands. The area is expected to be partially constructed by the end of 2025; refer to Figure 13.

[16] Cf. BT-DrS. 18/8860 of 21 July 2016, draft bill of the CDU/CSU and SPD parliamentary groups, draft bill on the introduction of tenders from renewable energies and further amendments to the law on renewable energies, page 280.

Area N-7 is located north of the shipping separation area "German Bight Western Approach". To the west the area is bordered by shipping reservation area 12 and in the northerly direction by the pipelines reservation area ("Norpipe"). The area is expected to be partially constructed by the end of 2025; refer to Figure 13.

Area N-8 corresponds to the wind energy priority area "Östlich Austerngrund" determined in the Spatial Plan. To the west the area is bordered by the pipelines reservation area ("Europipe 1"), to the east and north by shipping routes 4, 5 and 6. The area is expected to be partially constructed by the end of 2025; refer to Figure 13.

Area N-9 is bordered by shipping routes 6 and 10 as well as the pipelines reservation area ("Norpipe").

Area N-10 lies between the shipping routes 4, 6 and 10 and the pipelines reservation area ("Europipe 1").

Area N-11 is bordered by shipping routes 4, 5 and 6, the cross-border submarine cable system "NorNed" and the nature conservation area "Sylt Outer Reef – Eastern German Bight".

Area N-12 is bordered by shipping routes 4 and 10 and the cross-border submarine cable system "NorNed".

Area N-13 is bordered by shipping route 10 and nature conservation area "Sylt Outer Reef – Eastern German Bight".

Area O-1 ("Westlich Adlergrund") is located north-east of the island of Rügen on the boundary with the Danish EEZ. The area is north of the nature conservation area "Pomeranian Bight – Rönnebank" and north of the shipping priority area 21. West of the area is shipping priority area 20 while the EEZ boundary with Denmark runs along the eastern side. The area contains the spatially defined priority area "Westlich Adlergund". The area is expected to be partially constructed by the end of 2025, reference is made to Figure 3 and Figure 14.

Area O-2 ("ArkonaSee") is located north-east of the island of Rügen. The area is bounded to the north, east and south by the shipping priority areas 19, 20 and 21. The area boundaries a research priority area in the west. The area is expected to be partially constructed by the end of 2025; refer to Figure 3 and Figure 14. Furthermore, reference is made to chapter 5.2.2.

Area O-3 ("Kriegers Flak") is located north-west of the island of Rügen. The area is bounded to the north by the Swedish EEZ border, to the west by the Danish EEZ border, to the south by shipping priority area 19 and to the east by NATO submarine exercise areas. This area encloses the spatially defined wind energy priority area "Kriegers Flak" and is fully constructed. Compared with the designation of the cluster in the BFO, the area has been reduced in size and now only includes the operating OWP project. Reference is also made to the admissibility check in chapter 7.3.

Table 7: Summary of the areas

Area	Cluster designation in the BFO	Current additionally identifiable significant aspects regarding designation of the clusters in the BFO (section 5 subsection 5 sentence 3 WindSeeG) Currently identifiable usage conflicts
North Sea		
N-1	Yes	No
N-2	Yes	No
N-3	Yes	No
N-4 (Continued use under investigation)	Yes	Location in the main concentration area of diver bird species.
N-5 (continued use under investigation)	Yes	Reduction of designated cluster 5 to the operating OWPs "Dan Tysk" and "Sandbank". Due to its location within the conservation area, the "Butendiek" project is shown as a wind farm for information only. Location in the main concentration area of diver bird species. Additional significant identifiable aspects and usage conflict.
N-6	Yes	No
N-7	Yes	No
N-8	Yes	No
N-9	Yes	No
N-10	Yes	No
N-11	Yes	No
N-12	Yes	No
N-13	Yes	No
Baltic Sea		
O-1	Yes	No
O-2	Yes	Bird migration Foundation ground conditions Safety and efficiency of shipping
O-3	Yes	Area has been reduced compared to the designated cluster.

5.2 Sites for the installation and operation of offshore wind turbines

According to section 5 subsection 1 no. 2 WindSeeG, the Site Development Plan makes specifications for sites in the areas specified in chapter 5.1 for the construction and operation of offshore wind turbines. Section 5 subsection 4 does not define finalising criteria for specifying the sites (see chapter 4.8). In addition, in accordance with section 5 subsection 5 WindSeeG, the areas and the sites and the time sequence of their tendering are specified so that offshore wind turbines on sites with an expected generation capacity of 700 to 900 MW and on average not more than 840 MW are advertised on each bidding date according to section 17 WindSeeG and commissioned each calendar year starting from 2026.

To improve understanding, the areas are numbered 1 to 8 after the letter N or O for the North Sea or O for the North or Baltic Sea respectively and the numbers 1 to 13 for the respective area (example: N-9.1 for site 1 in area N-9 in the North Sea).

5.2.1 Rules of sites

Within the framework of the Site Development Plan, taking into account the OWP projects, which will be commissioned by the end of 2025, and the planning horizon until 2030, initially only sites in the areas N-3, N-6, N-7, N -9 and O-1 are designated. Please see chapter 4.6. Assuming that the wind farm projects in areas N-1, N-2, N-4 and O-3 that are already in operation or have been awarded under transitional tenders are still in operation or will enter operation by the end of 2025 provided the conditions are met, there will be no designation of sites in these areas. The investigation of the projects which have been awarded under the transitional tender remains reserved for the relevant individual approval procedure in accordance with the applicable rules. See chapter 6.

Table 8: Overview of sites for offshore wind energy

Area	Site	Site size [km²]	Connection concept
North Sea			
N-1	-	-	-
N-2	-	-	-
N-3	N-3.5	approx. 26	66 kV
	N-3.6	approx. 32	66 kV
	N-3.7	approx. 17	155 kV[1)]
	N-3.8	approx. 23	155 kV[1)]
N-4[2)]	-	-	-
N-5[2)]	-	-	-
N-6	N-6.6	approx. 42	220 kV[3)]
	N-6.7	approx. 16	220 kV[3)]
N-7	N-7.2	approx. 53	66 kV
N-8	-	-	-
N-9	N-9.1[4)]	approx. 87[4)]	66 kV
Baltic Sea			
O-1	O-1.3	approx. 25	AC connection
O-2	O-2.2[5)]	approx. 20	-
O-3	-	-	-

[1)] The sites N-3.7 and N-3.8 will be connected to the connection system NOR-3-3 and thus with the 155 kV connection concept, which will become operational in 2023.
[2)] Areas N-4 and N-5 are under investigation for possible continued use. Please see chapter 5.1.
[3)] The sites N-6.6 and N-6.7 will be connected with the 220 kV connection system due to their comparatively large distance from each other as well as the spatial limitations for cable routes.
[4)] The site N-9.1 is not fully required to achieve the statutory expansion target. In Chapter 5.5, therefore, only a sub-site of the specified site N-9.1 is taken into consideration.
[5)] The rule of the site O-2.2 is in doubt. Refer to chapters 5.1.2, 5.2.2 and 7.

North Sea

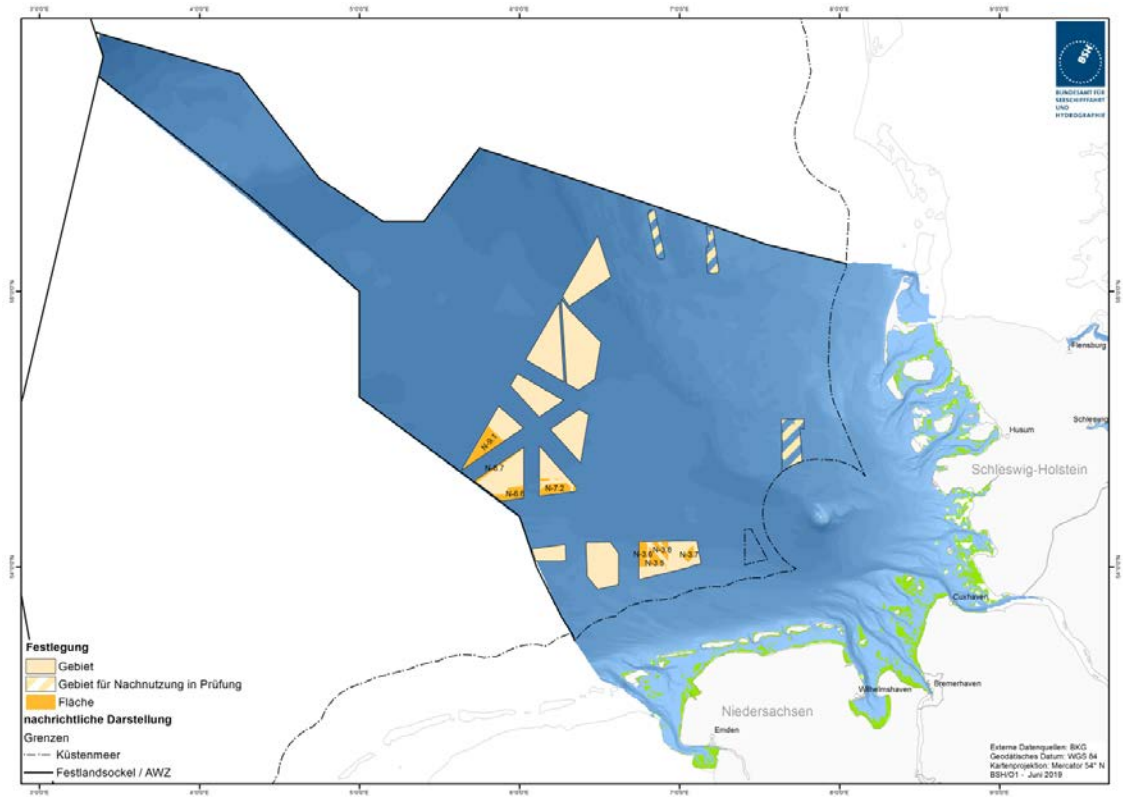

Figure 12: Sites of the German EEZ of the North Sea

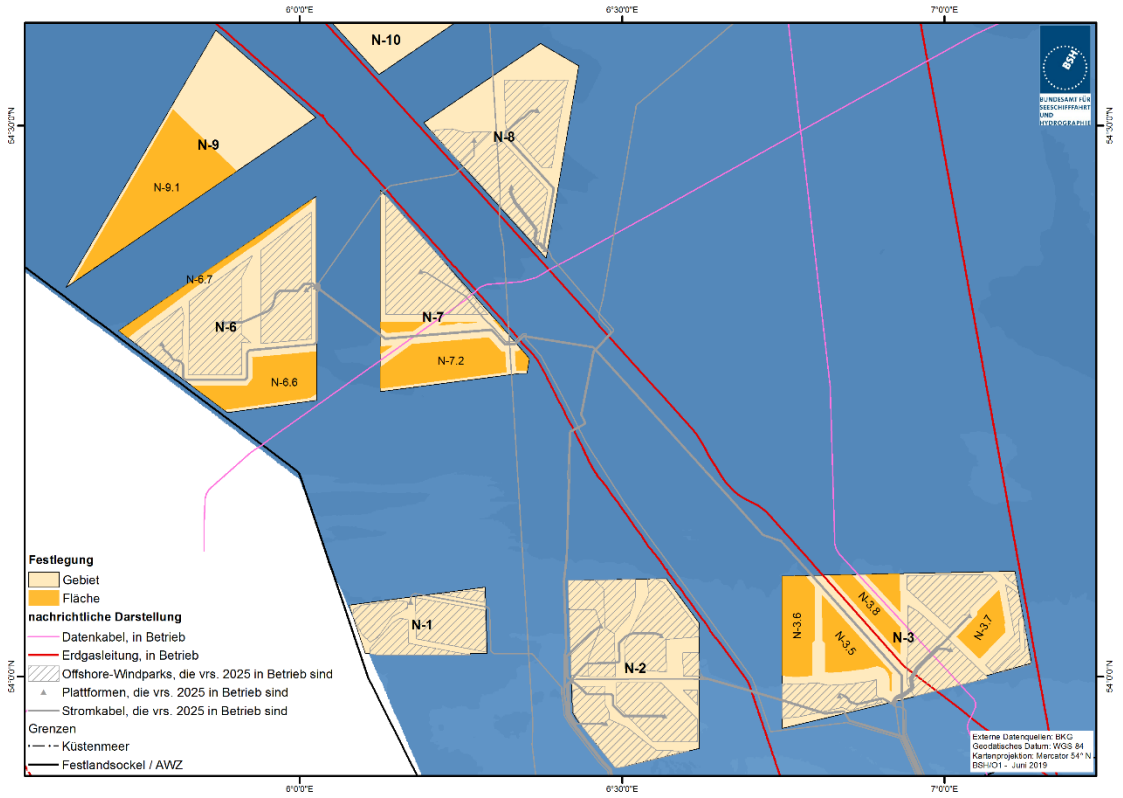

Figure 13: Sites in the areas N-3, N-6, N-7 and N-9 in the German EEZ in the North Sea

Four sites are specified in area N-3. Site N-3.6 is limited by reserved shipping area nos. 2 and 11, the constructed wind farm "Nordsee One" and site N-3.5. Also located to the west of "Europipe 1" and the connection systems "BorWin1" and "BorWin2" is the site N-3.5. On the eastern border of "Europipe 1" is site N-3.8. This is cut into two areas by the active data cable "TAT 14N". Also defined in area N-3 is site N-3.7, which is surrounded by the wind farms "Gode Wind 01", "Gode Wind 02", "Gode Wind III" and "Gode Wind 04".

The specification of two sites for area N-6 is envisaged in the plan. Site N-6.6 is located in the south of the area and is bordered to the south and east by reserved shipping areas. To the north are the three existing wind farms "Deutsche Bucht", "Veja Mate" and "BARD Offshore 1". Site N-6.7 is specified in the north of the area, to the north of the already established wind farms, bordered by reserved shipping areas.

Site N-7.2 is specified in the south of area N-7. North of the site is wind farm "EnBW He Dreiht"; to the east, west and south the sites are bordered by shipping routes. The connecting lines BorWin1, BorWin2 and NOR-6-3 run between the sub-sites, and the sites are also cut by the "Atlantic Crossing 2" data cable and the "NorNed" cross-border submarine cable system.

In area N-9, the specification of site N-9.1 is planned to achieve the statutory expansion target. In principle, in accordance with section 5 subsection 3 sentence 2 no. 5b WindSeeG, the specification of areas or sites outside clusters 1 to 8 (henceforth areas N-1 to N-8) in the North Sea and clusters 1 to 3 (henceforth areas O-1 to O-3) in the Baltic Sea of the BFO or areas or sites designated in coastal waters by a state bordering the coast is inadmissible. However, pursuant to section 5 subsection 3 sentence 2 no. 5b WindSeeG, this does not apply if sufficient areas and sites cannot be defined in these clusters and the areas and sites in the coastal waters so as to meet the expansion target pursuant to section 4 no. 2b EEG (15 GW in 2030). Rather than specifying a site in area N-9, designation of a site in area N-5 (formerly cluster 5 of the BFO) could be considered. However, the investigation revealed that, for a site in area N-5, usage conflicts pursuant to section 5 subsection 4 sentence 3 no. 4 WindSeeG exist between offshore wind energy use and nature conservation and environmental needs. In direct comparison, sites in area N-9 are better suited for the expansion of offshore wind energy. For the rest, reference is made to chapter 5.1.2 and chapter 9.3.2 North Sea Environmental Report.

Area N-9 is divided in a north-westerly direction. The site is bordered to the south by shipping routes. It should be noted that the full extent of site N-9.1 is not required to achieve the statutory expansion target. In chapter 5.5, therefore, only a sub-site of the specified site N-9.1 is taken into consideration.

Baltic Sea

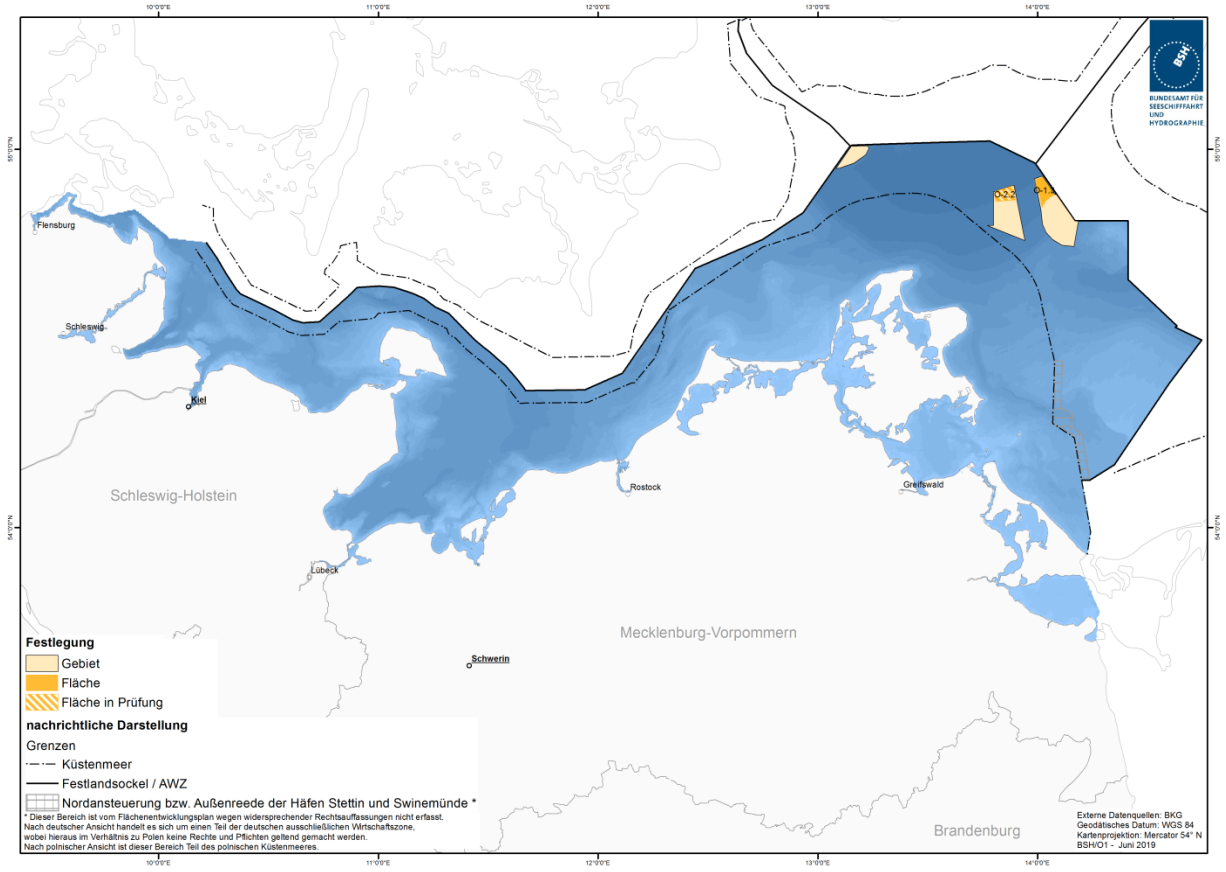

Figure 14: Sites of the German EEZ of the Baltic Sea

Site O-1.3 is defined in the north of area O-1. It is bounded by the EEZ border with Denmark, shipping routes and the "Wikinger" wind farm. The site is also bounded in the north by a NATO submarine exercise area. In area O-2, the specification of site O-2.2 in the north of area O-2 is under investigation. Refer to chapters 5.1.2, 5.2.2 and 7. This site is also bounded by shipping routes and the "Baltic Eagle" wind farm. In addition, the site is bounded to the west by a reserved research area.

5.2.2 Relevant criteria for the decision against the specification of a site

In specifying the sites in the Site Development Plan, the WindSeeG specifies in section 5 subsection 4, in a non-exclusive manner, the criteria to be applied. One or more criteria may result in regions within areas not being defined as sites. See chapter 7.

Refer to chapter 4.8 for the methodology to be used in applying the criteria, and its description.

Reference is made to the report on the site comparison in respect of nature conservation - aspects as part of the investigation of the spatial alternatives in the environmental reports (chap. 9.3.2).

The following table summarises in which areas sites are not specified based on the criteria listed in 4.7.2.

Table 9: Overview of significant criteria for the decision against rule of an area

Area	Site	Significant criteria for the decision against rule of an area
North Sea		
N-5	-	Criterion 4
N-8	-	Criterion 2
Baltic Sea		
O-1[1)]	-	Criterion 4 and 6
O-2[1)]	O-2.2	Criterion 4, 5 and 6

[1)] See Chapter 6 in which available grid connection capacities for pilot offshore wind turbines in the areas O-1 and O-2 are identified. Concerning notes on possible usage conflicts, please see the environmental statement as well as Chapter 7.5. Exactly if and where the installation and operation of pilot offshore wind turbines will be permitted shall be solely decided by the authorisation procedure for pilot offshore wind turbines, which will take place at a later stage.

Sites in area N-5

The designation of the site referred to as N-5.4 in the preliminary draft and drafts of the Site Development Plan cannot be considered due to nature conservation and environmental concerns.

An extension of area N-5 for the exploitation of offshore wind energy beyond the "Butendiek", "Dan Tysk" and "Sandbank" OWPs in operation at the time of this investigation and specifically in relation to the site N-5.4 presented in the drafts of the Site Development Plan is, according to the current state of knowledge, not consistent with the prohibition of section 44 subsection 1 no. 2 BNatSchG, and also not with section 5 subsection 3 no. 2 WindSeeG.

The exclusion of site N-5.4 is justified by the extent of the already identified cumulative adverse effects of the OWPs in the region of the main concentration area of divers in the German North Sea EEZ. The observed 19% loss of the valuable feeding and stopover habitats within the main concentration area, in conjunction with the identified statistically significant decrease in the abundance of divers, prohibits any increase in the exploited area for species protection reasons relating to the diver species group.

In accordance with the precautionary principle of section 3 UVPG and to avoid any substantial disturbance in the sense of section 44 subsection 1 no. 2 BNatSchG with the required degree of certainty, further cumulative effects due to the construction of more offshore wind turbines in area N-5 are to be avoided.

The precautionary principle is an environmental law principle of primary importance. It requires that risk reduction measures are not just taken in the event of imminent harm due to specific environmental hazards, but rather start before the risk even emerges. This rule is also supported by the wording of the legally relevant section 5 subsection 3 sentence 2 no. 2 WindSeeG "Threat to the marine environment". This results in the obligation to implement planning as far-sighted as possible and anticipatory environmental precautions that are aimed at preventing environmental hazards or indeed environmental damage from occurring in the first place. Particularly in the case of complex or not yet fully explored interrelationships, a cumulative summation of factors can occur. While these are potentially harmless individually, they may pose an environmental hazard when combined. For example, the construction of just one wind turbine, or even just one OWP, may well be regarded as problem-free in all respects, yet a different approach and treatment must be applied when a multiplicity of turbines or projects is involved. The application of the precautionary principle raises the possibility of taking action based on actual evidence as soon as there is a concern that environmental degradation might occur (Kuhbier & Prall, 2010).

Site N-5.4, which remains under consideration in the drafts of the Site Development Plan, will be excluded from the further plans for offshore wind turbines to be commissioned from 2026 based on the results of the evaluation of the cumulative adverse effects on the conservation status of the local population of divers.

The investigation of the area or an applicable site in this area has shown that diver populationsare biologically highly sensitive and that the main concentration area is highly important for maintaining the local population and that the adverse effects of the avoidance behaviour are intense and permanent.

In order to avoid a deterioration of the conservation status of the local population of the divers by the cumulative effects of the wind farms, it is necessary to keep the area of the main basin currently available to the divers outside of the impact zones of already constructed wind farms, to keep clear of new wind farm projects with commissioning from 2026 onwards.

The BSH concludes that a significant disruption as a result of the implementation of the plan, in the sense of section 44 subsection 1 No 2 BNatSchG, can be safely excluded if it is ensured that no additional habitat loss will occur in the main concentration area.

Due to the not to be excluded significant cumulative effects on the diver population due to the construction of further wind farm projects in the main concentration area, there already exists a threat to the marine environment, irrespective of the question of admissibility under species protection law, section 5 subsection 3 sentence 2 no. 2 WindSeeG. This is due to the fact that, amongst other things, the main concentration area is an important functional component of the marine environment in respect of seabirds and stopover birds. For this reason, a designation of site N-5.4 is not permitted.

Refer to chapter 7 of the Site Development Plan and to chapters 4.12.4 and 5.2.2.1 of the North Sea Environmental Report.

In any event, in respect of a possible site designation in this area, a usage conflict in the sense of section 5 subsection 4 sentence 2 no. 4 WindSeeG between the use of offshore wind energy and functional nature protection and legal environmental concerns has become apparent.

Sites in area N-8

There is no specification of sites in area N-8 due to criterion 2 (see chapter 4.8.2.2) because, taking into account the low expected generation capacity of the possible site, it appears to be spatially difficult and inefficient for this site to have its own offshore connecting line. A cross-area connection at area N-7 or N-6 is not possible because this would require multiple crossings. This would also significantly hinder the connection and thus development of the areas in zones 3 to 5 of the O-NEP and possibly result in undesirable split planning.

Sites in area O-1

In the south of area O-1, no site is defined due to usage conflicts (criterion 4, see chapter 4.8.2.4) and the expected generation capacity (criterion 6, see chapter 4.8.2.6). The southern part of the area is almost fully constructed. There are also reef structures here. Due to the small-scale possible sites, (economic) operation of a stand-alone wind farm seems impossible.

A further investigation of the safety and efficiency of shipping in the northern part of the area is required. In this context, the results of the expert report on the shipping police suitability for the site to be investigated in the preliminary investigation in the North and Baltic Sea German EEZs are in particular also to be referred to.

Site in area O-2

For area O-2, due to usage conflicts (criterion 4, see chapter 4.8.2.4) and the expected actual suitability for development (criterion 5, see chapter 4.8.2.5), investigations are under way to determine whether site O-2.2 will be specified. In this context, see also chapter 4.2.2 of BFO-O 13. Site O-2.2 is also being investigated in respect of concerns related to the safety and efficiency of shipping. In this context, the results of the expert report on the shipping police suitability for the sites to be investigated in the preliminary investigation in the North and Baltic Sea German EEZs are in particular also to be referred to because this region is included in the shipping traffic analysis. The same applies to an advanced investigation of bird migration. Refer to chapters 4.12.5 and 9.3.2 of the Baltic Sea Environmental Report.

Although grave and permanent obstacles to approval are yet to become apparent, the information available so far for the Arkona Basin region indicates that some areas have more than 10 m thick soft to pasty mud-beds below which there is up to 30 m of heavy sediments – comprising soft to firm clays, silts and fine sands as well as stiff to solid boulder clay. The base of the glacial and post-glacial deposits is in turn formed by considerable chalk deposits. In this context, it is to be noted that the latest wind turbine foundations and connecting lines have yet to be tested in the region in question. In addition, there is a need to discuss and clarify questions that can not yet be conclusively assessed, such as the subject of bird migration (see also chapter 4.2.2, BFO-O 16/17 and BFO-O 2013), so that the specification of site O-2.2 is being further investigated as part of the updating of the Site Development Plan.

In area O-2, there is a project which has been awarded under the second transitional invitation to tender.

Any knowledge gained from the planning permission procedure to be carried out in area O-2 will be taken into account as part of the updating of the Site Development Plan. No site is defined in the southern part of area O-2 because of the expected generation capacity (criterion 6, see chapter 4.8.2.6). In addition to the above-mentioned criteria, the (economic) operation of an independent wind farm in the southern part of area O-2 does not seem feasible due to the small size of the available area. See Figure 14.

5.3 Expected generation capacity

According to section 5 subsection 1 no. 5 WindSeeG, the Site Development Plan gives specifications for the expected generation capacity of offshore wind turbines in the specified areas and on the designated sites. Reference is made to the methodology introduced in chapter 4.7 for determination of the expected generation capacity on each site.

Table 10 represents the expected generation capacity on the sites specified in section 5.2. Determination of the expected generation capacity on sites that are shown as "under investigation" as described in section 5.2 is not performed.

Table 10: Overview of expected generation capacity in the sites for offshore wind turbines

Area	Site	Expected generation capacity [MW]
North Sea		
N-3	N-3.5	420
	N-3.6	480
	N-3.7	225
	N-3.8	375
N-6	N-6.6	630
	N-6.7	270
N-7	N-7.2	900
N-9	N-9.1[1)]	1,000[1)]
Baltic Sea		
O-1	O-1.3	300

[1)] Please see chapter 5.5 concerning the sub-site N-9.1.

For an illustration of the extent to which the expected generation capacity specified for the individual sites would differ from the generation capacity calculated in accordance with chapter 4.7.2, refer to the following section.

5.3.1 Plausibility verification of expected generation capacity

In accordance with the methodology for calculating generation capacity described in chapter 4.7.2, a plausibility check of the calculated generation capacity is performed in a final step. Here, essential investigation characteristics are the capacity of the connection systems, compliance with the statutory trajectory and the feasibility in respect of possible wind farm layouts.

Table 11 represents the calculated generation capacity and the corrected power density fixed for the individual sites, and also indicates for which sites the expected generation capacity specified in 5.3 will deviate from the capacity calculated in this way.

For site N-3.7, the expected generation capacity is reduced to 225 MW as the proposed connecting line does not permit a higher capacity. The construction of an additional AC connecting line is not possible due to spatial restrictions.

For sites N-3.8 and N-7.2, the expected generation capacity is reduced accordingly to comply with the statutory trajectory of 700 to 900 MW in respect of the specification of the time sequence.

Site N-6.7 will be reduced to an expected generation capacity of 270 MW because, due to the distances to be maintained relative to neighbouring wind farms, a higher capacity does not appear feasible.

For site O-1.3, the expected generation capacity is limited to maximum 300 MW in accordance with the standard Baltic Sea connection concept. The construction of an additional connecting line is disregarded because its utilisation would be too low.

Table 11: Plausibility check of the calculated generation capacity

Designation of sites	Corrected power density [MW/km²]	Capacity calculated according to chap. 4.7 [MW]	Capacity adjustment based on plausibility
North Sea			
N-3.5	9.5	approx. 420	-
N-3.6	10	approx. 480	-
N-3.7	9.5	approx. 280	Reduction to 225 MW (max. capacity of the AC connecting line)
N-3.8	9.5	approx. 440	Reduction to 375 MW (compliance with the legal trajectory)
N-6.6	10	approx. 630	-
N-6.7	10	approx. 470	Reduction to 270 MW (layout plausibility)
N-7.2	10	approx. 940	Reduction to 900 MW (compliance with the legal trajectory)
N-9.1	9	approx. 1.000	-
Baltic Sea			
O-1.3	10	approx. 420	Reduction to 300 MW (max. capacity of the connection system)

To lend plausibility to the expected generation capacity in respect of the cost and site efficiency objectives, the expected performance data of the individual sites based on typical wind farm layouts are underestimated. In this way, significant differences in the efficiency of the individual sites should be avoided and optimum comparability of the sites made possible.

The calculation is based on long-term time series of the average wind speed from the COSMO REA6 reanalysis model of the German Weather Service, which indicates the average annual yield using a reference turbine with a specific site generation capacity of 400 W/m² and a rotor diameter of 220 m in a typical wind farm layout. In doing so, both the shading losses internal to the wind farm and the losses resulting from shading by surrounding wind farms are considered for the area in question.

Figure 15 shows the corrected energy density and the capacity factor as parameters for a rough assessment of site and cost efficiency for the respective sites as a function of the corrected power density.

The magnitude of the corrected energy density is clearly dependent on the respective corrected power density. Areas for which a reduction in the calculated power resulted according to the reason given in Table 11 accordingly have a lower energy density. There are only minor deviations between sites with a corrected power density in the range of 9 to 10 MW/km².

The calculated capacity factor shows no significant dependence on the corrected power density. Rather, differences in the capacity factor are due to the varying degree of shading by surrounding wind farms. Essentially it can be seen that no significant deviations in the expected capacity utilisation are identifiable for the considered sites and thus the sites are largely comparable with each other.

Overall, capacity factors of the sites under consideration are in the range 42 to 48%, which corresponds to about 3,700 to 4,200 full load

hours per year. This comes within the range of the average utilisation of German OWPs in 2016 and 2017 (Rohrig, K., 2018). However, it should be noted that the value of the capacity factor is highly dependent on the wind turbine technology used. Therefore, the values shown here initially serve only to compare the sites defined in the Site Development Plan with each other.

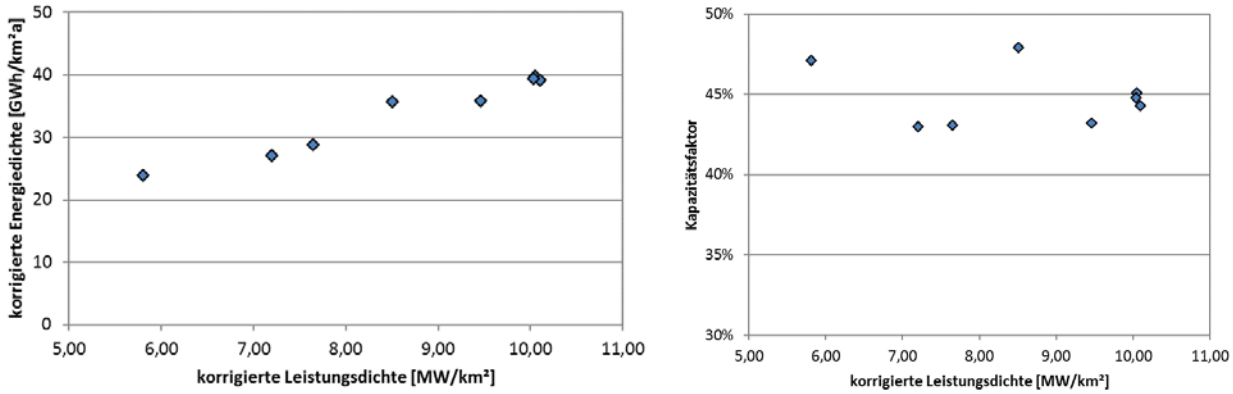

Figure 15: Corrected energy density and capacity factors of the sites defined in the Site Development Plan as part of the plausibility calculation

5.4 Rules for coastal waters

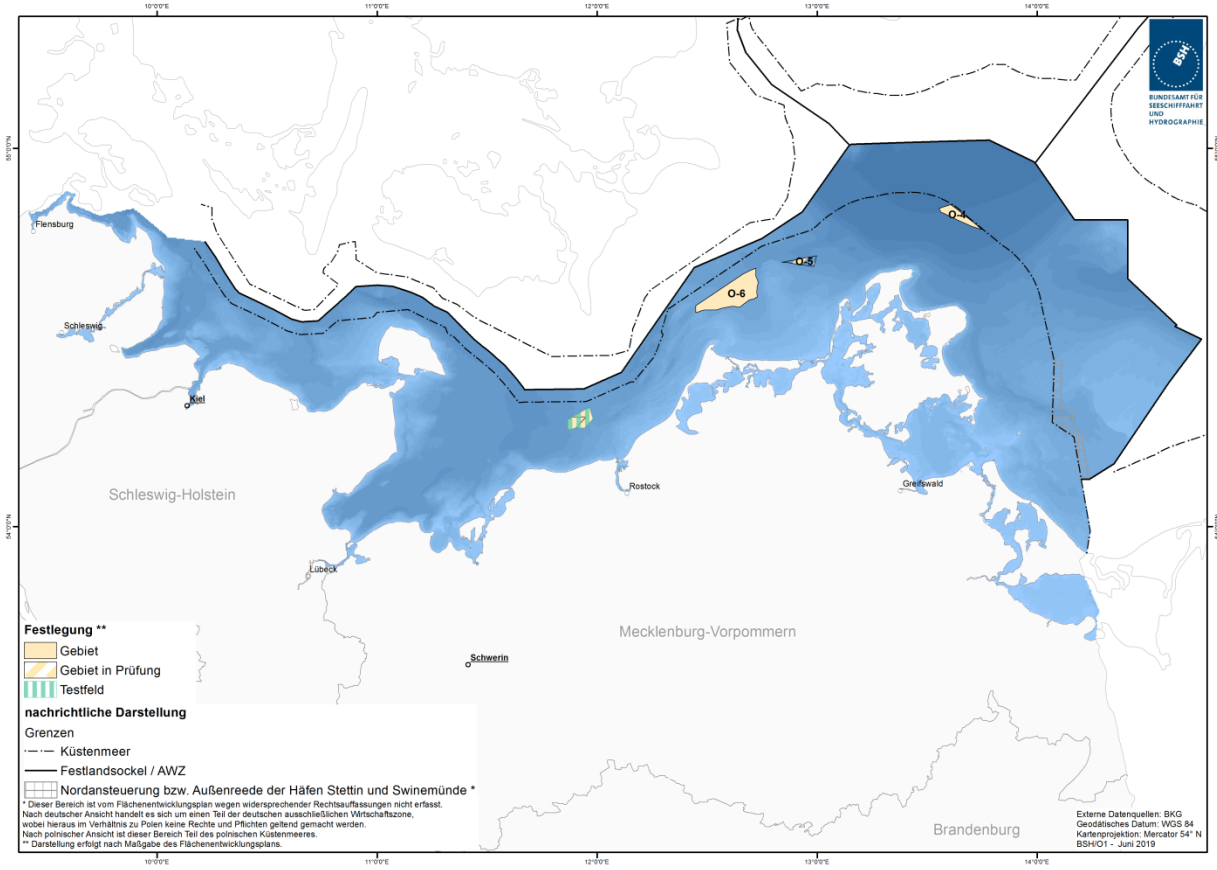

Figure 16: Areas put forward by Mecklenburg-Western Pomerania for possible designation and the testing ground in coastal waters

5.4.1 Requirement for an administrative agreement

According to section 4 subsection 1 sentence 2 WindSeeG, the Site Development Plan can also set out planning specifications for areas, sites, the site tendering time sequence, the calendar years of commissioning and the expected generation capacity both for testing grounds and other power generation regions in coastal waters. In accordance with an administrative agreement between the Federal Government, as represented by the Federal Maritime and Hydrographic Agency, and the country responsible, the individual provisions for the coastal waters are specified in more detail.

According to section 4 subsection 1 sentence 3 2. HS WindSeeG (amd), the federal state provides the BSH with the information and documents required, including those required for the strategic environmental assessment.

In accordance with the administrative arrangement, specifications for coastal waters do not include

- The locations of converter platforms, collecting platforms, and transformer platforms,
- Routes or route corridors for offshore connecting lines, for cross-border power lines or for possible interconnections of the turbines, routes and route corridors
- and rules of places at which the offshore connecting lines cross the border between the EEZ and coastal waters, and

- Standard technical principles and planning principles according to section 5 subsection 1 nos. 6 to 11 WindSeeG.

The corresponding technical and spatial requirements are the subject of the planning and individual approval procedure and come under the jurisdiction of the Federal State of Mecklenburg-Western Pomerania.

An administrative arrangement is currently ruled out for the federal states of Lower Saxony and Schleswig-Holstein. Therefore, no specifications have been made for the coastal waters of these federal states.

5.4.2 Areas for the installation and operation of offshore wind turbines

The marine priority areas for wind turbines designated by the state of Mecklenburg-Western Pomerania in the LEP M-V 2016 will be adopted. Refer to chapter 5.4.4 for specification of the testing ground (area O-7 of the Site Development Plan draft of 26/10/2018).

The reserved marine area for wind turbines will be adopted with the status "under investigation" because a spatial planning procedure is required.

5.4.3 Sites for the installation and operation of offshore wind turbines

Currently, the specification of sites within the sense of section 5 subsection 1 No. 2 WindSeeG is ruled out due to the lack of actually available sites, which also includes sites "free of rights". Please see chapter 4.8.2.8.

After consultation with Mecklenburg-Western Pomerania, the site O-7.1 shown in the draft of the Site Development Plan of 26/10/2018 is not currently specified as a site.

After the Bundestag passed a resolution on the possibility of designating testing grounds in the Site Development Plan on 04 April 2019 as part of the amendment to the Grid Expansion Acceleration Act (NABEG), area O-7 of the draft of the Site Development Plan of 26/10/2018 is henceforth shown as a testing ground. Please see chapter 5.4.4.

5.4.4 Specification of testing ground

In accordance with section 5 subsection 2 sentence 1 WindSeeG (amd), the Site Development Plan can specify testing grounds outside plan-specified areas, totalling up to 40 square kilometres in regions close to the coast in the period starting from the year 2021.

According to section 3 no. 9 WindSeeG (amd), testing grounds are areas in the EEZ and in coastal waters in which, in a spatial context, only pilot offshore wind turbines connected to the grid are to be constructed and which are to be jointly connected via a testing ground connecting line.

According to section 3 No. 10 WindSeeG (amd), a "testing ground connecting line" is an offshore connecting line that is required for the connection of testing grounds within the sense of section 3 number 9 WindSeeG (amd) and section 12b subsection 1 sentence 4 no. 7 EnWG (amd) on the grid development plan (NEP).

According to section 118 subsection 26 EnWG (amd), up through 31 December 2023, no more than one test-field connecting line with a connection capacity of less than 300 MW is required in the grid development plan according to section 12b EnWG.

The area north-west of Warnemünde is now designated as a testing ground in the western sub-site following notification by Mecklenburg-Western Pomerania.

The more specific arrangement or assignment of the spatial outline of the testing ground is reserved for a separate spatial procedure of Mecklenburg-Western Pomerania or the Site Development Plan update procedure.

The eastern part of the region is designated an area. The division of the region into two parts reflects the specifications of the LEP 2016.

Whether and, if applicable, when a site is specified that is to be submitted for tendering, or the entire region is to be designated as a testing ground, must also be examined in a separate spatial planning procedure of Mecklenburg-Western Pomerania or in the Site Development Plan update procedure.

In addition, the Site Development Plan may specify, starting from 2021 under section 5 subsection 2 no. 1b) WindSeeG (amd), the calendar years in which pilot offshore wind turbines and the corresponding testing ground connecting line are to be put into operation for the first time on the specified testing ground, and, according to section 5 subsection 2 no. 1c) WindSeeG (amd), specify the capacity of the corresponding testing ground connecting line.

The year 2024 is set as the calendar year of commissioning for the first pilot offshore wind turbines and the testing ground connecting line. The testing ground connecting line for the area north-west of Warnemünde is specified with a grid connection capacity of 300 MW.

In accordance with section 5 subsection 2 sentence 2 no. 1 to 3 WindSeeG (amd)

- define spatial specifications for the construction of pilot offshore wind turbines in areas and testing grounds, and
- specify the technical characteristics of the testing ground connecting line.

The spatial specifications in the testing ground are reserved for a separate spatial procedure of Mecklenburg-Western Pomerania or the Site Development Plan update procedure.

The technical circumstances of the testing ground connecting line correspond to those of standard connecting lines in the Baltic Sea. Therefore, reference is made to chapters 4.2.2 and 4.3.2 in their entirety.

5.5 Chronological sequence of tenders for the sites

In accordance with section 5 subsection 1 no. 3 of the WindSeeG, the Site Development Plan defines the time sequence in which the specified sites are to be tendered in accordance with Part 3 section 2 WindSeeG, including the designation of the respective calendar years.

To define the sequence, WindSeeG section 5 subsection 4 specifies non-exhaustive criteria that are to be applied. Refer to chapter 4.8 for the methodology to be used in applying the criteria, and its description.

Moreover, according to section 5 subsection 5 of the Offshore Wind Energy Act, the areas and sites and the chronological sequence of their tenders are determined such that offshore wind turbines with an expected generation capacity of 700 to 900 MW and of no more than an average of 840 MW are put out to tender at each tender deadline according to section 17 of the Offshore Wind Energy Act and brought into operation per calendar year from 2026 onwards.

As described under 4.8.1, the time sequencing of the sites is first carried out based on criterion 1 and then using criteria 2 to 8.

5.5.1 Chronological sequence of tenders for the sites

The sequence in which the sites are to be advertised is specified using criteria 1 to 8 and taking into account the information given in chapter 5.5.2 as well as section 5 subsection 5 WindSeeG. The time sequencing is shown in Table 12.

Due to spatial circumstances, sites N-3.8 and N-3.7 are due for linking to the grid connection system NOR-3-3, which will be available in 2026, ahead of sites N-3.6 and N-3.5, which are also in area N-3.

The tendering of site N-9.1 is not required in its full extent in order to reach the expansion target of 15 GW by 2030. Accordingly, when defining the time sequence for site N-9.1, a sub-site is defined of the size required to achieve the statutory expansion target. If another site should prove to be unavailable for reaching the expansion target, a corresponding expansion of sub-site N-9.1 would be possible. The entire site N-9.1 will be connected to the offshore connecting line NOR-9-1.

The consultation called for a clearer presentation of the time sequence, in particular the availability of offshore connecting lines, grid connection points and the on-shore grid expansion. To comply with this, the information currently available to the BSH and its consideration are presented in more detail in chapter 5.5.2.

Table 12: Overview of the chronological sequence of tenders for the sites with the application of criteria 1 to 8

Calendar year of call for tender	Calendar year of commissioning	Area designation (TF=sub-site)	Grid connection system	Expected generation capacity [MW]	Total expected generation capacity to be installed [MW]
2021	2026	N-3.7	NOR-3-3[1)]	225	900
		N-3.8	NOR-3-3[1)]	375	
		O-1.3	OST-1-4[1)]	300	
2022	2027	N-7.2	NOR-7-2[1)]	900	900
2023	2028	N-3.5	NOR-3-2[1)]	420	900
		N-3.6	NOR-3-2[1)]	480	
2024	2029	N-6.6	NOR-6-3[1)]	630	900
		N-6.7	NOR-6-3[1)]	270	
2025	2030	N-9.1 TF 1	NOR-9-1[1)]	600	600
Total target system					4.200
Probable implementation by end of 2025					10.800
Probable implementation by end of 2030					15.000

[1)] Reference is made to the preparation, assessment and confirmation of the network development plan 2019-2030.

5.5.2 Representation of the review of the time sequence based on references to offshore connecting cables, grid connection points and the network expansion on land

As described in chapter 4.8, criterion 2 serves on the one hand to avoid unoccupied spaces. On the other hand, when determining the chronological order based on criterion 2, a check is performed to see whether the corresponding pipeline links and grid connection points are likely to be available during the years for commissioning the sites, taking into account the planning and actual expansion of onshore networks. The information provided by the TSOs on the planning and implementation deadlines for the grid connection points and connectivity systems form a basis for this assessment.

The following information, based on the first and second draft of the NEP 2019-2030 and the TSOs' statements in the context of the deployment procedure of the Site Development Plan, is available for this review of the offshore connecting lines with a commissioning date from 2026 and the corresponding grid connection points taking into account the planning and actual expansion of the on-shore networks.

General information

As shown in the second draft of the NEP 2019-2030, the total construction duration is approximately 11 years for a DC grid connection system and 9.5 years for an AC grid connection system.

According to the statement of the TSOs of 29 August 2018, a TSO could construct at most one offshore connecting line per year. This statement needs reviewing.

Information about grid connection points as well as the planning and actual expansion of on-shore grids

The following information from TSOs on grid connection points that could be available for connecting the sites specified in chapter 5.2 and their earliest possible completion is available.

North Sea

- For a connecting line to be completed from 2026, a grid connection point (Hanekenfähr) will not be available in Lower Saxony before 2028. Here, free capacity of no more than 2,000 MW is confirmed by the TSOs. Any additional capacity would have to be checked by the TSOs.
- According to the TSOs, the completion of an offshore connection to the Hanekenfähr grid connection point will also not be possible before 2028 due to the entire (also on-shore) planning and implementation duration.
- In Schleswig-Holstein, the Büttel grid connection point (already in operation) will be available from 2026. Taking into account the ENTSO-E "Continental Europe Operation Handbook" in conjunction with the "Principles for the Planning of the German Transmission System", the Büttel grid connection point has a maximum available capacity of 932 MW for its offshore connecting lines. It should be noted here that the capacity of 62 MW available on the NOR-4-2 (HelWin2/beta) connection system at the Büttel grid connection point would be released for the relevant connection system.
- According to the TSOs, the completion of an offshore connection to the Büttel grid connection point will only be possible from 2027 due to the entire planning and implementation duration.
- According to the presentations of the TSOs, the commissioning of a grid connection

system at Wilhelmshaven II grid connection point in Lower Saxony in 2030 is possible.

Baltic Sea

- According to the TSOs in the second draft of the NEP 2019-2030, the construction of the grid connection system OST-1-4 in 220 kV three-phase technology is possible by 2026. The grid connection point was specified within the search area in the municipalities of Lubmin/Brünzow/ Wusterhusen/Kemnitz.

Note that the Site Development Plan does not specify grid connection points for network connection systems. The specification of the expected grid connection point is used in the compilation of the Site Development Plan, the spatial planning and the defining of the time sequence of sites. The grid connection points are identified by the TSOs during the compilation of the NEP and subsequently checked and approved by the BNetzA. A presentation of the grid connection point designated in the second draft of the NEP 2019-2030 for the network connection system specified in the Site Development Plan can be found in Table 13.

Table 13: Overview of the information concerning offshore connecting cables with a commissioning date from 2026 onwards by the TSOs according to the statements

Name	Expected Grid connection point	Earliest possible completion	Expected Transmission system operator
OST-1-4	Search area in the municipalities of Lubmin/Brünzow/Wusterhusen/Kemnitz	2026	50 Hertz Transmission GmbH
NOR-7-2	Büttel	2027	TenneT TSO GmbH
NOR-3-2	Hanekenfähr	2028	Amprion GmbH
NOR-6-3[1)]	Hanekenfähr	2029	Amprion GmbH
NOR-9-1	Wilhelmshaven II[2)]	2030	TenneT TSO GmbH

[1)] In accordance with the statement of the TSOs of 15 June 2018, the completion of a second offshore connecting cable with the grid connection point Hanekenfähr is not possible before 2029 due to the overall (also land-based) planning and installation time and the relatively long cable section on land.

[2)] It should be noted that in the NEP 2019-2030 the grid connection point Unterweser was specified for the network connection system NOR-9-1. However, based on current knowledge and in consultation with the BNetzA, the grid connection point Wilhelmshaven II appears advantageous instead.

Checking of the time sequence taking into account the availability of offshore connecting lines, grid connection points and land grid expansion

North Sea

For the region of the German North Sea EEZ, in accordance with BFO-N 16/17, all offshore connecting lines for connection of the sites defined in chapter 5.2.1 to gate N-II would run towards Lower Saxony.

To comply with the statutory trajectory, the first new connection system is required as early as from 2027.

However, taking into account the general information and the information on the availability of offshore connecting lines and grid connection points as well as the planning and actual expansion of onshore networks, an offshore connecting line that runs to gate N-II and thus to Lower Saxony will only be available from 2028. Thus, from a time point of view, sites N-3.6 and N-3.5 located in zone 1 (criterion 3) cannot be specified in tender year 2022. This would lead to a failure to comply with section 5 (5) WindSeeG, according to which the Site Development Plan specifies the areas and the sites, and the time sequence so that offshore wind turbines with an expected installed capacity of 700 to 900 MW and on average not more than 840 MW are advertised on each bidding date and will be put into operation from 2026 onwards. There is not enough land available to compensate in the Baltic Sea.

Since the Büttel grid connection point (already in operation) is available in Schleswig-Holstein from 2026 onwards, the routing of an offshore connecting line to the N-IV or N-V gate was checked in order to fulfil section 5 subsection 5 WindSeeG (see chapter 5.9.2). Even if the sites N-3.5 and N-3.6 lie in zone 1 and the sites N-6.6 and N-6.7, and N-7.2 in zone 2 (criterion 3), they come into consideration for a comparative assessment and then assessing of the connecting lines NOR-3-2, NOR-6-3 and NOR-7-2 under criterion 2 (here, ordered planning of offshore connecting lines).

In respect of the ordered planning of offshore connecting lines, a routing from NOR-7-2 to gate N-IV or N-V is more preferable than NOR-3-2 firstly because it is associated with fewer crossings of priority and reserved shipping areas. Secondly, the routing from NOR-3-2 to the gate N-IV or N-V would be associated with a path inside reserved shipping area no. 1 or no. 2. Furthermore, when considering the route length of both connecting lines for the area of the German EEZ, the path from NOR-3-2 to N-II and from NOR-7-2 to N-IV or N-V is in total about 36% shorter than the other way around.

In a comparison of NOR-7-2 and NOR-6-3, no route stands out as more preferable. However, if the statutory annual trajectory were to be made more flexible, site N-7.2 could use the Büttel grid connection point more efficiently with an expected installed capacity of about 930 MW[17]. This possibility would not exist if the areas N-6.6 and N-6.7 were connected because the expected installed capacity of the sites in total is about 900 MW.

In respect of environmental and nature conservation aspects, reference is made to the alternative investigation of route corridors in the environmental report (chapter 9.3).

[17] The expected installed capacity of site N-7.2 was reduced from about 930 MW to 900 MW to comply with the statutory trajectory. See chapter 5.3.1. The Büttel grid connection point has a maximum available capacity of 932 MW.

5.6 Calendar year of the commissioning for offshore wind turbines and connecting cables

According to section 5 subsection 1 no. 4 WindSeeG, the Site Development Plan stipulates the calendar years during which accepted offshore wind turbines on the specified sites and the corresponding offshore connecting line should be commissioned.

Decisive for determining the calendar years of commissioning are the specifications of the generating capacity to be installed per calendar year at a level of 700 MW to 900 MW and on average no more than 840 MW in accordance with section 5 subsection 5 WindSeeG. This annual expansion serves to achieve the statutory expansion target of 15 GW by 2030 according to section 1 subsection 2 WindSeeG. Here, the availability of grid connection capacity represents the essential technical criterion, in this respect, reference is made to the information in chapter 5.5. When specifying the calendar year for commissioning offshore wind turbines, it is assumed that the commissioning of offshore wind turbines and the associated grid connection system can essentially be performed in the same calendar year. This also corresponds to the objective of section 4 subsection 2 No. 3 WindSeeG, according to which the wind turbines must be developed in parallel with the grid connection systems.

The calendar years for commissioning of the offshore connection cables listed in the following table are derived based on the information given in chapter 5.5.

Reference is made to the preparation, assessment and confirmation of the network development plan 2019-2030.

Table 14: Overview of calendar years of commissioning of offshore connecting cables, on acceptance of the notes provided in chapter 5.5

Name	Calendar year of commissioning	Transmission capacity [MW]
OST-1-4	2026	300
NOR-7-2	2027	900[1)]
NOR-3-2	2028	900
NOR-6-3	2029	900
NOR-9-1	2030	1.000

[1)] It should be noted that the transmission capacity for the NOR-7-2 offshore connecting line in the scenarios presented for information in the appendix (chapter 13) differs from the 900 MW shown here because there is a limitation resulting from the statutory trajectory of 700 to 900 MW per tendering year.

5.7 Locations of converter platforms, collector platforms and transformer platforms

According to section 5 subsection 1 no. 6 WindSeeG, the Site Development Plan gives specifications for the locations of converter platforms, collecting platforms and, where possible, transformer platform.

Converter or transformer platforms are only defined in areas in which sites are also being designated. Transformer platforms are only defined to the extent that they are necessary for the connection concept. Consequently, no transformer platforms are specified for the 66 kV direct connection concept in the North Sea.

In area N-3, two transformer platforms and one converter platform are defined. The specification of the transformer platforms occurs in sites N-3.8 and N-3.7, which will be connected to the converter platform NOR-3-3/DolWin kappa that will already be present at this point in time. In the site N-3.8, the transformer platform location is shown in the western subsite. For site N-3.7, together with the development of the wind farms "Gode Wind III" and "Gode Wind 04", only two AC connection systems are available because of spatial constraints. Accordingly, there is a separate connection to the N-3.7 site and a further connection for the "Gode Wind III" and "Gode Wind 04" wind farms.

For the two sites west of "Europipe 1", N-3.6 and N-3.5, a connection to the 66 kV direct connection concept is planned. Accordingly, the converter platform NOR-3-2 is specified centrally between these two sites.

In area N-6, due to the distance between the sites N-6.6 and N-6.7 and due to spatial constraints in respect of existing OWP projects, a connection to the 220 kV connection concept is planned. Accordingly, as part of this plan, two transformer platforms and one converter platform are specified in area N-6. The converter platform NOR-6-3 is located on the eastern edge of the area between the wind park "BARD Offshore 1" and site N-6.6. The transformer platform of site N-6.6 is located roughly in the middle of the site. The transformer platform of site N-6.7 is located roughly in the eastern third of the site.

A connection to the 66 kV direct connection concept is planned in area N-7. The corresponding converter platform NOR-7-2 is specified approximately centrally between the 6 sub-sites. The northern sub-sites can only be connected by crossing the connection systems NOR-6-1/BorWin1, NOR-6-2/BorWin2 and NOR-6-3.

A 66 kV provision is also planned for area N-9. The converter platform NOR-9-1 is planned for the centre of site N-9.1.

A connection to the three-phase connection concept is planned for site O-1.3 in the Baltic Sea. The corresponding transformer platform for connecting OST-1-4 is planned on the western edge of the site.

Site O-2.2 is only designated as under investigation; a possible platform location is not specified here.

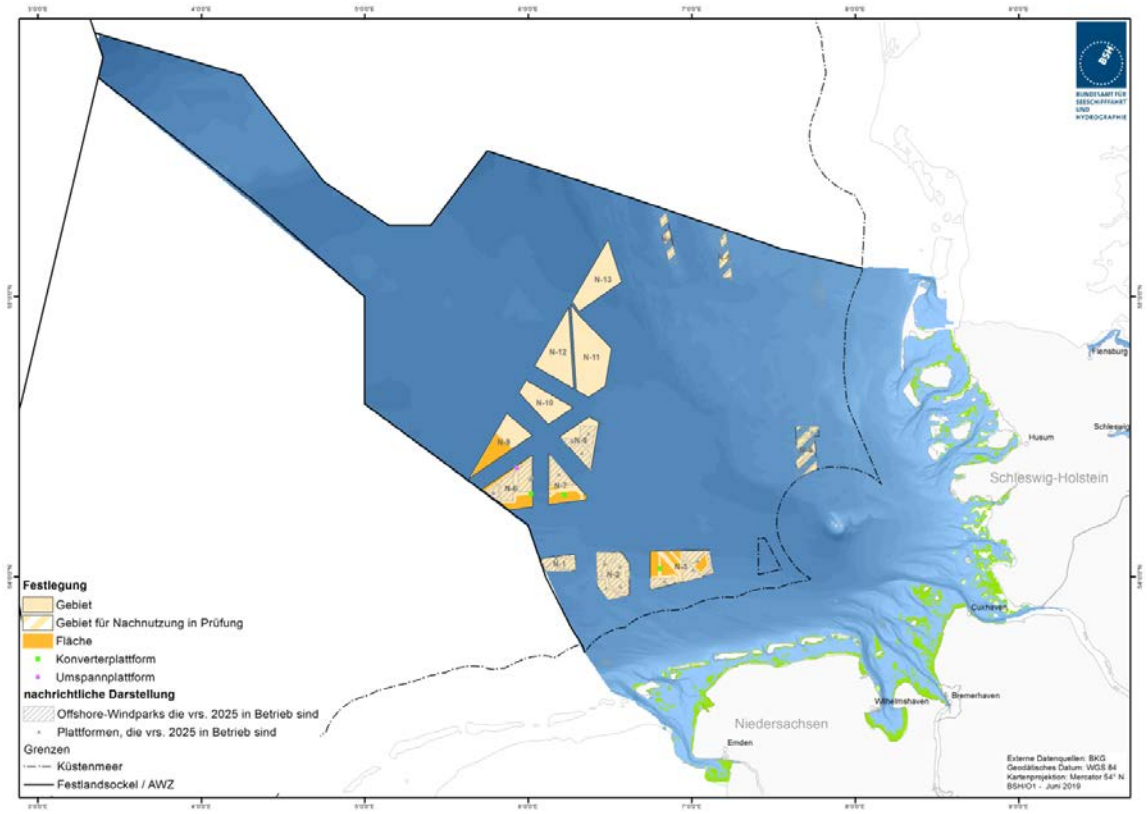

Figure 17: Platform locations in the German North Sea EEZ

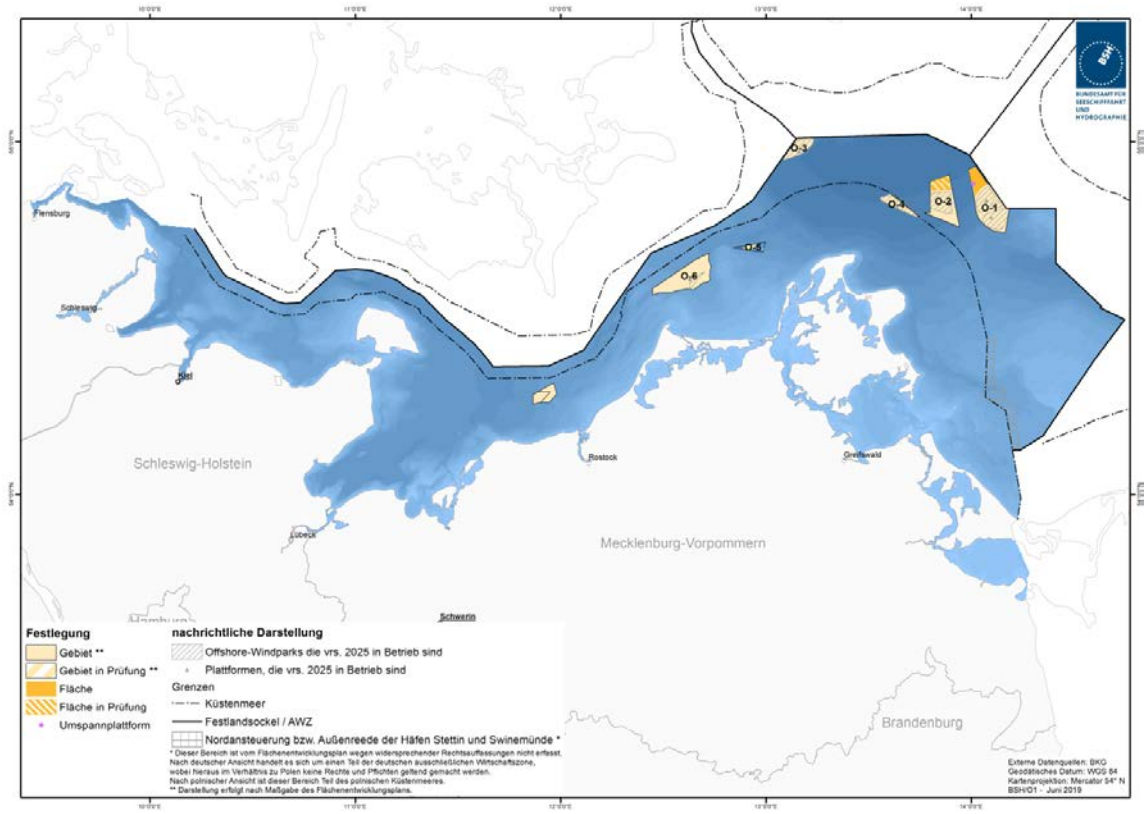

Figure 18: Platform locations in the German Baltic Sea EEZ

5.8 Routes or route corridors for offshore connecting cables

According to section 5 subsection 1 no. 7 WindSeeG, the Site Development Plan makes specifications for routes or route corridors for offshore connecting lines. The connection concepts listed in chapter 4.2 apply here.

Four areas are to be connected in area N-3. The eastern sites N-3.7 and N-3.8 are designated for connection to DolWin kappa/NOR-3-3. The three-phase routes specified in the plan correspond to a great extent, in particular where third parties are affected, to the routes already planned with DolWin2/beta/NOR-3-1. Due to the already existing OWPs, the projects "Gode Wind III", "Gode Wind 04" and the site N-3.7 can only be connected using no more than two three-phase submarine cable systems. To make the best possible use of the available capacities in association with this restriction, the connection of the "Gode Wind III" and "Gode Wind 04" projects via a common transformer platform and an AC submarine cable system with a capacity of 241.75 MW is planned. Site N-3.7 will be connected to DolWin kappa/NOR-3-3 using a separate transformer platform and a separate AC submarine cable system. This specification essentially corresponds to variant 1 as presented in the draft of the Site Development Plan. Appropriate feasibility as a special solution and subject to the condition that appropriate systems are offered in a tender was confirmed to the BSH by the responsible TSO, TenneT Offshore GmbH.
The DC line NOR-3-2 for connecting the sites N-3.6 and N-3.5 runs between the planned areas or at the edge of the existing wind farm "Nordsee One" up to the converter locations NOR-3-1/DolWin beta and NOR-3-3/DolWin kappa and from there parallel to these connections to gate N-II.

In area N-6, two sites are planned, which because of the relatively large distance between them are to be connected using the 220 kV connection concept. The three-phase line for connection to site N-6.7 runs from the transformer platform between the wind farms "Veja Mate" and "BARD Offshore 1" and from there in an easterly direction parallel to the three-phase systems from the wind farm "Deutsche Bucht" to the planned converter location NOR-6-3. The connection of site N-6.6 is in a straight line to the converter.
The DC connecting line NOR-6-3 starts from the converter and runs over the shortest route through shipping route 12. In area N-7 the route runs parallel to the existing systems NOR-6-1/BorWin1 and NOR-6-2/BorWin2. After crossing of the "Norpipe" pipeline, there is a run parallel to NOR-7-1/BorWin5 up to the gate N-II.

The DC connecting line NOR-7-2 runs from the converter platform through site N-7.2 and runs from there parallel to the existing systems NOR-6-1/BorWin1 and NOR-6-2/BorWin2. The existing connecting lines and the pipeline are crossed in the area of pipeline "Europipe 1", the route then runs parallel to shipping route 2 to gate N-V.

The DC connection NOR-9-1 of site N-9.1 runs straight from the converter platform to shipping route 6 and from there parallel to area N-9 to the pipeline "Norpipe". After crossing the "Norpipe", there is a run parallel to this and subsequently to the systems NOR-7-1/BorWin5 and NOR-6-3 to gate N-II.

In the Baltic Sea, only the connection of the site O-1.3 to the three-phase system OST-1-4 is provided. This runs south from the site's transformer platform and crosses shipping route 20 together with the already constructed connection systems of the wind farms "Wikinger" and "Arkona-Becken Südost". It then also runs parallel to these connection systems up to gate O-I.

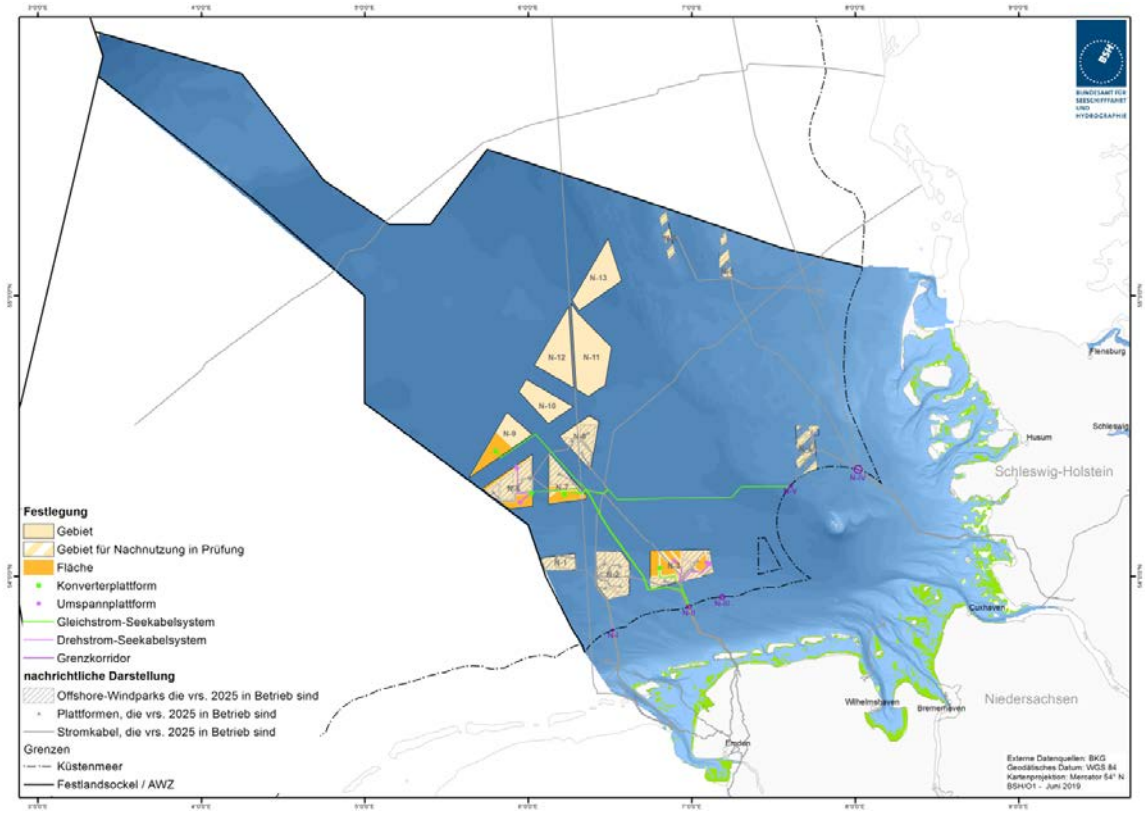

Figure 19: Grid connection systems in the German North Sea EEZ

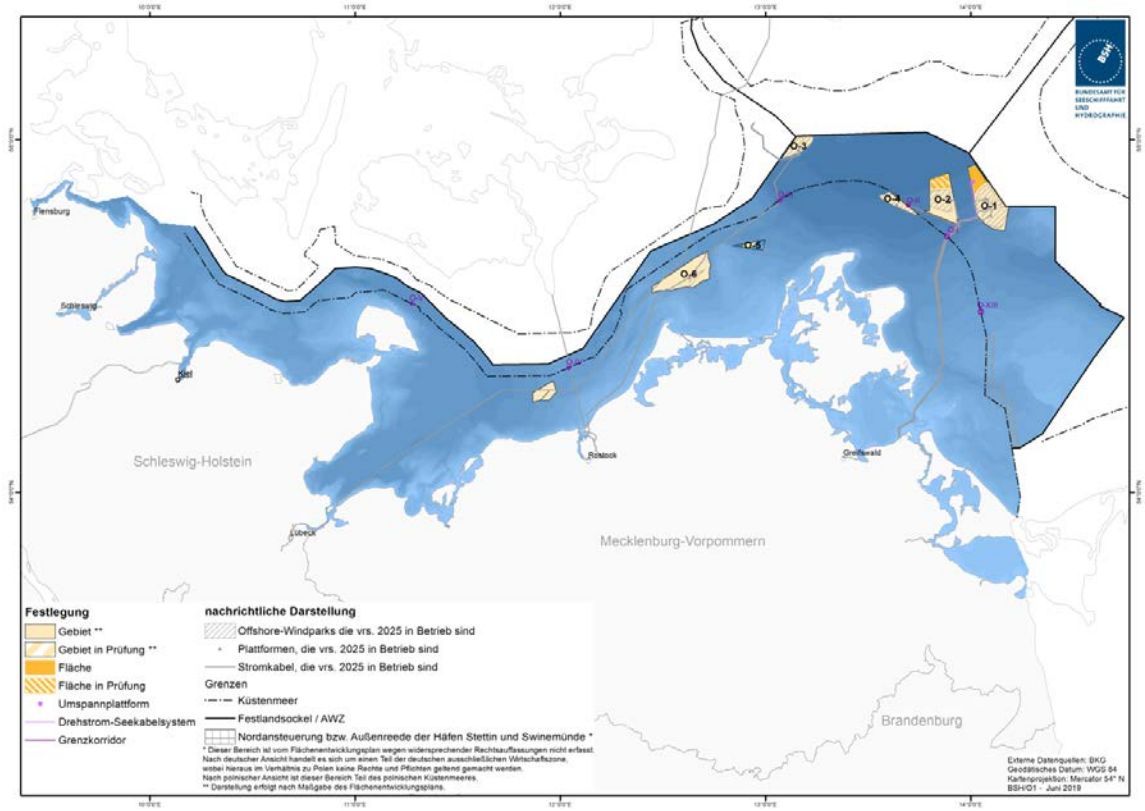

Figure 20: Grid connection systems in the German Baltic Sea EEZ

5.9 Gates to coastal waters

According to section 5 subsection 1 no. 8 WindSeeG, the Site Development Plan gives specifications for locations where the offshore connecting lines cross the boundary between the EEZ and the coastal waters (referred to as gates).

It must be possible for the routes planned in the Site Development Plan to be run in a reasonable manner through the coastal waters to the grid connection point (see planning principle 4.4.4.3). For coordination with the coasts, the gates serve as locations where the connecting lines cross the boundary between the EEZ and the coastal waters. The intention here is to concentrate the cable systems at these points as far as possible, and to bundle them for further diversion towards the grid connection points. The routing in the coastal waters is not specified; it is the responsibility of other bodies in the procedures provided for this purpose. In specifying the corridors, there is still no evaluation of the onward routing, e.g. from the point of view of nature conservation issues in coastal waters.

The dimensioning of the gates at the transition to the coastal waters is derived from the separations between the cable systems and the number of required or possible systems as well as the respective space situation at the transition to the coastal waters.

In respect of the planned location of the gates, strict restrictions already exist inside the EEZ due to the already approved and existing OWPs, so that the existing lack of space cannot easily be solved by specifications in this plan. In addition, existing structures, particularly already operating cable systems and pipelines, must be taken into account in that the submarine cable systems planned for the future must be integrated into the existing system. At the same time, planning in the coastal waters has not yet progressed so far that a sufficient number of routes have been designated to fulfil the trajectories specified in the NEP 2019-2030 scenario framework. The gates in this plan should therefore be defined in close consultation with the coastal federal states.

5.9.1 Current state

North Sea

The location of the gates at the transition to the coastal waters in the direction of Lower Saxony results from the already approved wind farm planning in the region between the two shipping separation areas "German Bight Western Approach" and "Terschelling German Bight". Located in Lower Saxony are the Ems route (gate N-I), the Norderney route (gate N-II) and the extension to the Norderney route (gate N-II) designated in the Lower Saxony Spatial Planning Programme 2017.[18] The extension of the Norderney route runs east of the existing Norderney corridor. According to the TSO, the maximum technically possible number of cable systems via Norderney is twelve. The state of Lower Saxony favours full utilisation of the Norderney route before new development of another route, starting at the N-III gate. For the Jade route, relating to gate N-III, there exists a land planning specification for the "NorGer" submarine cable system, but the corridor is already partly filled by the connection to the wind farm "Nordergründe". No routes are currently planned on the Lower Saxony side for more DC submarine cable systems. For future submarine cable systems, after using the already spatially secured corridors "Norderney", "Ems" and the extension of "Norderney", a corresponding procedure for the continuation of gate N-III via the islands Wangerooge, Langeoog or Baltrum is to be initiated. It should be noted in this context

[18] Act for changing the ordinance on the (LROP) Lower Saxony Spatial Planning Programme (LROP)

that the additional requirement is essentially routes that are expected to be needed after 2030, so that corresponding planning development steps can still be taken. Studies on possible routes through the coastal waters are currently under preparation.

The Büsum route (gate N-IV) in Schleswig-Holstein's North Sea coastal waters, is specified in the Schleswig-Holstein State Development Plan 2010 . The LEP (state development plan) is currently being updated.

Baltic Sea

No route has yet been defined in the LEP S-H for the area of the Baltic Sea bordering Schleswig-Holstein.

In the Mecklenburg-Western Pomerania coastal waters, lines to gates O-I and O-III have been designated in the current LEP M-V[19] reservation areas. A reservation area for lines along the "NordStream" pipeline was also specified. The reservation areas of the LEP M-V lines are buffers around routes that have already been specified in area planning or as part of the planning approval. This should facilitate bundling with the existing routes. Spatial planning procedures must be carried out for additional routes.

5.9.2 Rules of gates to coastal waters

North Sea

In the North Sea, gates N-I, N-II and N-III are specified at the transition to the coastal waters of Lower Saxony. Gates N-IV and N-V are specified at the transition to the coastal waters of Schleswig-Holstein.

No systems can be provided through gate N-I (Ems-Route) under the Site Development Plan, as it will already be fully occupied after the transition system is completed.

Seven of the twelve available routes will be filled in gate N-II (Norderney route) in 2026. Under this plan, the required connecting lines NOR-3-2, NOR-6-3, and NOR-9-1 are routed to this gate.

As no routing through gate N-III is required to reach the expansion target by 2030, no connection systems are currently specified as passing through this gate. Two cross-border submarine cable systems are scheduled in the scope of gate N-III under this plan (see chapter 5.10).

Gate N-V is defined south west of area N-4 for the Schleswig-Holstein North Sea coastal waters. Gate N-V newly defined in the Site Development Plan is needed so that it is possible to connect NOR-7-2 to the Büttel grid connection point. A route from NOR-7-2 inside the EEZ to gate N-IV ("Büsum") is not possible because of space constraints.

See Figure 19.

[19] Mecklenburg-Western Pomerania regional spatial development programme (LEP), June 2016

Baltic Sea

In the Baltic Sea, gates O-I, O-II, O-III, O-IV and O-XIV are defined at the transition to the Mecklenburg-Western Pomerania coastal waters. Gate O-V is defined at the transition to the Schleswig-Holstein coastal waters.

Under this plan, in addition to the existing systems, an extra connecting line and two interconnectors are planned in the scope of the O-I gate (see chapter 5.10).

In the sense of this plan, gate O-II is not a corridor for the connection of OWPs via the coastal waters to the grid connection point. This corridor is solely for the connection of the wind farm "ARCADIS Ost I" planned in the coastal waters (cluster 4 of the O-NEP). Under this plan, only one additional crossconnection is scheduled in this corridor (see chapter 5.11).

Gate O-III is assigned to the wind farm "EnBW Windpark Baltic 2" by the existing systems. Three cross-border systems are planned under the Site Development Plan for this corridor (see chapter 5.10).

Under this plan, gates O-IV, O-V and O-XIII also serve exclusively for routing cross-border submarine cable systems (see chapter 5.10).

See Figure 20.

Table 15: Overview of utilisation of gates

Border corridor	Submarine cabling systems
N-I	(1) NOR-1-1/DolWin5 (2) NOR-8-1/BorWin3 (3) NOR-2-3/DolWin3 (4) COBRAcable
N-II	(1) NOR-7-1/BorWin5 (2) NOR-3-1/DolWin2 (3) NOR-2-2/DolWin1 (4) NOR-2-1 (alpha ventus) (5) NOR-6-1/BorWin1 (6) NOR-6-2/BorWin2 (7) NOR-3-3/DolWin6 (8) NOR-3-2 (9) NOR-6-3 (10) NOR-9-1
N-III	(1) Submarine cable system to Norway (2) Submarine cable system to Great Britain
N-V	(1) NOR-7-2
N-IV	(1) NOR-4-2/HelWin2 (2) NOR-4-1/HelWin1 (3) NOR-5-1/SylWin1 (4) NordLink (5) NOR-7-2
O-I	(1) OST-1-1 / Ostwind 1 (2) OST-1-2 / Ostwind 1 (3) OST-1-3 / Ostwind 1 (4) OST-2-1 / Ostwind 2 (5) OST-2-2 / Ostwind 2 (6) OST-2-3 / Ostwind 2 (7) OST-1-4 (8) Submarine cable system to Denmark (9) Submarine cable system to Denmark
O-II	(1) OST-2-1 (2) Cross-connection between "ARCADIS East I" and "Baltic Eagle"
O-III	(1) OST-3-1 (2) OST-3-2 (3) Submarine cable system to Sweden (4) Submarine cable system to Sweden (5) Submarine cable system to Denmark
O-IV	(1) Kontek (2) Submarine cable system to Denmark
O-V	(1) Submarine cable system to Denmark
O-XIII	(1) Submarine cable system to Denmark

5.10 Routes and route corridors for cross-border power lines

Within the sense of this plan, cross-border power lines are submarine cable systems that pass through at least two states bordering the North Sea or Baltic Sea.

5.10.1 Current state

Multiple cross-border power lines pass through the German North Sea EEZ. Firstly, there is an interconnector in operation called "NorNed" that connects Norway and The Netherlands. Furthermore, the project "COBRAcable" is currently under construction, which will connect The Netherlands and Denmark. Moreover, the project "NordLink", which has been approved and is under construction, extends through the German EEZ to connect Norway and Germany. The "Viking Link" project linking Denmark with the United Kingdom has been approved.

Cross-border power lines are also in operation in the German EEZ of the Baltic Sea: "Kontek" (linking Denmark and Germany) and "Baltic Cable" (between Sweden and Germany). The interconnectorby the name of "Kriegers Flak Combined Grid Solution" is also operational. This project connects Denmark and Germany by connecting a Danish OWP project to a German OWP project.

5.10.2 Rule of routes and route corridors for cross-border power lines

This plan is intended to secure space for routes or route corridors for potential cross-border power lines so as to be able to ensure in future that the existing and planned interconnectors can be spatially integrated in a coordinated overall system, i.e. in particular in respect of connecting lines for offshore wind farms.

Based on the TYNDP 2018 (see section 2.5.4) and the ENTSO-E System Needs Report on TYNDP 2018 (ENTSO-E AISBL, 2018), routes or route corridors for the following potential cross-border power lines are to be secured in spatial terms.

As part of this plan, seven additional cross-border power lines will be stipulated in the North Sea EEZ. Of these, two connections landing in Germany are planned. Both start at gate N-III in Lower Saxony. The exact route of the submarine cables passing through gate N-III (in particular their east-west layout) is then to be defined in the individual procedure for the region from the shipping route 2 reservation area of the Spatial Plan to the boundary with the coastal waters (see also hatching in Figure 21).

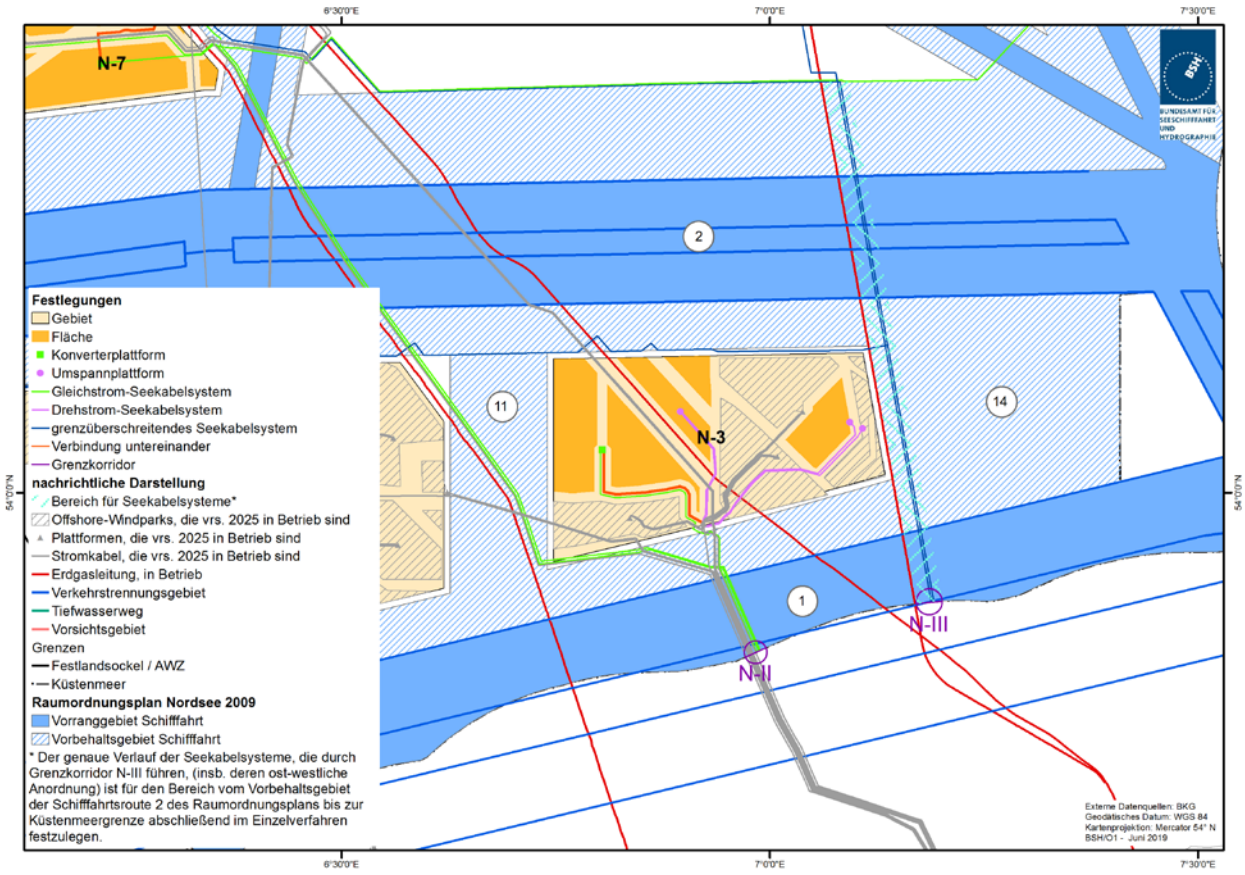

Figure 21: Submarine cable route east of Europipe 2

The cross-border submarine cable system to Norway starting at Gate N-III runs parallel to "Europipe 2", shipping route 4 and shipping route 5 up to the nature conservation area "Sylt Outer Reef – Eastern German Bight", then to the boundary of the nature reserve up to the cross-border submarine cable system "NorNed" and then, bundled with this, on to gate N-VII.

The second cross-border submarine cable system to come ashore in Germany travels to Great Britain. There are two alternative routes for this. Both routes start at gate N-III and then run parallel to "Europipe 2" in a northerly direction to the southern edge of shipping route 2. Here the alternative routes separate. From here one route runs west to the crossing of "Europipe 1" and then parallel to the pipeline "Norpipe" or along the western EEZ boundary to gate N-XII. The other route continues north to areas N-1, N-2 and N-3 then westward to gate N-XVII.

A cross-border system is planned to connect the converter platform in area N-1 with neighbouring OWPs in the Netherlands. This runs west from the converter platform in area N-1 through gate N-XVII.

In addition, four further interconnectors are planned which merely cross the German EEZ and may link The Netherlands with Denmark or Norway. Two routes run on both sides of shipping route 10 and connect gates N-VI and N-XVI as well as N-VIII and N-XV. A system is provided parallel to "Viking Link". Another system connects gates N-XII and N-XV. This runs mainly parallel to the "Norpipe" and then continues along the EEZ boundary to gate N-XV.

In the Baltic Sea EEZ, eight routes will be established for interconnectors connecting German coastal waters with the EEZs of

Denmark and Sweden. Systems are also planned for the area of the Fehmarn Belt crossing (O-V to O-VI) and parallel to "Kontek" (O-IV to O-VII). A further system to Denmark runs from gate O-III to gate O-VIII. Two systems heading towards Sweden also commence in gate O-III, subsequently running parallel to the "EnBW Windpark Baltic 2" wind farm to gate O-IX. These are located in the area of the wind park "EnBW Windpark Baltic 2" at a reduced distance of 350 m or 450 m from the wind farm, to minimise the impact on the superposed submarine exercise area. From gate O-I, two interconnectors are also planned in the direction of Bornholm, running parallel to the existing connecting lines to gates O-X and O-XI. Where gate OX is concerned, it is pointed out that this is on the edge of a submarine exercise area and, for State and Federal Defence security reasons, a route outside this NATO exercise area should be implemented, even in the Danish area.

A further system is planned to run parallel to "NordStream 1" or between "NordStream 1" and "NordStream 2", connecting gates O-XII and O-XIII.

A route running from Poland to Denmark does not appear to be possible at present due to existing restrictions within the German EEZ.

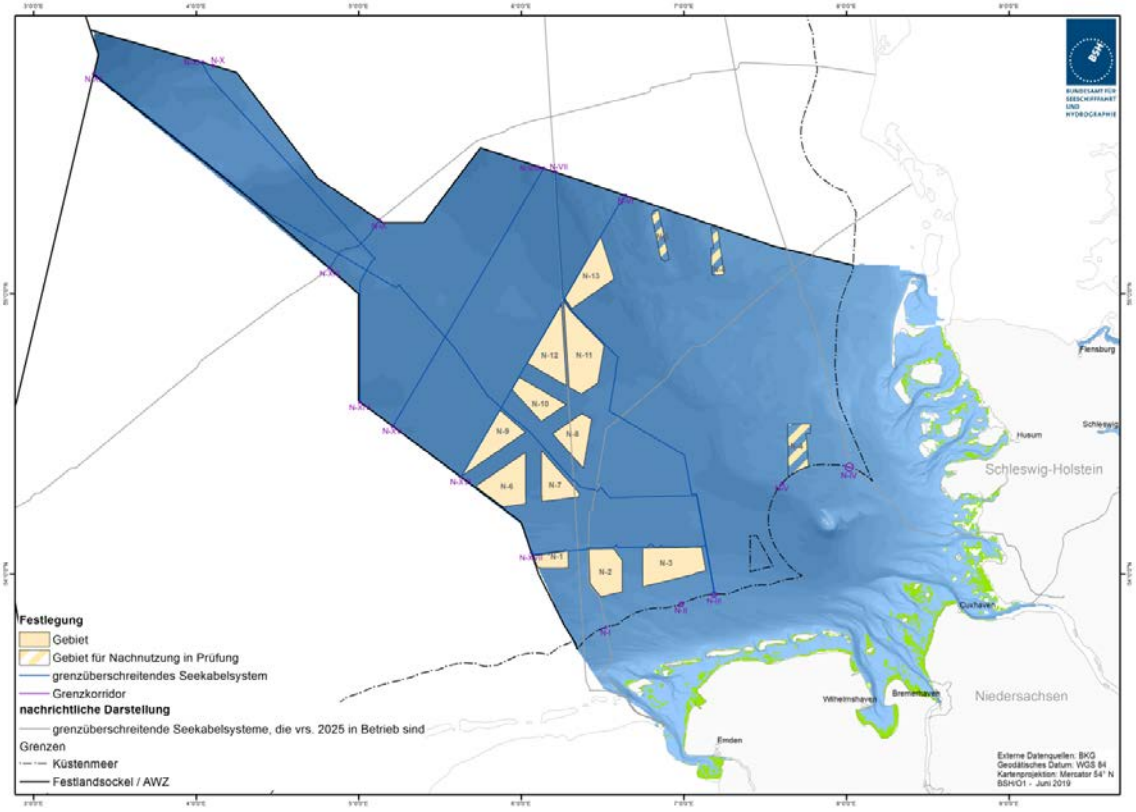

Figure 22: Interconnectors in the German North Sea EEZ

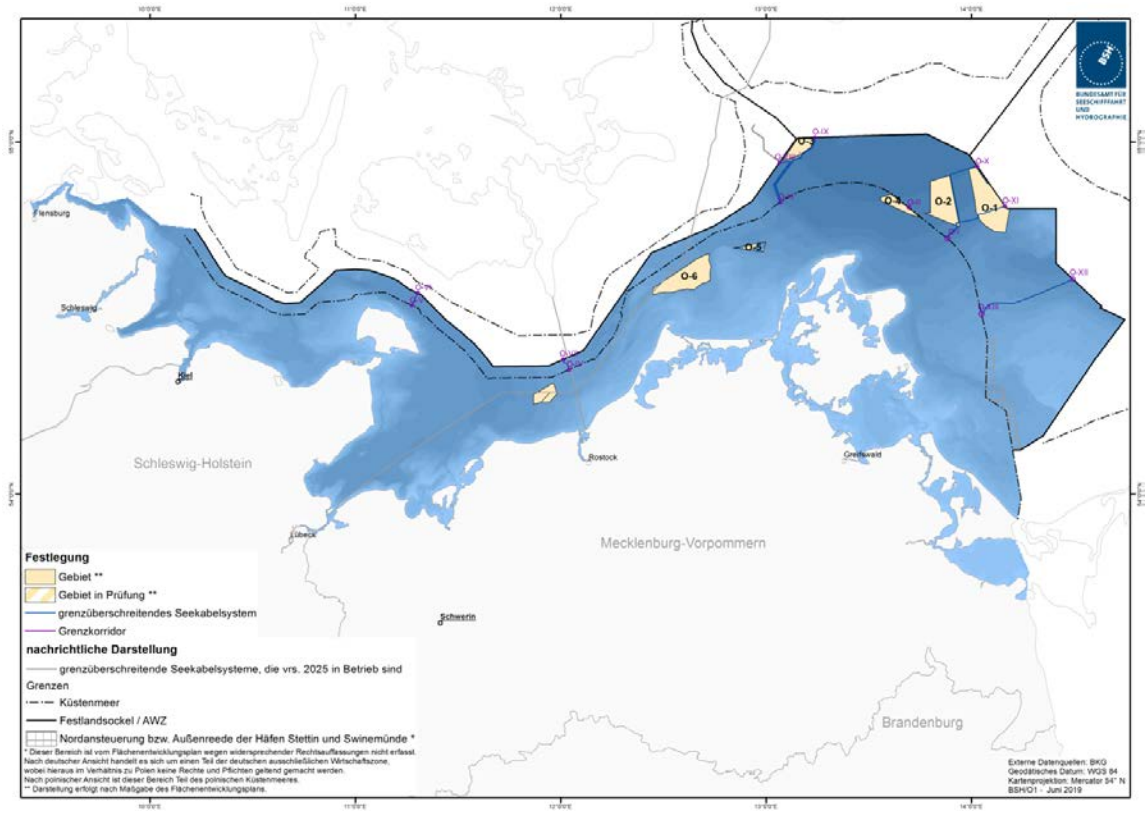

Figure 23: Interconnectors in the German Baltic Sea EEZ

5.10.3 Rules of gates for cross-border power lines

It must be possible to direct the routes planned in the Site Development Plan appropriately, through the coastal waters or EEZs of adjacent states to the grid connection points. The gates serve as points at which the connecting lines cross the boundary between the EEZ and the coastal waters, or to neighbouring countries. For the North Sea EEZ, this concerns the coastal waters of Lower Saxony and Schleswig-Holstein and the EEZs of The Netherlands, Great Britain and Denmark. For the Baltic Sea region, this affects the coastal waters of Schleswig-Holstein and Mecklenburg-Western Pomerania as well as the EEZs of Denmark, Sweden and Poland. The gates are specified at a standard width of 1 km, unless existing restrictions result in other dimensions. No statement is linked to this width as to whether, when and how many submarine cable systems should be run through the respective gates. Likewise, there is no statement as to whether conflict-free routing in foreign areas is possible in all directions.

Therefore the gates in this plan will be defined in close consultation with the coastal states and neighbouring countries. In areas where it is possible to do so based on present knowledge, gates for the bundling of submarine cable systems will be established in the transitional areas to the coastal waters, and all submarine cable systems landing in Germany are to be routed via these. The intention here is to concentrate the cable systems at these points as far as possible, and to bundle them for further diversion towards the grid connection points. Please see chapter 5.9 with regard to the designation of gates for coastal waters. See the planning principle 4.4.4.3.

The gates N-VI to N-XVII and O-VI to O-XIII, planned at the outer boundary of the EEZ, serve to bundle possible interconnectors which have not yet been defined in terms of their specific routing into or through the German EEZ. The gates are based on existing plans for interconnectors and wind farms, as well as on existing pipelines and data cables. When defining the gates, the existing plans for offshore wind farms in neighbouring countries were also taken into account so as to permit development of a sea-wide grid. Gate N-XVII has been extended sufficiently to make it possible to route submarine cables to the gate north of the wind farms in The Netherlands.

In the case of the O-IX and O-X gates, damage to the submarine exercise areas Bravo 2-5 used by NATO, should be reduced as much as possible. Routing outside of these areas is to be pursued if possible.

Further coordination of gates N-VI to N-XVII and O-VI to O-XIII for interconnectors with neighbouring states is to take place within the framework of updates to the Site Development Plan, the relevant Spatial Plans or the relevant approval procedures.

See Figure 22 and Figure 23.

Table 16: Overview of the gates and routes for cross-border power lines as defined in the Site Development Plan

Gate A	Gate B	Country A	Country B
North Sea			
N-III	N-VII	Germany	Norway
N-III	N-XII / N-XVII	Germany	Great Britain
N-VI	N-XVI	Denmark / Norway	Netherlands
N-VIII	N-XV	Denmark / Norway	Netherlands
N-IX	N-XIII	Denmark	Great Britain
N-XI	N-XIV	Norway	Netherlands
NOR-1-1	N-XVII	Germany, area N-1	Netherlands
Baltic Sea			
O-V	O-VI	Germany	Denmark
O-IV	O-VII	Germany	Denmark
O-III	O-VIII	Germany	Denmark
O-III	O-IX	Germany	Sweden
O-III	O-IX	Germany	Sweden
O-I	O-X	Germany	Denmark
O-I	O-XI	Germany	Denmark
O-XIII	O-XII	Germany	n.a.

5.11 Routes and route corridors for connections between installations

According to section 5 subsection 1 no. 10 WindSeeG, the Site Development Plan should contain routes or route corridors for possible connections between offshore installations, connecting lines and cross-border power lines as well as converter platform locations. In this way, the regulation in accordance with section 17a subsection 1 sentence 2 no. 6 EnWG is adopted for the BFO. The cross connections are submarine cable systems, which can connect the individual connection systems (according to DC or three-phase connection concepts) and thus the OWPs with each other, and which contribute to ensuring system reliability, increase security of supply by (partial) redundancies in order to reduce outage damage and increase system security, and which are also compatible with an efficient grid expansion. The Site Development Plan creates the spatial conditions for these cross connections. The decision on "whether" and "when" a cross connection is made is determined on a case-by-case basis within the framework of a damage reduction concept to be submitted by the grid operators to the BNetzA.

Cross connections are spatially planned for various already existing grid connections and new grid connections. As a rule, these are planned in the North Sea with two submarine cable systems, but only one route is planned in the Baltic Sea because of the lower capacity of the grid connections.

Five cross connections between platforms are planned in the North Sea.

The cross connection between NOR-1-1/ DolWin epsilon and NOR-2-3/DolWin gamma runs along the edge of the wind farms here parallel to the planned cross-border submarine cable system and, together with NOR-1-1, crosses shipping route 3.

In area N-3, a cross connection between NOR-3-3/DolWin kappa and NOR-3-2 is planned that runs parallel to the grid connection NOR-3-2.

One cross connection is planned in area N-6. This runs from the converter platform BorWin alpha to converter platform NOR-6-3.

In area N-7 it is planned to connect the two converter platforms of the area to each other because these are no longer in spatial proximity due to the conversion to the 66 kV direct connection concept and are thus no longer directly connected to each other. Still planned is the connection between NOR-7-1/BorWin epsilon and NOR-8-1/BorWin gamma.

Three cross connections between platforms are planned in the Baltic Sea.

In area O-1, a cross connection is provided between the existing project "Wikinger" and the site O-1.3. This cross connection runs parallel to the corresponding connection systems.

The site O-1.3 is also to be connected to the wind farm "Baltic Eagle" in area O-2. Here, the system runs from the site O-1.3 substation, first cross shipping route 20 at right angles, then runs parallel to the planned cross-border submarine cable system.

The third cross connection is planned between the wind farms "Baltic Eagle" and "ARCADIS Ost I". This also runs parallel to the corresponding connection systems.

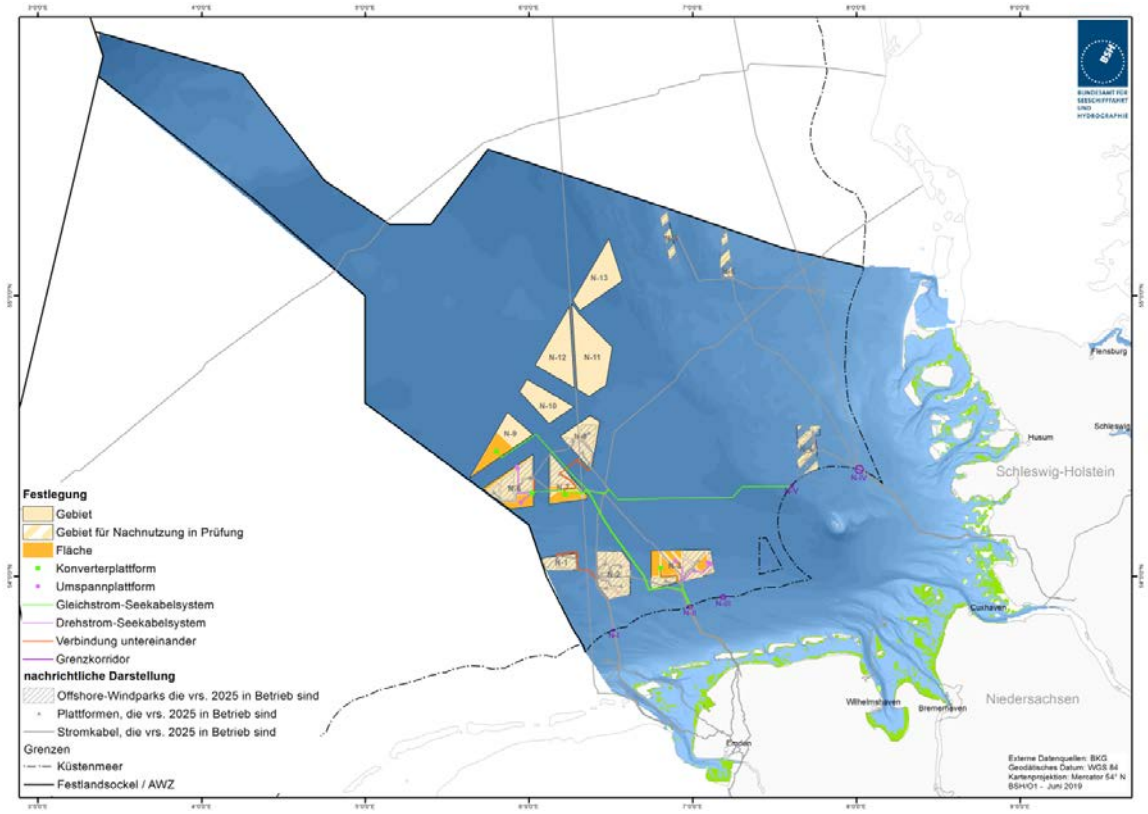

Figure 24: Interconnections in the German North Sea EEZ

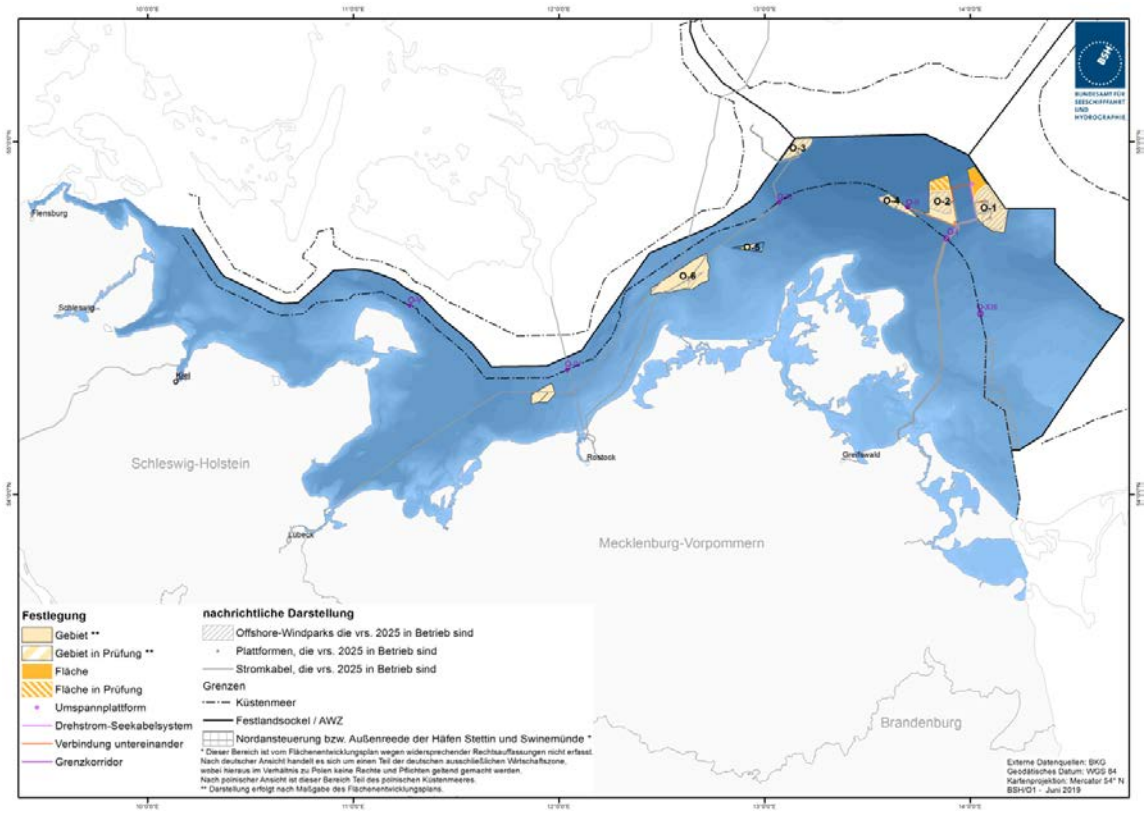

Figure 25: Interconnections in the German Baltic Sea EEZ

Table 17: Overview of the routes defined in the Site Development Plan for connections between systems

Platform A	Platform B
North Sea	
NOR-1-1/DolWin epsilon	NOR-2-3/DolWin gamma
NOR-3-2	NOR-3-3/DolWin kappa
NOR-6-1/BorWin alpha	NOR-6-3
NOR-7-1/BorWin epsilon	NOR-7-2
NOR-7-1/BorWin epsilon	NOR-8-1/BorWin gamma
Baltic Sea	
Wikinger	O-1.3
O-1.3	Baltic Eagle
Baltic Eagle	ARCADIS East I

6 Rules for pilot offshore wind turbines

In accordance with section 5 subsection 2 WindSeeG, the Site Development Plan may have, for the period from 2021 onwards, available grid connection capacities for areas in the EEZ and coastal waters on existing or future offshore connecting lines that can be assigned to pilot offshore wind turbines, in accordance with section 70 subsection 2 WindSeeG. In this respect, the Site Development Plan includes available grid connection capacities that are insufficient for efficient, economic operation of a large number of offshore wind turbines in a spatial context and which should therefore not be included in the tenders, but which are, however, adequate for connecting pilot offshore wind turbines. In this way, the efficient use and capacity utilisation of offshore connecting lines should be increased[20].

The Site Development Plan may provide spatial specifications for the installation of pilot offshore wind turbines in certain areas, and designate the technical conditions of the offshore connecting cable and the resulting technical prerequisites for the grid connection of pilot offshore wind turbines.

It is pointed out that a preliminary area investigation for pilot offshore wind energy turbines does not take place[21].

6.1 Available grid connection capacities

The grid connection capacities available for pilot offshore wind turbines in accordance with section 70 subsection 2 WindSeeG are presented in Table 18. This relates to free capacity on the converters or DC systems in the North Sea and the AC connections systems in the Baltic Sea, for which so far neither an unconditional grid connection commitment in accordance with section 118 subsection 12 EnWG, nor an allocation in accordance with section 17d subsection 3 sentence 1 or section 118 subsection 19 EnWG nor a contract in accordance with section 23 or section 34 WindSeeG, has been awarded. With regard to the relevant capacities for the North Sea on the corresponding AC systems between converter platforms and offshore substations, the TSOs have made more concrete declarations in their statement of 19/12/2018. Thus, the capacity shown in Table 18 can also be applied to the converter platforms NOR-2-2/DolWin1/alpha and NOR-2-3/DolWin3/gamma for the AC connecting lines. However, it should be noted that upon submission of an application for the construction of pilot offshore wind turbines a case-specific investigation would have to be carried out for the cables concerned. Since the connection system NOR-3-3/DolWin6/kappa will only become operational in 2023, the TSO is not yet able to provide any information about free capacities on the AC connecting lines. In area N-4 the available capacity shown on the NOR-4-2/ HelWin2/beta connection system may be used for connection via the transformer platform of the OWP "Amrumbank West". According to the TSO, the capacity available on NOR-6-

[20] BT-DrS. 18/9096 of 6 July 2016, Recommendation and report of the Committee on Economic and Energy Affairs (9th Committee) on the draft bill of the CDU/CSU and SPD parliamentary groups – Journal 18/8860 – and on the draft bill of the Federal Government – Journals 18/8832, 18/8972 – pp. 372.

[21] BT-DrS. 18/9096 of 6 July 2016, Recommendation and report of the Committee on Economic and Energy Affairs (9th Committee) on the draft bill of the CDU/CSU and SPD parliamentary groups – Journal 18/8860 – and on the draft bill of the Federal Government – Journals 18/8832, 18/8972 – pp. 373.

2/BorWin2/beta can be connected to all three connected transformer platforms.

The grid connection capacities available for pilot offshore wind turbines in the Baltic Sea were confirmed by the TSOs in their statement of 19/12/2018.

Table 18: Grid connection capacities available for pilot offshore wind turbines

Connecting line	Available grid connection capacities for pilot offshore wind turbines
North Sea	
NOR-2-2 /DolWin1/alpha	88 MW
NOR-2-3 /DolWin3/gamma	50 MW
NOR-3-3 /DolWin6/kappa	approx. 58.25 MW
NOR-4-2 /HelWin2/beta	32 MW[1)]
NOR-6-2 /BorWin2/beta	14.4 MW
Baltic Sea	
OST-1-3	5 MW
OST-2-1	3 MW
OST-2-3	23.75 MW

[1)] The grid connection capacity available in area N-4 for pilot offshore wind turbines will be reduced to 32 MW, since the 62 MW capacity available on the NOR-4-2 connection system (HelWin2/beta) will be partly released for the NOR-7-2 connection system to be set up at the Büttel grid connection point.

6.2 Spatial specifications

The Site Development Plan can define spatial specifications for the construction of pilot offshore wind turbines in areas so that spatial conflicts are avoided.

Summarising, the following spatial specifications for the grid connection of pilot offshore wind - turbines are defined for the German EEZ region.

Summary

- Construction of pilot offshore wind turbines only in areas defined under 5.1
- Compliance with planning principles 4.4

In accordance with section 5 subsection 2 WindSeeG, pilot offshore wind turbines may only be set up in areas defined in chapter 5.1.

Moreover, the planning principles under 4.4 must be observed so that public and private interests are taken into account. See 0.

Concerning notes on possible usage conflicts, please see the environmental statement as well as chapter 7.5.

It should be noted that by designating available grid capacities, the Site Development Plan does not make any statement about whether there are free locations in an area for the construction and operation of pilot offshore wind turbines. Furthermore, the Site Development Plan does not make any statement as to whether pilot offshore wind turbines can be connected to the offshore connecting line on which grid connection capacity is available. Exactly if and where the installation and operation of pilot offshore wind turbines will be permitted shall be solely decided by the authorisation procedure for pilot offshore wind turbines, which will take place at a later stage[22].

6.3 Technical conditions and prerequisites for grid connection

In addition to spatial specifications, the Site Development Plan can also specify the technical conditions of the offshore connecting line and the resulting technical requirements for connection of pilot offshore wind turbines to the grid.

Summarising, the following technical conditions and requirements for the grid connection of pilot offshore wind turbines in the German EEZ region are defined.

Summary

- Agreement or consent with or from affected third parties, e.g. e.g.
  - OWP projects for the use of the transformer platform and for spatial and technical integration in its projects
  - Neighbouring OWP projects
  - Responsible TSO, e.g. for testing operation of the connecting line in compliance with the approval (e.g. compliance with temperature criteria) and for distributing power if multiple AC cables are available
- Interface agreement with OWP project developers or TSOs for connection to the platform

It has been determined that, as a prerequisite for grid connection of pilot offshore wind turbines, an agreement with or approval of, for example, third parties should be presented together with an application as per Part 4 of the Offshore Wind Energy Act (WindSeeG) . Third parties includes parties such as the offshore wind farm project - developer within whose project the pilot wind turbines will be integrated, either spatially or technically, but also neighbouring offshore wind farm project developers (insofar as they are

[22] BT-DrS. 18/9096 of 6 July 2016, Recommendation and report of the Committee on Economic and Energy Affairs (9th Committee) on the draft bill of the CDU/CSU and SPD parliamentary groups – Journal 18/8860 – and on the draft bill of the Federal Government – Journals 18/8832, 18/8972 – pp. 373.

physically close to the planned pilot wind - turbines), with regard, for example, to the structural integrity of the offshore wind turbines. Third parties also includes the responsible transmission system operator, for example for the distribution of the output of the pilot offshore wind turbines via multiple three-phase current submarine cable systems between the transformer platform and the converter platform, so that the operation of the pipeline links will be compliant.

The approval of the responsible transmission system operator includes, where necessary, inspection of the technical capability of the specific/concrete pipeline link for compliance with the approval to carry the electrical output of the pilot offshore wind turbines from the transformer platform of the offshore wind farm project to the network node point.

A variety of designs come into consideration for the connection of pilot offshore wind turbines, with a variety of associated technical preconditions. This explains the requirement to clarify technical interfaces and the necessity of clarifying formal interfaces. With regard to specificities of implementation, it is therefore foreseeable that early clarification of the technical and formal interfaces and local conditions is a basic requirement for the connection of pilot offshore wind turbines to a transformer platform or converter platform. This explains why, for each individual approval process, it is compulsory to present a - comprehensive interface agreement with the project manager of the platform to which the pilot wind turbines are to be connected.

Please note that the pipeline links set out at 6.1 were or are being developed by the responsible transmission system operator according to BFO-N/O (Bundesfachplan Nordsee Offshore) linking concepts. Based on the linking concepts direct linking of the pilot wind turbines to a converter platform may not be possible or may be possible only with considerable effort and expense. This would necessitate linking of the pilot offshore wind turbines to the transformer platform of an offshore wind farm project.

7 Conformity of the rules with private and public concerns

According to section 5 subsection 3 of the Offshore Wind Energy Act (WindSeeG), spatial rules are inadmissible if there are overriding opposing public or private interests. A catalogue lists the particular concerns involved. Insofar as one of the grounds for exclusion mentioned in section 5 subsection 3 sentence 2 of the Offshore Wind Energy Act (WindSeeG) applies, rules may not be applied in any case. The list of concerns is not exhaustive.[23] Insofar as individual concerns available for consideration compete with each other, they shall be assessed in comparison to one another.

For the determination of sites and areas according to section 5 subsection 1 nos 1 and 2 of the Offshore Wind Energy Act (WindSeeG) which are located in a cluster defined by the Spatial Offshore Grid Plan (BFO) under section 17a of the Energy Industry Act (EnWG), or in a priority, reserved or designated area of a spatial plan according to section 17 subsection 3 sentence 1 of the Spatial Development Act (ROG), the admissibility of the determination need be examined only if additional or other significant aspects are discernible or if updates and in-depth examinations are required (see section 5 subsection 3 sentence 3 of the Offshore Wind Energy Act (WindSeeG). The background to this is that when examining the rules of the clusters in the Spatial Offshore Grid Plan and priority, reserved or designated sites in the spatial plans for the North Sea and Baltic Sea EEZs, a decision was already made in accordance with the applicable provisions, whereby the concerns were assessed individually and against one another.

The admissibility of the rules was examined by the state of Mecklenburg-Western Pomerania for the coastal waters of Mecklenburg-Western Pomerania. Please see the environmental report of the Mecklenburg-Western Pomerania spatial development programme (LEP-MV) with regard to the threat to the marine environment.

[23] Cf. BT-DrS. 18/8860 of 21 July 2016, draft bill of the CDU/CSU and SPD parliamentary groups, draft bill on the introduction of tenders from renewable energies and further amendments to the law on renewable energies, p. 273.

7.1 Legal grounds for exclusion

7.1.1 Compliance with requirements of spatial planning

Any provisions that fail to comply with requirements of spatial planning according to section 17 subsection 3 of the Federal Spatial Planning Act are inadmissible. This involves the land use aspects of the rules according to regional criteria. According to section 3 subsection 1 No. 1 of the Spatial Development Act (ROG), "spatial planning requirements" is the generic term for spatial planning objectives, principles and other spatial planning - requirements. According to section 4 subsection 1 No. 1 of the Federal Spatial Planning Act, the spatial planning objectives must be observed in regionally significant planning operations and measures, and other requirements of spatial planning must be taken into account in balancing or discretionary decisions.

The Spatial Plans for the German Exclusive Economic Zone in the North and Baltic Sea EEZs[24] for the first time specify spatial planning objectives and principles for this region with regard to economic and scientific use, ensuring the safety and ease of shipping traffic and protection of the marine environment. Guidelines for spatial development are formulated and objectives and principles are defined, in particular areas for uses and functions. The spatial plan defines coordinated rules for the individual uses and functions of shipping, extraction of raw materials, pipelines and submarine cables, scientific marine research, wind power generation, fisheries and mariculture and protection of the marine environment.

The rules were reviewed to ensure compliance with the spatial planning objectives and principles.

7.1.2 No risk to the marine environment

According to section 5 subsection 3 sentence 2 no. 2 of the Offshore Wind Energy Act (WindSeeG), rules that endanger the marine - environment are inadmissible.

The specialised legal test characteristic "Gefährdung der Meeresumwelt" (Threat to the marine environment) constitutes its own review standard. In addition, the existing provisions of the specific legislation apply, i.e. those relating in particular to the protection of wildlife and conservation of natural habitats and the testing/checking with regard to probable significant environmental impacts in the context of strategic environmental planning.

Reference is made to the maps in chapter 11 for the representation of the area.

Under Art. 1 of the Federal Nature Conservation Act (BNatSchG), all instruments of nature conservation (with the exception of Chapter 2: Landscape Planning) [25]were extended to the area of the German EEZ and the continental shelf in accordance with section 56 subsection 1 of the Federal Nature Conservation Act (BNatSchG). This means in particular, that the requirements of statutory biotope conservation (section 30 of the Federal Nature Conservation Act), European conservation of natural habitats (section 34 of the Federal Nature Conservation Act) and special wildlife conservation (sections

[24] Appendices to Federal Law Gazette (BGBl) I No 61 of 25 September 2009, Appendix to the Regulation concerning spatial planning in the German exclusive economic zone in the North Sea; Appendix to Federal Law Gazette I No 78 of 18 December 2009, Appendix to the Regulation concerning spatial planning in the German exclusive economic zone in the Baltic Sea.

[25] Federal Nature Conservation Act of 29 July 2009 (Federal Law Gazette I p. 2542, last amended by article 8 of the Act dated 13 May 2019, Federal Law Gazette I p. 706.

44 ff. of the Federal Nature Conservation Act) must be observed. The corresponding examinations were carried out as part of the Strategic Environmental Assessment and presented in the environmental reports. For assessment of the risk to the marine environment, see Chapters 7.3 to 7.6, the environmental reports and, for rules based on previous sectoral plans, the environmental reports for the Spatial Offshore Grid Plan, in particular the environmental report on the BFO-N 2012 – 17 and BFO-O 2012 – 17.

7.1.3 No negative impact on safety or ease of traffic

Rules that effect the safety and ease of traffic are also inadmissible according to section 5 subsection 3 sentence 2 no. 3 WindSeeG.

The rules of the areas in the North Sea and Baltic Sea were largely taken from the clusters already defined in the BFOs for the North Sea and Baltic Sea. Clusters were set taking into consideration and account the provisions of the spatial plans. As issues related to shipping have already been examined within the framework of the preparation and updating of the BFO, re-examination of the areas and sites in accordance with section 5 subsection 3 sentence 3 of the Offshore Wind Energy Act (WindSeeG) is probably not necessary initially, except for a few rules.

7.1.4 No impairment of the security of national and Alliance defence

According to section 5 section 3 subsection 4 of the Offshore Wind Energy Act (WindSeeG), no rule may impair the security of national and alliance defence.

The rules of the areas in the North Sea and Baltic Sea were largely taken from the clusters already defined in the BFOs for the North Sea and Baltic Sea. Area O-3 has been reduced to the actual cultivated or built-upon site in the interests of national and alliance defence. The laying of submarine cable systems in submarine diving areas will be avoided as far as possible. In the case of gate O-IX, the planned route reduces clearances in the wind farm's security zone. Concerns relating to national and alliance defence have already been examined within the framework of the establishment and updating of the BFO, so re-examination of the areas and sites according to section 5 subsection 3 sentence 3 of the Offshore Wind Energy Act (WindSeeG) is probably not necessary initially, apart from a few individual rules.

7.1.5 No location in legally designated protected area

Section 5 subsection 3 sentence 2 no. 5 of the Offshore Wind Energy Act (WindSeeG) stipulates that the determination of areas or sites in protected areas designated in accordance with section 57 of the Federal Nature Conservation Act is inadmissible. The rules of the areas in the North Sea and Baltic Sea were largely taken from the clusters already defined in the BFOs for the North Sea and Baltic Sea. Therefore, areas and sites are not specified in nature conservation sites.

7.1.6 No location outside areas and sites designated in BFO clusters or by coastal states

The rule of areas or sites outside clusters 1 to 8 in the North Sea and clusters 1 to 3 in the Baltic Sea of the BFO, or the areas or sites designated by a coastal state in coastal waters, are inadmissible according to section 5 subsection 3 sentence 2 no. 5b WindSeeG. This does not apply if sufficient areas and sites cannot be defined in these clusters, areas and sites in order to achieve the expansion target according to section 4 no. 2b of the Renewable Energy Sources Act (15 GW in 2030).

This Regulation ensures that sectoral plans to date (BFO) will be transferred into the new system. In particular, expansion of the use of offshore wind energy should initially take place

in the clusters already examined in more detail and in the coastal area designated by a country. The opening clause ensures that planning can go beyond the stated BFO clusters and areas and sites in coastal waters if this is necessary in order to achieve the expansion objective.

7.2 Other public and private interests

In addition to the reasons for exclusion expressly listed in section 5 subsection 3 sentence 2 WindSeeG, a number of other concerns are relevant within the framework of the review of the Site Development Plan rules according to section 5 subsection 3 sentence 1 WindSeeG. These include uses such as planned and existing data cables, pipelines and mining activities, the concerns of the fishing industry, workplace health and safety, cultural heritage, disaster prevention and emergency services and the economic costs of constructing and operating wind farms and of constructing and operating offshore connecting lines.

The latter is also taken into account in the determination of the sites and the chronological order of their tendering via criterion 1 of efficient use and utilisation of the connecting lines and criterion 2 of efficient planning, construction and use of the connecting lines still to be completed in accordance with section 5 subsection 4 sentence 2 nos 1 and 2 of the Offshore Wind Energy Act (WindSeeG). This also applies to the geographical proximity to the coast according to section 5 subsection 4 sentence 3 no. 3 WindSeeG, which influences the costs of the offshore connecting line. The operational costs are included in the rules of the site development plan via the criteria of geographical proximity to the coast, the anticipated actual development potential, chronological order and the expected generation capacity, which are also mentioned in section 5 subsection 4 sentence 2 of the Offshore Wind Energy Act (WindSeeG). Reference is made to Chapter 4.8.1.

The interests of existing projects that have not been awarded contracts in the tendering - procedures are not private or public interests

which preclude determination.[26] This is supported by the wording of section 5 subsection 3 sentence 2 of the Offshore Wind Energy Act (WindSeeG), which does not mention the right of subrogation when it sets out each of the interests and the degree to which it may be relevant.

Even if the right of subrogation – contrary to the explanatory memorandum – were a private interest, there is no right to specify a site or a certain site layout.

Insofar as the prerequisites for the right of subrogation are in accordance with §§ 39 ff. of the Offshore Wind Energy Act (WindSeeG), it is in any case relevant that, for subsequent exercise of the right of subrogation, the right of subrogation can be allocated with a majority (at least 50%), according to section 39 of the same Act. For the site development plan, this means that it is relevant whether the existing project overlaps the site determined in the site development plan by more than 50%. If this is the case, there exists a subsequent right of subrogation for the entire site - if the prerequisites are met.

In the event that multiple existing projects have a right of subrogation - assuming that the prerequisites have been met - the only project to have the right of subrogation shall be the one whose existing project overlaps the site in the site development plan by more than 50%. If this is the case, the subsequent right of subrogation - if the prerequisites have been met - applies to the entire site.

In the event that the site development plan does not specify a site, even if the prerequisites for right of subrogation according to sections 39ff of the Offshore Wind Energy Act (WindSeeG) have been met, refer to Chapter 8.9 of the site development plan. Prevention of the occurrence of the exclusion criteria through planning principles

Planning principles were introduced in order to prevent hazards to the marine environment and safety and impairments to the safety and efficiency of transportation and to national and alliance defence, and to mitigate these to such an extent that there are no impairments or hazards. Besides the general principles, the planning principles also specifically concern areas and sites, platforms and submarine cable systems (see chapter 4.4).

The spatial planning requirements are addressed by the following planning principles in the draft site development plan:

- the principle of overall coordination of timing and construction and laying work
- the objective of respecting nature - conservation areas and taking legally protected biotopes into account
- the objective or principle stating that the safety and efficiency of shipping must not be compromised
- the objective of dismantling wind turbines, submarine cables and pipelines
- the objective of taking into account all existing and authorised uses
- the principle of taking into account locations where cultural assets have been found
- the principle of economical area use
- the principle of bundling of submarine cable systems
- the objective of ensuring that shipping traffic crosses priority areas by the shortest possible route

[26] Cf. BT-DrS. 18/8860 of 21 June 2016, draft bill of the CDU/CSU and SPD parliamentary groups, draft bill on the introduction of tenders from renewable energies and further amendments to the law on renewable energies, p. 273.

- the principle that shipping traffic crosses - restricted areas by the shortest route
- the principle of least intrusive laying procedures

The following planning principles concern threats to the marine environment:

- Overall chronological coordination of installation works
- Consideration of nature conservation areas and regard to legally protected biotopes
- Dismantling of wind turbines, submarine - cables and pipelines
- Consideration of locations of cultural assets
- Noise mitigation
- Minimisation of scour protection
- Consideration of regulatory standards, specifications and concepts
- Emission mitigation
- Economic area use
- Bundling of submarine cable systems
- Bundling of submarine cable systems in the sense of parallel routing
- Careful installation
- Covering
- Mitigation of sediment heating (compliance with 2 K criteria)

The following planning principles serve to prevent impairments to the safety and efficiency of shipping:

- Overall chronological coordination of installation works
- No negative impact on safety and efficiency of shipping
- Dismantling of wind turbines, submarine - cables and pipelines
- Bundling of submarine cable systems in the sense of parallel routing
- Shipping traffic crosses priority and restricted areas by the shortest possible route
- Consideration of regulatory standards, specifications and concepts
- Perpendicular crossing of shipping priority and shipping reservation areas
- Preventing crossings; any crossings should be as perpendicular as possible
- Accessibility of platforms with ships
- Careful installation
- Covering

As regards air traffic, a planning principle 4.4.1.3 has been introduced stating that the safety and efficiency of air traffic must not be compromised.

The following planning principles serve to prevent impairment of the safety of national and alliance defence

- No impairment of the security of national and Alliance defence
- Consideration of all existing and approved usages
- Dismantling of wind turbines, submarine - cables and pipelines
- Covering
- Installation of sonar transponders

With regard to other public and private concerns, occupational health and safety concerns are included in the site development plan via the planning principle of compliance with official standards; data cables and pipelines are likewise included via the planning principle that involves taking existing and approved uses into consideration.

7.3 Admissibility of the rule of areas

The determination of areas in the North Sea and Baltic Sea was largely taken from the clusters already defined in the spatial offshore grid plans for the North Sea and Baltic Sea. As related issues have already been examined within the framework of the preparation and updating of the BFO, re-examination according to section 5 subsection 3 sentence 3 WindSeeG is generally not required. Regular updating or consolidation of the examination beyond the aspects described below is not necessary because the last update occurred as recently as the end of 2017.

The designated areas are outside the priority and restricted areas for shipping traffic and outside nature conservation areas.

Sites identified in the site development plan overlap extensively military training areas, but only the overlaps where conflicts can be expected are taken into consideration. Overlaps with flight training and/or warning and hazardous areas that begin at 5,500 ft or higher are not mentioned. Areas or part-areas N-3, N-4, N-5, O-1 and O-3 are inside military training areas. As the areas have already been defined as clusters by the North Sea and Baltic Sea Spatial Offshore Grid Plan and parts of them have been defined as priority areas for wind energy in the spatial plan for the North Sea, and no additional, significant or new aspects are apparent, admissibility according to section 5 subsection 3 sentence 3 of the Offshore Wind Energy Act (WindSeeG) does not need to be re-examined at this stage.

Data from the results of monitoring by the operated offshore wind farm and planned - research projects raises questions about the suitability of area N-4 for designation for subsequent re-use, so this area is subject to examination.

Please see Chapter 5.1.2 for details.

The existing wind farm, in area N-5, "Butendiek", is described for information purposes. It would not be permissible to designate this as a site or conservation area with regard to possible subsequent re-use according to section 5 subsection 3 sentence 2 no 5a of the Offshore Wind Energy Act (WindSeeG), as it lies within the "Sylt Outer Reef – Eastern German Bight" (Sylter Außenriff – Östliche Deutsche Bucht) nature conservation area. This is supported by goal/target 3.5.1. (3) of the North Sea Exclusive Economic Zone Spatial Planning Ordinance (AWZ Nordsee-ROV). Furthermore, unlike the designation of Cluster 5 in the BFO-N 2012-17, the site now encompasses only those projects that are operational, since no additional aspects in accordance with section 5 paragraph 3 sentence 3 of the Offshore Wind Energy Act (WindSeeG) have emerged.

The N-5 site is being examined for possible subsequent use for offshore wind energy for nature conservation and environmental reasons. Please see Chapter 5.1.2 for details.

Furthermore, the rules of the areas are not inadmissible according to section 5 subsection 3 sentence 2 no. 5b WindSeeG, according to which areas and sites must lie within clusters 1 to 8 of the North Sea and clusters 1 to 3 of the Baltic Sea as defined by the BFO. The rules of areas and sites in the North Sea and Baltic Sea were largely taken from the clusters already defined in the BFOs for the North Sea and Baltic Sea.

Although area N-9 is outside clusters 1 to 8 of the BFO for the North Sea, it may be necessary to specify a site in area N-9 as site N-9.1 in order to safely achieve the expansion target according to section 5 subsection 3 sentence 2 no. 5b final clause of the Offshore Wind Energy Act (WindSeeG).

The sites in areas N-10 and N-12 listed in the annex for an enhanced development pathway by 2030 are also outside clusters 1 to 8. However, these were initially presented for information purposes only and would likewise be necessary in order to achieve an enhanced expansion target in accordance with section 5 subsection 1 of the Offshore Wind Energy Act (WindSeeG).

Concerns have been expressed with regard to the rule of areas N-11 and N-13. The Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the Agency for Nature Conservation (BfN) recently pointed out, in their statement in respect of the consultation on the draft of the site development plan, that clusters 13 and 11 are also very important for harbour porpoises (main distribution area for harbour porpoises from May to August) and for seabirds and resting birds as resting and feeding habitat, as well as overwintering habitat. To the extent that it is even possible, clusters 9, 10 and only then, subsequently, cluster 12, should be developed/OPENED UP (see position paper of the Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) dated 25 June 2018 and position paper of the Agency for Nature Conservation (BfN) dated 14 June 2018).

As development of the areas in zone 3 will be necessary in order to implement the development pathway, the comment was taken into account by the determinations in the site development plan by initially defining a site for area N-9 only. Accordingly, sites in areas N-9, N-10 and N-12 are initially presented for information purposes in the annex for an enhanced development path ending in 2030. No threat to the marine environment is therefore assumed initially (see the environmental report, chapters 4.5.1, 4.6.1, 5.1.2, 5.2.2 and 6).

The eastern part of area O-3 was reduced to the site of the existing "Baltic 2" wind farm in order to counter the threat to national and alliance defence posed by military training areas located in the east of area O-3.

7.4 Admissibility of the rule of sites

The specified sites are beyond the priority and reservation areas for shipping traffic and outside nature conservation sites. Please see chapter 7.3 with regard to the location of individual sites in military training areas.

As regards site N-3.7, there are no overriding private concerns preventing rule by awarding a contract with location coordinates in a call for tenders for existing projects. If a contract is awarded only to the extent of the minimum or secondary bid size, a smaller installed line will be used as a basis for the approval procedure for wind turbines, i.e. the number of turbines and their locations will deviate from the original - approval or application.[27] Coordinates in the contract are used only to map the location of the wind farm precisely and to prevent the contract from being transferred to another project in another site, and do not indicate a claim to the entire site. Moreover, the principle of economical area use in accordance with section 2 subsection 2 no. 6 of the Spatial Development Act (ROG) and the early use of vacant areas in accordance with section 5 subsection 4 sentence 2 no. 2 of the Offshore Wind Energy Act (WindSeeG) run counter to any such use of the site merely for the reduced capacity of the partial contract. The site was determined taking into account the main concerns and results of the consultation.

An extension of area N-5 for the exploitation of offshore wind energy beyond the "Butendiek", "Dan Tysk" and "Sandbank" OWPs in operation at the time of this investigation and specifically in relation to the site N-5.4 presented in the drafts of the Site Development Plan is, according to the current state of knowledge, not consistent with the prohibition of section 44 subsection 1 no. 2 BNatSchG. The exclusion of site N-5.4 is justified by the extent of the already identified cumulative adverse effects of the OWPs in the region of the main concentration area of divers in the German North Sea EEZ. The observed 19% loss of the valuable feeding and stopover habitats within the main concentration area, in conjunction with the identified statistically significant decrease in the abundance of divers, prohibits any increase in the exploited area for species protection reasons relating to the diver species group.

In accordance with the precautionary principle based on section 3 UVPG and to avoid any substantial disturbance in the sense of section 44 subsection 1 no. 2 BNatSchG with the required degree of certainty, further cumulative effects due to the construction of further offshore wind turbines in area N-5 are to be avoided.

Due to the not to be excluded significant cumulative effects on the diver population that would arise from the construction of further wind farm projects in the main concentration area, there already exists a threat to the marine environment, irrespective of the question of admissibility under species protection law, section 5 subsection 3 sentence 2 no. 2 WindSeeG. This is due to the fact that, amongst other things, the main concentration area is an important functional component of the marine environment in respect of seabirds and stopover birds. For this reason, a designation of site N-5.4 is not permitted.

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[27] BT-DrS. 18/9096 of 6 July 2016, Recommendation and report of the Committee on Economic and Energy Affairs (9th Committee) on the draft bill of the CDU/CSU and SPD parliamentary groups – Journal 18/8860 – and on the draft bill of the Federal Government – Journals 18/8832, 18/8972 – pp. 301, 302.

In addition, a conflict of use under section 5 subsection 4 sentence 2 no. 4 of the Offshore Wind Energy Act (WindSeeG) between offshore wind energy use and nature conservation and environmental concerns has become apparent, which means that other sites (such as sites in area 9) are better suited to the development of offshore wind energy. For explanation of the details, see Chapter 5.1.2 of the site development plan and Chapters 4.12.4 and 5.2.2.1 of the environmental report for the North Sea.

With regard to site O-1.3, concerns were expressed by the Directorate-General for Waterways and Shipping in its statement regarding possible hazards to shipping traffic. These can be clarified by means of a risk analysis as well as a nautical traffic and maritime police investigation, as evidenced by the statement on further investigations. This may be presented and evaluated within the context of the suitability examination. The rule of site O-2.2 is still under consideration. Concerns relating to endangerment of shipping traffic and the marine environment due to bird migration form the background to this. Moreover, there are indications of difficulties with regard to the anticipated actual development potential (see Chapter 5.2.2of the site development plan and Chapters 4.12.5 and 5.2.2.1 in the environmental report for the Baltic Sea).

7.5 Permissibility of further determinations

The locations of platforms, routes and route corridors for offshore connecting lines, as well as for cross-border power lines, for possible connections between or among the turbines, locations where the connecting lines cross the boundary between the EEZ and coastal waters, and standardised technical and planning - principles are also examined with regard to whether they are admissible under section 5 subsection 3 sentence 2 of the Offshore Wind Energy Act (WindSeeG).

According to the Agency for Nature Conservation (BfN), the grid connections passing through gate N-I run across a sandbank that is a legally protected biotope according to section 30 of the Nature Conservation Act. This does not significantly effect the biotope. Available grid connection capacities for pilot offshore wind turbines exist in area N-2. According to the Agency for Nature Conservation (BfN), the southern part of area N-2 is also located on the sandbank. The determination of available grid connection - capacities is not a subject of the inadmissibility test according to the list in section 5 subsection 3 sentence 1 of the Offshore Wind Energy Act (WindSeeG). Other than that, however, such determination would not significantly affect the biotope (see Chapter 6.5.1 of the environmental report). Exactly if and where the installation and operation of pilot offshore wind turbines will be permitted shall be solely decided by the authorisation procedure for pilot offshore wind turbines, which will take place at a later [28]stage.

At present, the NOR-7-2 linking system is routed only as far as gate N-V. Regardless of the routing in coastal waters, crossings of existing

[28] BT-DrS. 18/9096 of 6 July 2016, Recommendation and report of the Committee on Economic and Energy Affairs (9th Committee) on the draft bill of the CDU/CSU and SPD parliamentary groups – Journal 18/8860 – and on the draft bill of the Federal Government – Journals 18/8832, 18/8972 – pp. 373.

linking systems north of gate N-IV will be required in the EEZ. Routing in this area is currently under discussion.

Two interconnectors cross the "Dogger Bank" nature conservation area from gate N-XI to gate N-XIV and from gate N-XII to N-III. In the Baltic Sea, interconnectors run from gate O-XII to gate O-XIII through the "Pomeranian Bight – Rönnebank" nature conservation area, and from gate O-V to gate O-VI through the "Fehmarn Belt" nature conservation area. The strategic environmental assessment has shown that this is unlikely to have a significant impact on the environment (see Chapter 6.5.1 of the environmental reports for the North Sea and the Baltic Sea).

8 Summary consideration

This chapter summarises the results of the consultation in the context of the procedure for drawing up the 2019 site development plan, including the hearing on 27 June 2018 and the discussion on 31 January 2019.

The procedure included several opportunities for parties to be involved in the process. In particular, the calls issued by those taking part in the consultation are stated, justified with regard to the decision on which the plan is based; insofar as divergent calls were made, the decision in favour of the weightiest call/the most important concern is justified.

As part of the procedure, documents were amended several times after each consultation had taken place. The subsequent assessment of these calls and concerns relates to those not resolved during the process currently under way.

The determinations of the site development plan are a manifestation of a planning process that offers scope for manoeuvre.

Public and private interests are determined, adjusted, evaluated and weighed up within in light of planning considerations and in the framework of statutory requirements.

Public and private concerns affected by this planning must be fairly weighed up against and between each other, taking the legal framework into account.

The bases for assessing these are the statutory framework conditions (including sections 4 and 5 of the Offshore Wind Energy Act (WindSeeG)), in particular but not only the position statements and other statements submitted by participating authorities and members of the public.

For details of taking the position statements and other statements into account, please see the documentation of the assessment.

Each answer received to the consultation questions formulated in the draft documents is treated according to topic and relevance.

Documentation of specific details of the assessment of position statements and answers received to the consultation questions is published separately.

The assessment does not include editorial comments or memorandum items.

8.1 General background to the site development plan

8.1.1 Legal foundations, Development pathway

In all phases of the issuing process, associations, wind farm developers and operators and the transmission system operator called for increases to the development pathway of approximately 17 GW or 20 GW and a long-term scenario to be taken into account.

In principle, the statutory development pathway from section 4 subsection 2 no. 1 of the Offshore Wind Energy Act (WindSeeG) site development plan, in conjunction with section 4 no. 2b of the Renewable Energy Act (EEG) is taken as the basis in the site development plan.

However, to honour the calls of those participating in the consultation and to respond to potential future developments, the site development plan, in conformity with the current (second) draft of the 2019-2030 site development plan, provides in the appendix, for information only, larger site development paths of 17 GW and 20 GW and a long-term scenario.

8.1.2 Other energy generation areas

The main thing called for during the issuing process was that other energy generation areas should be listed in the initialissue of the site development plant. Specific suggestions of areas coming into consideration were also made.

Since changes to legislation during the current procedure came into force on 21 December 2018 and require extensive examination and, in some cases, agreements, in particular with authorities, lists of other energy generation areas were not included in the initial issue of the site development plan, in order to prevent delays in the area of pipeline-related offshore wind energy, but remain reserved to the partial update of the site development plan, which is set to commence in the third quarter of 2019.

8.2 Interfaces with other instruments of network planning

Some parties to the consultation raised the matter of instruments for grid planning, which they stated should be synchronised, particularly when a larger development pathway was taken as a basis.

The site development plan and NEP are issued on the basis of statutory requirements and deadlines which also apply to the consultation.

Given the specific framework conditions, the two grid planning instruments are mostly compatible. This is ensured by, among other things, that parties to each are involved in each process and coordinate the processes.

8.3 Connection concepts

8.3.1 North Sea

The main position statements regarding the linking plan for the North Sea that were received related to the 66 kV direct linking plan for the direct linking of the offshore wind turbines using a converter platform. This plan was included in the BFO-N 16/17 as an alternative plan and was decided upon as the standard even in the preliminary draft of the site development plan. In comparison to the 155 kV linking plan in the BFO-N, with an additional transformer platform, an expert report from the transmission system operators has now achieved a significant cost advantage for the 66 kV direct linking plan. The basic determination of this linking plan as standard was welcomed in the position statements received, although most position statements wished for more far-reaching determinations in connection with the plan.

The primary interface between the offshore wind far project developers and the responsible transmission system operator was already set down in the preliminary draft as being at the cable end closure of the submarine cable systems going in on the converter platform. Clarification has been made in the current version of the site development plan because of one of the position statements. Furthermore, some statements also asked for further technical interfaces to be determined. As a result of consideration of the position statements, the site development plan now contains a reference to the VDE grid connection rules in this respect. Additionally, some position statements mentioned the possibility of use of the converter platform by the offshore wind farm project developers. They stated that the elimination of the transformer platform made it worthwhile for the project developer to use buildings and infrastructure (e.g. the helicopter landing deck) on the converter platform. The transmission system operators and the Federal Network

Agency both advised that the call for tenders for the platform would occur prior to the allocation of the site, which would make it impossible to take into account the wishes of the offshore wind farm developers and/or this might be inefficient if a developer did not use planned facilities. Accordingly, shared use of the platform would be limited to the use required for grid connection. In the results of the assessment, the site development plan states that any shared use of the platform includes only the shared use required in the context of grid connection, making reference to section 8.5.1. Hence a separate platform for accommodation and maintenance purposes may be required; the site development plan provides for this. Because the 66 kV direct linking plan requires the parties involved to undertake a significant amount of coordination, the site development plan, as suggested by some of the position statements, emphasises the absolute necessity for cooperative collaboration.

If several sites in an area are far apart, a linking plan with a transformer platform and a higher voltage than 66 kV may be useful because of the length and number of submarine cables required. Up to and including the draft site development plan, reference was made in this respect to the 155 kV linking plan in the BFO-N, which would be taken into account in the determinations of the grid linking plans in Chapter 5.2.

Due to technical developments and the associated reduction in submarine cables required, the voltage for this alternative plan was increased to 220 kV in the second draft. The transmission system operators commented on this in their position statement, suggesting no fixing of the voltage or finding out whether it would be possible to avoid cases in which the alternative plan would apply. Examination of the matter revealed that, according to the current status of the target system, there is only one linking system (NOR-6-3) with the alternative plan and that, moreover, this is to be realised by a transmission system operator that has not yet operated a linking system with a voltage of 155 kV. Particularly because of space constraints in area N-6, it seems advisable to reduce the number of cable systems required as much as possible and to set the higher voltage of 220 kV.

8.3.2 Baltic Sea

In comparison to the BFO-O, the linking plan for the Baltic Sea in the site development plan relocates the interface and responsibilities. A consultation question relating to this has been included in the draft site development plan, based on a suggestion by the transmission system operator in its position statement on the preliminary draft dated 15 June 2018. There were various positions on the question of whether responsibility for the planning, construction and operation of the transformer platform in the Baltic Sea should rest with the transmission system operator, each shedding light on a different aspect.

Until now, planning and construction of the platform has been carried out by the offshore wind farm project developers, with the transmission system operator being allowed to use the platform to the extent required to operate the grid connection system. Many of the position statements noted the necessity of collaboration and mutuality in the implementation of the grid connection.

There were also a variety of suggestions for the specific determination of the interface between the project developers and the transmission system operators in such a transition. In general, the aspects mentioned are covered in the determinations in Chapter 4.2.2 and the responsibility for planning, constructing and operating the transformer platform allocated to the transmission system operator. Chapter 4.2.2 also fleshes out the interface between the transmission system operator and the project developer.

8.4 Standard technical principles

8.4.1 North Sea

Even the preliminary draft of the site development plan pointed out that the target was to increase the standard transmission capacity from the previous standard value of 900 MW, which was based on the BFO-N. The preliminary draft therefore worked on a standard transmission capacity of 1,200 MW for a standard transmission voltage of +/- 320 kV. In response, the transmission system operators made it plain in their position statement that an increase to 1,200 MW was not compatible with complying with the planning principle of sedimentary warming (the 2K criterion).

The standard transmission capacity was initially reduced to 1,000 MW in the draft, also on the basis of the grid connection capacities required for the connection of areas in zones 1 and 2 (areas N-1 to N-8); it was pointed out that individual ratings would be set in the areas based on the capacity required and that it was not possible to go below 900 MW. The capacity to be installed in each area was adjusted in the second draft of the site development plan by adapting the method for determining the capacity, resulting in a standard transmission capacity of 900 MW for the grid connection systems required in zones 1 and 2.

The availability of technology to increase the standard transmission voltage to +/- 525 kV in combination with an increase of the standard transmission capacity to 2,000 MW was surveyed by consultation questions in the draft site development plan. The position statements submitted did not present a homogenous view on these matters. The transmission system operators all mentioned increased risks and problems with availability of manufacturers of the technology as serious reasons for uncertainty. They also explained that this voltage was presently the prerequisite for cross-linked polyethelene land cables but that the results

could not necessarily be generalised and applied to submarine cables. The other participants in the consultation believed there was technical availability and pointed to a current project in the North Sea using this voltage.

In summary, it can be stated that it seems feasible to realise +/- 525 kV grid connection - systems with 2,000 MW per system from around 2030. On this basis, which was also substantially confirmed by a research contract awarded by the Maritime and Hydrographic Agency (BSH), the second draft set +/- 525 kV systems with a transmission capacity of 2,000 MW as standard for the linking plans in zone 3.

It is not possible to give preference to the systems in zones 1 and 2 as well, firstly because of the limited potential in each of these areas and secondly because it is difficult to predict how available this technology will be before 2030. The position statements received on the second draft of the site development plan generally - welcomed the ruling, noting in particular the associated significant reduction in route corridors. The Federal Network Agency welcomes the fastest possible transition to a higher transmission voltage. The transmission system operators' position statement, on the other hand, mentions several challenges in connection with the implementation of +/- 525 kV systems and comes to the conclusion that realisation in 2030 would be critical and realisation as early as 2029 is not feasible.

After weighing the statements received and, in particular, after testing the onshore grid connection points suitable for accommodating the increased capacity – the +/- 525 kV voltage level is now defined for the areas in zone 3 starting with area N-10, whereby in this area a capacity of only 1,700 MW is required due to the available site potential. For the anticipated NOR-9-1 link, set down in the site development plan for 2030, and for the subsequent NOR-9-2 system, the transmission capacity is set individually at 1,000 MW and a voltage of +/- 320 kV.

As the second draft of the site development plan included a note to the effect that for transmission capacities of 2,000 MW, compliance with the 2K criterion must be checked, some position statements urged that this be checked promptly. The initial results of this check are now available and will be evaluated in the context of discussions of the 2K criterion.

8.4.2 Baltic Sea

At the technical level, the site development plan makes only minor adjustments, compared to the BFO-O. While the standard transmission voltage of 220 kV is retained, a standard transmission capacity is also set, as for the North Sea. After considering the statements by those participating in the consultation, this was set at 300 MW. The offshore wind farm project developers argued for a higher transmission capacity, mainly because the designated site in the Baltic Sea would permit it. However, based on the transmission system operators' statement and the research contract awarded by the Maritime and Hydrographic Agency (BSH), an increase of the standard transmission capacity to more than 300 MW is not envisaged, due to the length of the links and the restrictions consequent upon compliance with the 2K criterion.

8.4.3 Cross-connections between converter/transformer platforms

Potential links between platforms in the North Sea and the Baltic Sea were named and presented graphically in the site development plan. Moreover, the standardised technical principles include a stipulation that these potential links must take into account appropriate prerequisites on the relevant - platforms. For the North Sea, the transmission system operators pointed out in their position statements that it did not make sense to link the platforms using different AC linking plans (e.g. 66 kV and 155 kV). They also pointed out that it would be necessary to check, in each case, whether it made economic sense to create the link. As set out in Chapter 5.11, such a check is in any case made by the transmission system operators as part of the mitigation measures plan. Since the site development plan only creates the spatial preconditions on the basis of the statutory provisions in section 5 subsection 1 no. 10 of the Offshore Wind Energy Act (WindSeeG), such a check is advisable in this context.

However, the Maritime and Hydrographic Agency will keep an eye on this topic in the future, including as part of a work package in the accompanying research contract.

Regarding the provision of control panels on the platforms, it was noted that it was not appropriate to make a ruling on number of control panels to be kept available. The relevant standardised technical principles therefore do not now mention the provision of one control panel per platform in the Baltic Sea and two in the North Sea but rather, the number of control panels per link.

8.5 Planning principles

8.5.1 No negative impact on safety or ease of air traffic

The transmission system operators' position statement pointed out that the operator of a platform should have the choice of implementing the standard access to a platform by helicopter or by ship. The (BSH) Maritime and Hydrographic Agency's view is that the transmission system operators' offshore platforms constitute an important part of the public grid and thereby also of energy generation. This is where the energy generated in the offshore wind farms is bundled and converted to direct current. Because converter platforms are critical to the system, they must be reachable by both ships and helicopters, i.e. there must be redundancy.

In terms of planning the approach and take-off corridors for offshore platforms, the transmission system operators pointed out that slight curvature of the configured corridors should be permitted. They stated that a planning principle was behind the rules, according to which deviations were possible for an appropriate reason. Nevertheless, it was important that corridors be planned to be straight, particularly for night-time operation of a helicopter landing deck, in order to prevent flying curves within a background of obstruction and not to limit the usefulness of visual flight control systems (approach slope lighting) or to make the information they provide available the length of the entire corridor. Furthermore, because the corridors serve take-offs as well, potential emergencies must be taken into account when they are being sized (e.g. unilateral engine failure).

Several position statements pointed out that the requirements for planning the approach and take-off corridors should be made more flexible so that, among other things, it would be possible for corridors to overlap. The background

obstruction of an offshore wind farm makes it necessary to keep certain areas free of obstructions (e.g. wind turbines) (i.e. flight corridors), so as to offer the helicopters operating there a safe place to approach and take off from, i.e. without risk of collision and as free as possible from wake turbulence. The flight corridors are to be used during the day and must be used at night. This means that they constitute a transport route and/or that they represent a fixed route to and from helicopter landing decks; consequently, leaving a corridor is not safe at night and safe only under certain conditions during the day. Furthermore, the crew of a helicopter in such a corridor has only limited possibilities of identifying other aircraft, particularly in the sections of corridor within the offshore wind farm background obstruction. In summary, it is clear that corridors must not intersect.

Many of those who participated in the -consultation questioned the requirement in the planning principles that intersections with the helicopter route network should be avoided when planning approach and take-off corridors. This requirement was omitted from the final version of the site development plan.

Offshore associations further commented that the restriction that would prohibit the corridors from infringing the boundaries of the EEZ could have disadvantages from an air safety point of view. Little to no influence can be exercised on rules for the use of areas outside Germany's EEZ because only the country responsible for an area that is beyond Germany's EEZ border can plan for that area. It is therefore not possible to ensure that these areas will always be free of buildings or that structures planned for them will be sited in such a way as to meet the obstruction criteria of a flight corridor. The requirement therefore remains.

Several parties responded to the second draft by saying that shared use of helicopter landing decks on converter platforms by the offshore wind farm operator should be possible in the event of connection according to the direct link plan, as this would eliminate the need for the operator to construct additional platforms. In principle, the linking plan really only provides for shared use of the converter platform because of the technical interface of the grid connection. Other shared uses beyond this are possible, but should be arranged by agreements under private law.

8.5.2 No impairment of the security of national and Alliance defence

Based on the position statement of the BAIUDBw (Das Bundesamt für Infrastruktur, Umweltschutz und Dienstleistungen der Bundeswehr) the planning principle 4.4.1.4 was reinstated in the second draft of the site development plan. The BAIUDBw had asked, as part of the consultation, for routing to exclude military training areas. The transmission system operators advised that it was necessary to be able to distinguish between the military training areas because all the route gates to coastal waters were close to or within military training areas. It is impossible to exclude submarine cable systems from all military training areas because the training and warning areas cover almost the entire EEZ.

The transmission system operators also pointed out that a 20-day notification deadline for unplanned measurement exercises, e.g. in the event of damage or loss, could lead to compensation payments under section 17e of the Energy Industry Act (EnWG). Please refer to the explanations in Chapter 4.4.1.4.

8.5.3 Clearance rules

During the consultation, it was mentioned that safety clearances of 1,000 m around converter platforms had been measured too generously and would disproportionately restrict the developers of the wind farm to come. A reduction to up to 200 m was requested. At the same time, it was noted that, because of their anticipated size and height, the turbines were likely to stand much farther than 1,000 m apart. A request was also made that planning of the details of the wind farm, including the converter platforms (for 66 kV) and/or the transformer platforms (for 155 kV and/or 220 kV) be left to the future wind farm operator. This cannot be done because the transmission system operator will already have begun the tender process and construction of the converter platforms at the time the areas are awarded. No restriction of the wind farm is anticipated, since the platform locations will be determined early in the process so that the wind farm is aware of the framework conditions before planning the layout.

Furthermore, it was pointed out several times that the clearances for parallel laying and in thirds had been measured overly generously. At the same time, it was explained that it was not permitted to make changes in the area of existing projects as this would create further risks for those projects. Noting that the full version of the DNV-GL study would not be available until June 2019, a position statement on the second draft of the site development plan stated that no decisions should be made at this point. Accordingly, decisions will be postponed and this plan does not make changes to any clearances.

8.5.4 Economic area use

The planning principle of economical use of areas and offshore wind turbines based on section 2 subsection 2 no. 6 of the Spatial Development Act (ROG) and the rules of section 4 subsection 2 no. 2 of the Offshore Wind Energy Act (WindSeeG) was followed. In the position statements on the draft site development plan, which was the first to include this planning principle, participants in the consultation pointed out that it was obsolete because the "central model" required the capacity to be installed, as determined in the site development plan, to use the area economically in any case. Even though this is acknowledged to be true, the principle of economical area use should remain in the plan, as situations could arise in which uneconomical exploitation of the area needed to be prevented. This rule could come into play in relation, for example, to a reduction in capacity on an area determined by the site development plan due to the preliminary site inspection or the proceedings for licensing for specific use, because in such case, the remaining (reduced) capacity should be distributed over the area as economically as possible. However, insofar as capacity and area conform to the specifications of the site development plan, this planning principle does not have any effect because economical area use is already taken into account in the determinations of the site development plan as a goal under section 4 subsection 2 no. 2 of the Offshore Wind Energy Act (WindSeeG).

8.5.5 Emission mitigation

The transmission system operators' position statement on the first draft of the site development plan raised the question of the legal bases of this planning principle. The determinations serve to prevent contamination of and hazards in the marine environment in accordance with section 6 of the Ordinance concerning offshore installations for defining German coastal waters (Offshore Installations Ordinance, SeeAnIV), and the uses set out in the plan are subject to the "minimisation rule".

In terms of construction and operational preventive and safety measures, one position statement received pointed out that because it was not practicable to gather all operational

materials in tanks, justified exceptions should be permitted. According to the explanatory text for the planning principle, the minimisation rule applies to discharged materials. Insofar as certain emissions into the marine environment are unavoidable in normal operations, for technical reasons, deviations from this principle must be registered and justified as part of the planning approval process. For clarification, the relevant section of the planning principles was revised in the second draft.

The transmission system operators were also of the view that the use of biodegradable operating materials should be limited to turbines that had a direct effect on the marine environment. However, in line with the minimisation rule, the rules of the planning principles in relation to environmental impact concern both direct and indirect effects.

The transmission system operators also questioned the determinations of the planning principles with regard to the eligibility for approval of wastewater treatment plants. Prioritisation of competent, professional collection of wastewater over processing it on the platforms is a categorical requirement, to be applied regardless of the actual number of people on the platform. A note regarding the circumstances under which, as an exception, wastewater treatment equipment may be used, is to be added in the relevant planning approval process. The second draft includes revised text that provides an appropriate explanation of the planning principle, for clarification.

Several participants in the consultation pointed out that only a limited number of manufacturers could meet the minimum rules for emissions standards for diesel generators used. The emissions standard has been retained, taking into account the minimisation rule and the time still to elapse before the relevant turbines are constructed.

8.5.6 Consideration of ordnance locations

The position papers on the first draft of the site development plan from several public institutions noted that relocation of munitions found in the seabed should be prohibited and that transportable weapons should be disposed of on land in consultation with the ordinance clearance services in each German state. Appropriate text was added to the second draft of the site development plan.

The transmission system operators stated that a blanket obligation to dispose of uncovered munitions was inappropriate and, with consideration of workplace safety and the costs involved, it should be possible to re-route and change the construction area. To this end, the planning principle was made more specific in the second draft, linking the obligation to dispose of munitions to transportable weapons taken up.

8.5.7 Planning principles relating to conservation

Numerous participants asked for the inclusion of further general and specific planning principles designed to protect the marine environment, in addition to the existing planning principles of prevention and reduction of significant environmentaleffects. Given the unanswered questions after the formulation of such principles, such as the specifics of delineating migration routes to be kept clear, and due to the tight time frame for the first issue of the site development plan, it was not possible to do this for the 2019 site development plan. However, it is planned, as part of the upcoming update of the spatial development plans for the EEZ, and in parallel, in the update of the site development plan, to discuss - and include, where appropriate - an extension of the nature conservation - planning principles.

The request for tighter formulation of the planning principle on consideration of wildlife reserves and recognition of legally protected biotope was implemented when the draft site development plan was revised.

In respect of the planning principle of noise reduction, some position statements called for a more binding formulation, such as the use of the best available low-noise foundation technology, whereas the planning principle requires the 4.4.1.8examination of low-noise types of foundations.

Conservation association NABU calls for the use of alternative, state-of-the-art low-noise foundation methods.

There is also great interest within the sector in developing alternative types of foundations, but it has become evident that not every type of ocean floor is suited to alternative foundation techniques. Suitability is examined not only by noise input but also by guarantees of structural integrity of the turbine and by the available state of the art. It is always important to evaluate other adverse effects on the marine environment of low-noise foundations, including the sealing of unacceptably large areas of the ocean floor, the removal of upper sediment layers of up to 6 m in the case of gravity foundations, the introduction of lubricants and the deposition of large amounts of sediment in the case of drilled foundations.

The formulation of the principle includes, among other things, aversive conditioning. Aversive conditioning and monitoring of the effectiveness of aversive conditioning measures are part of the noise protection plan of an approved project. The specific requirements of the noise protection plan are always expressed in the approval in a way that is specific to the location and the project and takes into account the latest knowledge and techniques. In regard to the point that the noise protection plan for the North Sea had been prepared while there was no corresponding plan for the Baltic Sea, it should be noted that responsibility for such a plan does not lie with the Maritime and Hydrographic Agency (BSH) but with the Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

A further request in relation to noise emissions was for more binding rules governing construction and maintenance traffic, to reduce continuous noise in sensitive areas. Prevention and mitigation measures in connection with wind farm-related shipping are currently under investigation, and options are being discussed with authorities and representatives of nature conservation and industry associations. For logistical reasons alone, it is not possible to completely exclude construction and maintenance traffic from protected areas with species that are susceptible to interference, as was suggested, because some offshore wind farms can only be accessed via routes through protected areas.

Multiple research projects are in progress both in Germany and internationally to investigate the potential effects of continuous noise. The results will be evaluated to discover the extent to which observed changes in behaviour at population level have significant, substantial consequences and which preventive and mitigation measures can be effective.

8.5.8 Distances between sites and from wind turbines

When answering consultation question F.6 of the draft site development plan, about the minimum clearances for the wind turbines of neighbouring wind farms, participants in the consultation agreed most with the view that a minimum clearance of five times the rotor diameter was sufficient. At the urging of the participants, the wording of the planning principle was amended to clarify that this rule applies only to the clearances relating to wind turbines in a neighbouring wind farm and not to turbine clearances within a wind farm.

Several participants pointed out that rotor diameters of more than 200 m, which are expected in the future, would lead to the setting up of safety zones around the turbines and possibly also to navigable corridors within the

wind farm, and this should be avoided. The planning principle 4.4.1.2 was therefore amended such that the setting up of safety zones within an area should be coordinated and not allow any gaps.

8.5.9 Deviation of actual installed capacity from allocated grid connection capacity

This planning principle first appeared in the second draft of the site development plan. The participants welcomed this, but felt that verifying compliance by offshore wind farm operators with maximum sediment warming limits would not be practicable. The planning principle was therefore revised so that it is now incumbent upon the responsible transmission system operator, in cooperation with the offshore wind farm operator, to perform the warming calculations.

Some individual position statements from operators stated that unlimited use of the awarded grid connection capacity was being assumed. However, because the basis for laying the grid connection system is an appropriate wind load profile for the offshore wind farm, unlimited grid connection capacity is not available to the successful tenderer. The note to be created according to this planning principle must set out an undertaking that the maximum sediment warming limit will not be exceeded even if there is a deviation from the standard load profile of the offshore wind farm.

One participant in the consultation pointed out that the potential extent of exceeding the allocated grid connection capacity was not specified; if it were, this would enable the responsible transmission system operator to take this into account when planning the grid - connection system. In line with efficient grid planning, however, the planning principle clearly states that no over-allocation can be assumed when planning the grid connection system and accordingly, the allocated capacity should be applied, taking into account the standard wind load profile.

8.5.10 Accommodation on platforms

Several position statements by associations pointed out that the construction of accommodation on platforms increasingly seems unnecessary. Since the planning principle is not intended to be understood as a recommendation to set up accommodation, it was revised to be more specific and state that if (temporary) accommodation was planned, this must be done at when plans for the platform itself were being drawn up.

8.5.11 Careful installation

The planning principle 4.4.4.6 was essentially taken from the BFO-O and the BFO-N and fleshed out in the site development plan such that the draft plan specified impact zones for installation equipment. The position statements received that commented on this added detail stated that compliance with these impact widths, and possibly also with the overlap target as per the planning principle 4.4.4.7 was impossible and/or that there might well be no appropriate installation equipment available on the market. Another position statement advocated that the site development plan not contain such specifics but instead a ruling should be issued for each individual approval process. This would be contrary to the purpose of the planning principles which includes reducing the load on the individual approvals process by providing

specific rules to be observed. Furthermore, participants in the consultation were asking for clarification of specific points. After consideration of these various position statements, it was decided not to set fixed impact zones for installation, and specific determinations were made concerning the removal of gravel.

8.5.12 Covering

The BFO-N already set a minimum covering for submarine cable systems in the North Sea by specifying a durable covering of at least 1.5 m. Because of the varied nature of sediments in the Baltic Sea, the BFO-O did not stipulate anything but referred to a study to be carried out as part of the individual approval process. The essential aspects of the determinations were expanded upon in the draft documents of the site development plan.

The draft site development plan asked a consultation question designed to find out whether a depth of greater than 1.5 m should be considered, particularly in light of the 2K criterion. Responses from participants in the consultation evidenced widely differing views on the matter. While some authorities believed a depth of greater than 1.5 m would probably make sense, the transmission system operators and representatives of the offshore wind sector did not agree. They referred to the temperature difference (2K criterion) and other points, such as the absolute maximum conductor temperature and economic viability due to high installation costs. Several parties pointed out that the planning principle should not apply to cabling within a wind farm. This is not the case, however (see Chapter 4.4.4). After evaluation of the responses received, the site development plan omits specification of a depth greater than 1.5 m, in the context of complying with the 2K criterion. As a result, a guaranteed covering of at least 1.5 m is specified for the North Sea; for the Baltic, as in the BFO-O, reference is made to a specific determination as part of the individual approval process. It also mentions that the planning principle of covering may be further elaborated, as appropriate, as part of a future update process.

8.5.13 Sediment heating

The planning principle 4.4.4.8 stipulates compliance with the 2K criterion for submarine cable systems. The principle was the subject of much discussion and numerous position statements throughout the drafting of the site development plan, because the stipulation could limit the transferrable capacity to one submarine cable system, so a working group was set up within the Maritime and Hydrographic Agency (BSH). The working group is tasked with identifying the main factors having influence on the necessary calculation of warming and finding out about sediment warming currently occurring. Three main variables involved in the warming calculation were identified: the depth and/or covering of the submarine cable, the load profile applied and the assumed heat resistance of the sediment. Consultation questions on each of these were formulated in the draft site development plan. Please refer to the above summary assessment of the 4.4.4.7 planning principle regarding the covering.

In regard to the load profile applied, participants asked whether the 77%/99%/77% profile usually applied could also be applied in the case of "overplanting", i.e. the installation of additional wind turbines beyond the allocated grid connection capacity. The answers to these consultation questions were not unanimous. Some stated that the load profile could still be used in the case of overplanting, but others disagreed. Insofar as the load profile is no longer applicable, it is suggested that either the load profile be examined or that it be set aside in favour of actual measurements in combination with a dynamic rule. The Maritime and Hydrographic Agency (BSH) working group on the 2K criterion is investigating both options, so the site development plan does not yet have a set rule for the load profile to be used in

verification management. Please refer to the new planning principle 4.4.2.4, "Abweichung der tatsächlich installierten Leistung von der zugewiesenen Netzanbindungskapazität" (Tr: Deviation from the actual installed capacity of the allocated grid connection capacity), which the successful tenderer must use if installing additional wind turbines beyond the allocated grid connection capacity (i.e. overplanting) to verify compliance with the planning principle 4.4.4.8.

Alternatively, consultation participants suggested measuring the conductor temperature to further research the topic and using conductor temperature to enable verification of compliance with the 4.4.4.8planning principle. Answers to the consultation question on this topic in the draft site development plan varied widely. The transmission system operators' position statement pointed out that the relevant technology had not yet reached the necessary standard and that the results were therefore very unreliable, while other participants stated that - temperature measurement should be mentioned as an option but not made compulsory. They also mentioned the possibility of distinguishing between cabling within a wind farm and cable systems forming part of the linking system. Another participant advocated checking compliance with the 2K criterion during operation by means of regular measurements.

Because of the unreliability of measurements and the state of development of the technology at present, the site development plan has not set a rule regarding measurement of conductor temperature at this stage. However, the working group will continue to discuss the K2 criterion and monitor technological developments in this area.

To deepen understanding of sediment warming by submarine cables, the Maritime and Hydrographic Agency (BSH) has been tasked with calculating warming for existing and future grid connection systems as part of a parallel research contract. The results of these calculations will feed into the ongoing discussion. After consideration of the position statements and knowledge to hand, the planning principle as set down in the draft site development plan has not been adapted, but it may well be adapted in a future update.

8.6 Possible deviations

Chapter 4.5 of the draft site development plan of 26 October 2018 sets out possible deviations from standardised technical and planning - principles. The opinions expressed on these, particularly on the standardised technical principles, called for the possibility of a deviation that had not been envisaged originally. This was because the rules for the technical design of the grid connection systems set down in the site - development plan were for realisation by the relevant transmission system operator. The central model under the Offshore Wind Energy Act (WindSeeG) allocates a site at a point in time when, to enable prompt realisation, the essential components of the associated grind connection system will already have been allocated. This makes deviation impossible.

The second draft of the site development plan adds a note to clarify this, explaining that - only to the extent required and due to new information coming to hand - a deviation may be possible in certain individual cases, insofar as it is incorporated prior to the issuing of the tender for the site(s) or before the grid connection system is allocated.

Due in particular to the increased risk of non-achievement of the annual statutory development quantities under section 5 subsection 5 of the Offshore Wind Energy Act (WindSeeG), deviation from the standardised technical principles at a later stage is not possible.

Deviation from the planning principles of the site development plan must be applied for in the relevant individual approval process and comply with the basis of the relevant planning principle. Insofar as a planning principle is based on legislation specific to the sector or regional spatial planning goals, deviation is not possible. If a planning principle is not based on the foregoing, deviation is possible in principle. It was not possible to implement the request to state the relevant planning principles explicitly in the context of position statements on the draft site development plan, because it was not always possible to clearly identify which principle was involved. However, statements on the individual planning principles do make reference to legislation in the sector and to regional spatial planning rules.

8.7 Determination of expected generation capacity

Provisions for the methodology for determining capacity in the preliminary draft and first draft of the site development plan envisaged categorising the sites using the criteria "Geometry" and "Shading by surrounding wind farms". Evaluation of answers to the consultation questions revealed that, comparing technological advances in turbine technology to wind farms realised so far, it seems appropriate to increase the capacity density significantly. As some responses showed, however, the rigid limit values for categorising the sites made it difficult to compare the sites. Individual circumstances should be taken into account and the tenderer given more scope for adjustment. To move toward meeting this request, the previously envisaged methodology for determining capacity was examined as part of the parallel research contract and the "alternative methodology" suggested. This alternative methodology was introduced in the first draft of the site development plan and discussed at a representatives from the sector at a specialists' workshop.

The majority of participants in the consultation believed that applying the alternative methodology for determining capacity was expedient, and this view was confirmed at the specialists' workshop on determination of capacity on 6 December 2018. On this topic, another party pointed out that the figures to be applied for the amended capacity density should be thoroughly justified and that the methodology should not rest solely on the geometrical differences between the sites but also on other aspects, such as differences in shading of the sites. Accordingly, the methodology should take into account how circumstances in Zones 1 and 2 differed from those in Zone 3 of the North Sea EEZ. Most consultation participants agreed that determination of the amended capacity density should be nuanced and that the different conditions in the areas and zones should be taken into account. These points were included when the methodology for determining capacity was revised and set out appropriately. The revised methodology for determining capacity provides a suitable approach that distinguishes the aspects mentioned. To justify or check the workability of the stipulated capacity density, the profit from each site was calculated and the results presented in the site development plan.

As the responses from participants produced a range from 200 to 250 m as a possible reference rotor diameter for wind turbines that will be commissioned between 2026 and 2030. a rotor diameter of 220 m was used to calculate the anticipated capacity to be installed.

Position statements on the second draft of the site development plan from multiple participants pointed out that a reduction of the anticipated capacity to be installed due to the annual corridor upgrade should be rejected. The statutory provisions do not allow a deviation from annual tender volumes of 700 to 900 MW. Dividing the site so that it would come up for tender in different calendar years would produce part sites with very low anticipated capacity to be installed, which would preclude independent economic operation of a wind farm.

8.8 Area

Business associations pointed out that fixing sites should not entail encroaching upon existing clusters or projects. Other participants in the consultation, particularly project developers and operators, mentioned specific clusters and areas, most frequently Cluster 5 in the national plan and/or area N-5 in the site development plan, saying that the existing fleet of wind farms already in operation must not be encroached upon and that no decision should be made about matters such as site allocation in areas (particular area N-5) unless documentation from studies still under way was presented.

Other consultation participants, including Deutsche Umwelthilfe (Tr.: German Environmental Relief), welcomed queries about Cluster 5/Area N-5 in order to protect birds, saying it was right to highlight conflicts of use. Repowering of wind turbines there should be relocated to places outside the main area of concentration for divers.

In comparison with the designation of clusters 4 and 5 of the BFO 2012 - 17, there are significant additional considerations in the sense of section 5 subsection 3 sentence 3 WindSeeG in respect of the strictly protected species of red- and black-throated divers for the entire area off the Schleswig-Holstein North Sea coast. In particular, the analysis and assessment of the cumulative impacts of the OWPs revealed that the deterrence effects acting on divers are much more pronounced (Garthe, et al., 2018) than was originally assumed in BSH decisions for individual approval procedures and in the position paper of the BMU (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2009). The OWPs "Amrumbank West", "Nordsee Ost" and "Meerwind Südost" in area N-4 and the OWPs "Butendiek", "Dan Tysk" and "Sandbank" in area N-5 contribute to the identified displacement of divers from a hitherto preferred feeding and stopover habitat and the concentration in another, in the opinion of the experts, possibly less favoured habitat.

Furthermore, because of the identified wind farm avoidance behaviour, the main concentration zone can only be used to search for food to a limited extent. Evidence indicates that familiarisation has not occurred.

Based on the consultation reports and the data and information available to BSH, the investigation has shown that diver populations are biologically highly sensitive and that the main concentration area is of high functional importance for conserving the local population and that the adverse effects of the avoidance behaviour are intense and permanent.

Due to the fact that the cumulative adverse effects on divers are intense and permanent, the monitoring actions must be continued while the relevance of the cumulative effects of continued use of the areas for offshore wind energy, in accordance with section 8 subsection 3 WindSeeG, in the coming years must also be investigated. In addition to strict monitoring measures, mitigation measures must also be implemented to safely prevent the occurrence of circumstances leading to the disturbance in the sense of section 44 subsection 1 no. 2 BNatSchG.

Furthermore, threats to the marine environment in the sense of section 5 subsection 3 sentence 2 no. 2 of the Offshore Wind Energy Act (WindSeeG) could not be ruled out if areas N-4 and N-5 were subsequently used, so subsequent use should be examined.

Areas N-4 and N-5 are therefore under investigation for possible continued use.

A specific statement on the approved service life of the OWP projects present in areas N-4 and N-5 or any measures taken in the context of the implementation is not linked to the presentation of areas N-4 and N-5 under investigation in respect of any continued use, rather remains reserved solely for the procedure in question.

The same applies to the project in area N-4, which comes under the rules of the transitional regime. Treatment of this subject is reserved for the approval procedure.

Please refer to Chapter 5.1.2 of the site development plan and Chapter 4.6 of the environmental report for the North Sea for details.

In addition, the Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), the Agency for Nature Conservation (BfN) and Deutsche Umwelthilfe (Tr.: German Environmental Relief) had doubts about the determination of areas N-11 and N-13, as these had great significance for harbour porpoises (main concentration area) and seabirds and resting birds as habitat for rest, feeding and - overwintering.

All research hitherto confirms that divers do not inhabit water of great depth in search of food but - if at all - as migratory individuals and always in low numbers. The suitability of habitat for divers is determined exclusively by the availability of food at sea behind the fronts and at depths between 20 and preferably a maximum of 30 m. For Clusters 11 and 13, the avoidance behaviour of divers is of little consequence from a scientific point of view, as this is an "open sea" of no significance to divers.

Areas N-11 and N-13 are outside the priority locations for the appearance of harbour porpoises in the German EEZ in the North Sea. Also, both areas will only be developed along with areas N-3 and N-6 to N-10. Further examination is planned for updates of the site development plan.

In addition, the Agency for Nature Conservation (BfN) and the participating environmental associations argued that there should be no further development of offshore wind energy in the Baltic Sea, for reasons of nature conservation and protection.

On the other hand, other consultation participants believed that further potential in the Baltic Sea represented by the O-1.3 site in the northern area of areas O-1 and O-3 should be taken into account.

Development potential in the Baltic Sea varies by location, depending on the area and site.

It can be assumed, based on current knowledge, that the fixed site O-1.3 is suitable for the construction and operation of wind turbines. There are outstanding issues to be discussed, particularly relating to nature conservation and protection and shipping concerns, but we are waiting for results from the preliminary survey and the relevant contracted research on the suitability of the site before dealing with these.

Another reason site O-1.3 needs to be fixed is the background of the criterion "Ausgewogene Verteilung des Ausschreibungsvolumens auf Flächen in der Nordsee und in der Ostsee" (Tr.: Even distribution of tender volume between sites in the North Sea and in the Baltic Sea) (section 5 subsection 4 sentence 2 no. 7 of the Offshore Wind Energy Act (WindSeeG).

Due to shipping, marine environmental and subsoil (probably actual development potential), no sites in the Baltic Sea other than O-1.3 are being listed. Site O-2.2 is being investigated for the update to the site development plan because research and analysis of shipping is still pending, and for nature conservation and protection and environmental reasons, particularly bird migration.

Generally speaking, the area containing site O-2.2, which is being investigated, has average to above-average significance for bird migration. Migration of cranes must be considered in a sophisticated, nuanced manner. A total of 1,231 migrating cranes was recorded in site O-2 in the 2008 autumnal migration, which corresponds to approximately 3.1% of the crane population in Western Pommerania outside the breeding season or 1.37% of the biogeographical population. Most of these birds probably were probably directed south-east to here by north-westerly winds as they were flying from southern Sweden to Rügen. Site O-2.2 lies close to well identified key migration routes, which gives it average to above-average significance for crane migration, regardless of wind strength or direction, so nature conservation and protection conflicts on this site are apparent in relation to protected migratory birds, particularly when viewed cumulatively.

Please see Chapter 4.8.2.8 and, in particular, Chapter 5.4.3 of the site development plan for information about the development potential of Mecklenburg-Western Pommerania.

Refer to chapters 5.1.2 and 5.2.2 of the Site Development Plan and to 2.10.3.3 and 9.3.2 of the Baltic Sea Environmental Report.

8.9 Sites and capacity

Sites N-3.5 and N-3.6

In connection with determining sites N-3.5 and N-3.6, the first draft raised the question whether, under the designation of the largest possible continuous sites measure, the two sites should be combined. During the consultation on the draft site development plan, not a single participant supported such an amalgamation, and several participants were against it, so the Maritime and Hydrographic Agency (BSH) will honour their views.

Insofar as individual wind farm developers and operators made submissions on the right of subrogation, please see Chapter 7.4.

Site N-3.7

Regarding the delineation of site N-3.7, it had already been submitted, in the consultation on the preliminary draft, that the site should not be part of the central model for tendering, because there was tender for an existing project that encompassed the entire site.

Because the existing project has only a partial tender and the spatial dimensions of site N-3.7 was in need of clarification, the participants - taking submissions from the consultation into account - agreed on the delineation in the site development plan in order to prevent inequitable hardship between the transition phase and the central model.

Please see Chapters 5.2.1 and 5.8 of the site development plan for details.

Site N-6.7

In relation to determining site N-6.7, several position statements from participants pointed out that not all of the site would not be developable if the clearances were observed and that this limited exploitability did not permit independent economic operation.

It became apparent early in the consultation on the site development plan that the methodology for determining capacity used in the preliminary draft was most unsuitable, especially for sites with an elongated shape, such as the above-mentioned site N-6.7. Hence the "alternative methodology" for determining capacity was introduced and presented at the hearing on 31 January 2019. It is relevant that the usable proportion of the site is reduced depending on the diameter of rotors used, due to the clearance with sites adjoining the wind turbines. Therefore, in the draft site development plan and at the hearing there were presentations to the effect that the determination of the anticipated capacity to be installed should be checked as part of a feasibility study with eye to a possible wind farm layout and the operating results that could be expected. Because the consequences of the actual usable site as presented in the expert statement are very significant, particularly in the case of site N-6.7, the capacity calculated using the alternative method, of around 470 MW, is reduced to 270 MW for feasibility consideration. Taking into account the usual clearances between the wind turbines, this corresponds to development of the site with a linear shaped wind farm. Furthermore, as part of the study of feasibility of determination of capacity, the operating results that could be expected were calculated using wind speed time series. The results indicated that above-average efficiency could be expected from site N-6.7, compared to other sites, so from the point of view of the Maritime and Hydrographic Agency (BSH), profitable operation of the site can be expected.

Another position statement set out the argument that fixing site N-6.6 was injurious to the private interests of the surrounding wind farm because of the shading effects resulting from development of the site.

Site N-6.6 corresponds by and large to the former "Atlantis I" project. In response to this argument in the preliminary draft of the site development plan, the anticipated capacity to be installed on the site was reduced from 740 MW to 630 MW, which corresponds, more or less, to the capacity planned by the original project developer. The operators of the neighbouring wind farms were therefore amenable to development of the southern part of area N-6, to the extent presented in the site development plan. There is therefore no infringement of private interests in relation to this site.

Site N-8.4

A wind park developer suggested the site identified as site N-8.4 in the preliminary draft of the site development plan as a potential area for other types of energy generation (for hydrogen).

Please see Chapter 8.1.2 for discussion of designation of other types of energy generation.

Site N-8.4 is currently not designated, primarily because grid connections across multiple areas are best avoided, to prevent undesirable "splintered" planning. See also chapter 5.2.2.

Updates to the site development plan may examine the site further.

Site N-5.4 of the preliminary draft/drafts of the site development plan

Regarding the site identified as site N-5.4 in the preliminary draft and the drafts of the site development plan upon examination, one wind farm developer repeatedly stated that this site should be included in the site development plan for legal and technical reasons and undergo a preliminary check.

The developer's final statement put forth the following arguments:

- The alternative examination in the second draft of the site development plan and the second draft of the environmental report for the North Sea did not meet the requirements for consideration that does justice to the stated interests, as only technical and legal environmental measures were mentioned and the larger scope of concerns relevant for consideration were not covered. Examination criteria could not be restricted in this way in an overall alternative planning examination; rather, in the interests of site N-5.4, it should be taken into account:
- that the scarecrow effect on divers was reduced, because the scarecrow radii from the wind farms Nördlicher Grund and Sandbank intersected and priority use of sites on which (at least in part) a scarecrow effect was already in effect, caused by other wind farms, was not permitted, for reasons for nature conservation;
- that because site N-5.4 could be realised faster than other sites it would make a particularly important contribution to speedy implementation of the transformation of Germany's energy system, which was presently lagging behind despite being vigorously promoted by politicians and environmentalists;
- that there was a basis of trust in the interests of the approved wind farm, Nördlicher Grund;
- that a constitutional right of subrogation under Article 14 section 1 of Germany's Basic Law (Grundgesetz, GG) existed for the site N-5.4.

The available technical results on the topic of divers were still insufficient to serve as a basis for decision making. In particular, at the information meeting at the Maritime and Hydrographic Agency (BSH) on 18 March 2019 on avoidance behaviour by divers in relation to wind farms, not all aspects had been able to be covered properly.

Thus the following technical and methodological questions were still to be answered:

- the results and quality benchmarks of the various models calculated by the Office for Communication Technology (Fernmeldetechnische Zentralamt, FTZ) were not to hand;
- the predictions from the model had not been validated by the incoming data, yet such validation was critical to assessing the explanatory power of the model;
- in particular, it was not clear how reliable the population estimates for each year were;
- the alleged extent of the decline in numbers between 2012 and 2017, i.e. by more than 50%, which according to the models could only have occurred outside the main areas of concentration, was therefore insufficiently substantiated;
- although the implicitly claimed causal connection between the (modelled) decline in numbers and the construction of wind farms was possible, it was not evidenced by anything in the reports;
- statements about "cumulative disturbance effects" as the cause of declines at a distance of > 10 km from wind farms or via "possibly suboptimal areas" could not be demonstrated using the given data set. In this connection, the interested party repeatedly referred to a study commissioned by the Association of German Offshore Wind Farm Operators (Bundesverband der Windparkbetreiber Offshore e.V., BWO) on changes in

populations of divers in the German Bight, which would be presenting its initial results at the end of May 2019 and should therefore be incorporated in the overall assessment.

The essence of the wind farm operator's statement regarding the NOR-5-2 (SylWin2) grid connection system was that it should be taken into account that the grid connection system for the Nördlicher Grund (SylWin2) project had already been approved with the grid connection point in Büttel, Schleswig-Holstein and therefore represented an advanced stage of realisation.

Affiliating projects in the north of the North Sea in the north and projects in the south-west of the North Sea in the south-west went against time-honoured, tried and tested practice and currently applicable planning principles.

The grid connection plan for Nördlicher Grund, which was already 15 years old, had already been approved and the routes already specified in the Spatial Offshore Grid Plan (Bundesfachplan Offshore), a predecessor of the site development plan. Furthermore, due to the significance of SylWin2 in the energy sector for achieving the development goals for offshore wind in Germany, it had been included in grid development planning both in the Federal Network Agency's (BNetzA) ONEP and in the European ten-year plan (TYNDP) of the European Network of Transmission System Operators and had already been partially validated.

In addition, the wind farm developer stated, the economic costs were highly politically relevant, because electricity end users had borne them and they would otherwise be wasted – a "stranded investment" by the state.

The wind farm developer stated that the preliminary results of a study on divers by the Association of German Offshore Wind Farm Operators (Bundesverband der Windparkbetreiber Offshore e.V., BWO) could be expected by the end of May 2019, the Maritime and Hydrographic Agency (BSH) notes that these results were not, as described, submitted to it by that date. Rather, the Agency was informed that the final results could be expected at the end of September 2019. For this reason, results from the diver study on behalf of the Association (BWO) cannot be included in the published site development plan, the deadline for which is 30 June 2019.

Nature conservation-related evaluations and specifications were decided based on current knowledge.

The new scientific findings on avoidance behaviour by divers taken as a basis for conservation-related evaluation were determined using scientifically valid statistical methods that represent current good scientific practice both in Germany and internationally. The results were presented, both generally and, in particular, for populations of red-throated divers in the German North Sea and its subdivisions under consideration (EEZ, main concentration area, bird sanctuary), showing ranges of fluctuation, according to the scientific standard. Moreover, the comprehensive information base from the study by the Office for Communication Technology (Fernmeldetechnische Zentralamt, FTZ) comprises mainly date from monitoring offshore wind farms in the German EEZ in the North Sea. The findings emerging from the study on the extent and intensity of avoidance behaviour by divers with regard to wind farms also result, as set out in Chapter 4.6.1 of the environmental report for the North Sea, from the reports on monitoring during operation of offshore wind farms. The above scientific and methodological questions by the party therefore do not stand up to scientific scrutiny.

The wind farm developer's statements on the low-level scarecrow effect of a project on site N-5.4, saying that the scarecrow radii of Nördlicher Grund and Sandbank wind farms intersected and a priority use of sites on which

(at least in part) a scarecrow effect was already in effect, caused by other wind farms, relate to a previous position statement dated 12 April 2019, which presented different layout options for a Nördlicher Grund project in terms of additional loss of surface area in the main concentration area. All of the options resulted in an additional loss of surface area in the main concentration area of at least 100 km².

Regarding the consideration of the effects of individual projects, the Agency for Nature Conservation (BfN), in its position statement on 13 May 2019 stated:

In light of section 44 subsection 1 no. 2 of the BNatSchG, it was not permissible to consider one disruptive event in isolation when dealing with problems relating to divers. Gellermann (2011, p. 123) wrote: Since the preservation status is measured using all the factors that influence the size and distribution of the population in a location from a longer-term perspective, it must be expected, particularly in the case of endangered species being affected (in this case, divers) that a disruptive one-off event can, in combination with other factors that disrupt the population in that location, be "the straw that breaks the camel's back". (Gellermann, Stoll & Czybulka, 2011). Gellermann (2011, p. 123) explicitly notes that, in relation to overwintering divers, "the loss of - habitat brought about by the construction of an offshore wind farm might seem insignificant in itself, but the combined effect of it and other disruptive factors could well have effects on - population and could exceed the threshold for relevance." (Gellermann, Stoll & Czybulka, 2011)

The main area of concentration of divers in spring, according to the Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, BMU) (2009), represents the natural landscape and functional unit of the local population of divers in the German EEZ in the North Sea.

In the explanatory statement to the amendment to the BNatSchG 2007, the term "local population" is defined thus: "A local population includes those (partial) habitats and activity areas of the individuals of a species that are sufficiently coordinated spatially and in terms of function for the live and habitat requirements of the species.

In its position statement of 13 May 2019, the Agency for Nature Conservation (BfN) stated that the main concentration area was significant because of its high proportion, numerically speaking, of population in the German North Sea alone and that the high functional significance of the main concentration area as a feeding habitat that results from that would become very apparent. The predictability and availability of food resources on the hydrographic fronts occurring in this part of the German Bight was the reason for the concentration of divers in the main concentration area (Skov & Prins, 2001). If the food-rich hydrographic fronts were relocated to areas which divers avoided because of turbine-related scarecrow effects and other effects, the birds could not go to where their food was.

As the Agency for Nature Conservation (BfN) further stated, the main concentration area gained further significance from the fact that the birds gathered there immediately prior to their vernal migration to the Arctic and boreal breeding areas in Eurasia. Before the vernal migration, the divers ate from their spring resting habitat to build up reserves of fat that were essential not only for the migration but also, even more importantly, for successful reproduction in the subsequent breeding period. Breeding would definitely be less successful if animals were in a poor condition in spring (Dierschke & Garthe, 2006).

After examining the matter carefully, the Agency came to the conclusion in its position statement of 13 May 2019, that in order to reduce the adverse effects to the level estimated in 2009 as being tolerable, it was necessary to prohibit further wind farms in the main concentration area as well as prohibiting use of the "Butendiek" wind farm at night.

The Agency for Nature Conservation (BfN) agreed with and supported the arguments put forward by the Maritime and Hydrographic Agency (BSH). An extension of area N-5 for the exploitation of offshore wind energy beyond the "Butendiek", "Dan Tysk" and "Sandbank" OWPs in operation at the time of this investigation and specifically in relation to the site N-5.4 presented in the (pre-)drafts of the Site Development Plan is, according to the current state of knowledge in respect of species-protection law, not consistent with the prohibition of section 44 subsection 1 no. 2 BNatSchG. The exclusion of site N-5.4 is justified by the extent of the already identified cumulative adverse effects of the OWPs in the region of the main concentration area of divers in the German North Sea EEZ. The observed 19% loss of the valuable feeding and stopover habitats within the main concentration area, in conjunction with the identified statistically significant decrease in the abundance of divers, prohibits any increase in the exploited area for species protection reasons relating to the diver species group. Following the precautionary principle as set out in section 3 UVPG and in order to prevent significant disturbance as stringently as required under section 44 subsection 1 no. 2 BNatSchG, further cumulative effects due to the construction of more offshore wind turbines in area N-5 should be prevented.

Due to the not to be excluded significant cumulative effects on the diver population that would arise from the construction of further wind farm projects in the main concentration area, there already exists a threat to the marine environment, irrespective of the question of admissibility under species protection law, section 5 subsection 3 sentence 2 no. 2 WindSeeG. This is due to the fact that, amongst other things, the main concentration area is an important functional component of the marine environment in respect of seabirds and stopover birds. For this reason, a designation of site N-5.4 is not permitted.

Because the grounds for inadmissibility stated in section 5 (3), sentence 3, no. 2 WindSeeG (Offshore Wind Energy Act), "Endangerment of the marine environment", are fulfilled, a stipulation - as described in section 7 of the Site Development Plan - is inadmissible in any case. This means that, according to the wording and the legislative intent, the "endangerment of the marine environment" concern cannot be counterbalanced against other interests.

Even if it were assumed that private interests should also be considered in the weighing-up, it should be noted with regard to the right of subrogation that not all the conditions for acquiring a right of subrogation set out in section 40 Offshore Wind Energy Act have been met. BSH has merely declared the effectiveness of the disclaimer.

Moreover, irrespective of the question of whether a right of subrogation can even be a proprietary right, the right of subrogation does not infer compensation for the loss of the license. Rather, according to the clear wording of section 39 (1) Offshore Wind Energy Act and the official intent, it is granted for voluntary surrender of the data generated during the licensing procedure.

Here, the owner of an existing project can decide for themselves whether to provide BSH with the data and in return have an opportunity to enter a bid, inasmuch as the site is advertised for tender. According to the systematics of the act, the opportunity to enter a bid is based on the fact that the site is actually advertised, i.e. that it meets the criteria for admission to the Site Development Plan and that its suitability is

determined during the preliminary investigation. These steps are not pre-empted by granting of the right of subrogation, and in particular BSH is not restricted to the use of the (possibly outdated) data provided but is actually obliged to take into account more up-to-date data and insights within the framework of the respective strategic environmental assessment when determining suitability.

The right of subrogation does not otherwise constitute compensation for the loss of licence because, as stated above, the license has not already ceased to be valid by operation of law. On the contrary, the license expired on 15 July 2018 without further action by BSH or the law, due to the construction work for the installation of facilities not being commenced in a timely manner in accordance with sub-clause 23 of the licence.

In addition, a conflict of use compliant with section 5 (4), sentence 2, no. 4 Offshore Wind Energy Act, between the use of offshore wind energy and nature conservation and environmental interests has become apparent, leading to the conclusion that, in direct comparison, other sites in Area 9 are better suited for the development of offshore wind energy, because there are no conflicts of use in Area 9 based on current knowledge.

If the wind farm developer argues that the former "Nördlicher Grund" project is a particularly economically important project, which can be quickly implemented, this argument is not convincing. The special economic relevance in terms of the positive effects for the electricity supply or on electricity customers is not presented.

In its statement, the wind farm developer argues that the absence of proper consideration of the suitability of the site for cost-efficient electricity generation is erroneous.

However, this is countered by the fact that, from the point of view of the BSH in specifying the sites and the anticipated installed capacity, the economic costs must be directly or indirectly considered by applying the legal criteria of section 5 (4), nos. 1 to 7 Offshore Wind Energy Act. Criteria 1 and 2 aim in particular at the efficient exploitation of existing grid connections and the efficient planning, construction and use of new grid connections.

On the other hand, section 4.7 of the Site Development Plan shows in detail that determination of the anticipated installed capacity is based on the objectives of cost and land-use efficiency. In addition, the plausibility of the criteria is based on operating results modelling.

With regard to the discussed N-5.4 site: because of the conflicts of use criterion, in particular, it can be assumed that even after an imputed positive suitability assessment, which appears doubtful, extensive and lengthy technical and legal nature conservation investigations would need to take place during the planning permission procedure, which make a licensing decision appear unlikely or at least to pose a high legal risk. This, too, argues against the assumption of cost-effective power generation and therefore against the inclusion of N-5.4 in the Site Development Plan. In addition, given the implementation risk on this site, it would not be acceptable for preliminary investigations to be commissioned and paid by the state if it can be anticipated that these expenses cannot be recovered at a later date - given the absence of a call for tenders.

It is for this reason that the legislator introduced the conflict of use criterion. The aim is to give priority to sites for which there are as few conflicts of use as possible.

This also applies to any implementation of the NOR-5-2 (SylWin2) grid connection system.

Accordingly, site designation in area N-9 is required to achieve the trajectory. This is allowable, because area N-9 is more suitable for site designation than area N-5 for the reasons discussed above.

Refer to section 5.2.2 and 8.1.2 of the Site Development Plan, and 9.3.2 of the North Sea Environmental Report.

In the event that other nature conservation findings should arise in the future, a revaluation would be appropriate.

With regard to the "SylWin2" grid connection system, it should be noted that no licence for a high-voltage direct current transmission grid connection system with a converter platform within the EEZ exists. In addition, neither the (exclusively) spatial criteria of the Federal Requirements Plan nor the Offshore Grid Development Plan convey or mediate any claim to the implementation of this grid connection - system. And even if this were the case, it should be noted that BNetzA recently failed to confirm the grid connection system in Offshore Grid Development Plan 2014 or the confirmation of the last Offshore Grid Development Plan 17 - 2030 was given with reservation - among others the criteria of the subsequent Site Development Plan.

Over and above this - as described in the North Sea Environmental Report - any routing from Federal Requirements Plan Cluster 5 towards Büttel through the "Sylt Outer Reef – Eastern German Bight" conservation area - regardless of the problems posed by area N-5.4 - presents both nature conservation and environmental concerns. The shortest routing to gate IV within the EEZ would have a length of 157 km and thus travel almost completely through the "Sylt Outer Reef – Eastern German Bight" nature conservation area. In addition, in some places the route was within or in close proximity to known section 30 biotope occurrences (see sections 9.3.2 and 9.3.3 of North Sea Environmental Report).

8.10 Coastal waters criteria

A number of consultation responses were received on possible coastal waters criteria.

On the one hand, wind farm developers and operators, as well as the TSOs, claimed that additional sites should be designated in coastal waters M-V (for example in area O-6).

Others, such as the Federal Agency for Nature Conservation (BfN) and other nature conservation associations, for example, raised concerns about further development of offshore wind energy in the Baltic Sea.

In the context of the first draft of the Site Development Plan, the specific consultation question was raised as to whether stipulation of area O-7.1 with a comparatively low power output would allow economical operation and should therefore be stipulated in the Site Development Plan. The statements and comments did not give a clear picture - some of the consultation participants estimated that the operation would probably be economical due its coastal proximity, while others did not anticipate economic operation due to the low capacity of the site.

Areas and sites

After consultations, in particular with M-V state (Mecklenburg-Vorpommern - Mecklenburg-Western Pomerania), a total of two areas (area O-4 and area O-6) will be specified for the construction and operation of wind turbines on the basis of an administrative agreement between BSH and M-V state.

The marine priority zones defined in the 2016 M-V state spatial development plan will be adopted.

Given the current framework, sites are not currently designated taking all relevant interests into consideration. The reason is that a portfolio project (Arcardis Ost 1) exists in area O-4, which is expected to be implemented by the end of 2025 as part of the transitional phase. The site for the central model and the Site Development Plan is therefore not currently available.

Area O-6 contains a wind farm project approved by an order dated 15 May 2019 in accordance with the Federal Immission Control Act Although the project could not participate in the interim tender due to the lack of legal prerequisites, the procedure could not be simultaneously terminated due to the lack of a legal basis (unlike comparable procedures within the EEZ). Area O-6 is therefore not free from third-party rights, meaning that no site can currently be included in the Site Development Plan within this area.

Testing ground for pilot offshore wind turbines

According to section 5 (2), sentence 1 Offshore Wind Energy Act (revised), which came into force on 17 May 2019, the Site Development Plan can specify coastal testing grounds outside of areas over a total of 40 km², the calendar years for commissioning the pilots and the testing ground grid connection including grid capacity.

Taking into account all relevant interests, and in particular after consultation with M-V state, the Site Development Plan (the western part) currently designates the former O-7 area (north of Warnemünde) as a testing ground and a testing ground grid connection with a capacity of 300 MW for the commissioning year 2024.

In order to comply with the currently binding provisions of the M-V state spatial development plan, the eastern part is initially designated as an area. The more specific design or stipulation of the spatial outline of the testing ground remains reserved for a separate, M-V state regional planning procedure or the Site Development Plan's updating procedure. Whether or not, and when, an area is designated, is also examined in a separate spatial planning procedure by M-V state or in the Site Development Plan's updating procedure.

Additionally, refer to section 5.4 of the Site Development Plan.

The Rostock Chamber of Industry and Commerce explained with reference to the corresponding provisions in the M-V state spatial development plan 2016, that the visibility of technical installations in coastal waters from tourist centres was an important criterion in deliberations. This must also apply to the facilities installed in the wind turbine testing ground.

As the Chamber of Industry and Commerce itself notes, the rules of the M-V state spatial development plan 2016 were defined through a formal process involving two major participation procedures with public-sector and public input. The notes and comments presented have been fully considered in the deliberations. With regard to the marine geographical area of wind turbines, concerns about the visibility of the turbines from land were also taken into consideration in the deliberations and, ultimately, in the criteria for determining the geographical area. Balancing conflicts between different interests is one of the primary tasks of spatial planning. This has been done in the state spatial development plan[29].

In addition, it is pointed out that the target defined in 8.1(9) of the state spatial development plan and addressed by the Chamber of Industry and Commerce, which stipulates a spatially-compatible restriction of the height of built structures, does not address wind turbines (including those erected for testing purposes), but explicitly refers only to "more innovative forms of marine power generation". The target specification only applies to the latter, as the explanatory statement on page 98 of the state spatial development plan explains in more detail.

The state spatial development plan with its rules is brought into force by state regulations. According to section 7, paragraph 4 of Mecklenburg-Western Pomerania's State Planning Act, the state spatial development plan is determined by the state government in consultation with the state planning advisory council, which also includes representatives of the Chambers of Commerce and Industry. The rules contained therein are legally effective and can only be changed or deviated from using a state spatial development plan change procedure or, in individual cases, by a target deviation procedure.

The legally effective marine geographical area for state spatial development plan wind turbines (state spatial development plan area) was taken up in the second draft of the Site Development Plan. The state spatial development plan cannot make modifications to the Site Development Plan area.

A collision risk analysis, which resulted in changes in the two priority areas off Warnemünde, was carried out on the question of the compatibility of the state spatial development plan area with shipping. This analysis was prepared in consultation with the Federal Waterway and Shipping Administration.[30]

[29] Also see: http://www.raumordnung-mv.de/pages/abgeschlossene_raumentwicklungsprogramm.html

[30] https://www.regierung-mv.de/Landesregierung/em/Raumordnung/Landesraumentwicklungsprogramm/FAQ

BAIUDBw (Bundesamt für Infrastruktur, Umweltschutz und Dienstleistungen der Bundeswehr - Federal Agency for Armed Forces Infrastructure, Environmental Protection and Services) demanded that it be involved in possible consultations between BSH and M-V as part of an administrative agreement on rules impacting coastal waters.

The geographical area for marine priority and reserved areas for wind turbines within Mecklenburg-Western Pomerania's coastal waters, which was defined in the state spatial development plan following the implementation of a multi-level participatory procedure, was incorporated 1:1 in the second draft of the site development plan. No new facts therefore need to be considered in terms of the interests of BAIUDBw.

As part of its statement on the state spatial development plan participation procedure, BAIUDBw stated that it considers the interests of the military users of the offshore training areas directly affected by the state spatial development plan to be guaranteed by means of proposed provision 8 (3) of the state spatial development plan, which states that the use of military areas for training purposes in coastal waters should be guaranteed, and that spatially significant plans, measures and projects therein are ruled out, inasmuch as these are not compatible with military interests.

8.11 Chronological order and calendar year of the sites and connection cables

The comments on the chronological order and the calendar year of commissioning of wind turbines at sea and grid connections are deliberated together below. Application of the criteria according to chapter 4.8 is decisive for determination of the chronological order of the sites to be opened for tender. The prioritisation of the criteria was previously described in the preliminary draft of the Site Development Plan. Accordingly, criteria 1 and 2, which both relate to the availability of grid connection capacity, represent important requirements. Criterion 1 states that vacancies on existing offshore pipeline links must first be filled, which applied in particular to rules in area N-3 in 2021, the first tendering year. There were no fundamental objections to the basic procedure for the organisation and application of the criteria in the consultation rounds on the Site Development Plan. In order to apply criterion 2, the orderly and efficient planning, construction, commissioning, use and utilisation of the offshore pipeline links with commissioning from 2026, knowledge of the boundary conditions applicable to individual offshore pipeline links is necessary. In particular, suggestions made during the hearing were accompanied by a description of these boundary conditions and requirements, which are based to a large extent on representations in the grid development plan or the TSOs, with the draft Site Development Plan in chapter 5.5.2. For example, general and anticipated specific - implementation times for the offshore pipeline - links were presented based on the TSO's guidance.

In the second Site Development Plan draft, some commentators pointed out the challenge of connecting wind turbines from various project - developers to a converter platform - in the future with a capacity of 2,000 MW - in only a single calendar year. The logistical challenge here is clearly recognised. Nevertheless, the alternative would be to distribute the sites to be connected to a converter platform across several commissioning years with corresponding effects on the tendering years and the annual expansion corridors. To what extent this is useful would need to be examined. If the findings are refined to identify a corresponding requirement, in particular for converter platforms with a capacity of 2,000 MW, this may possibly be taken up again as part of an update of the Site Development Plan.

In this context, it was also demanded that the project developer be enabled by the responsible TSO to implement its respective grid connection in good time for the planned commissioning. This was stipulated with appropriate references to the connection concept in 4.2.1 and 4.2.2.

8.12 Spatialrules for submarine cable systems and platforms

The stipulation of the NOR-7-2 connection system to Büttel was both welcomed and rejected in the statements received. Some demanded an economic review of the connection in relation to the possible "SylWin2" connection. The state of Schleswig-Holstein pointed out that the state spatial development plan to date only designates gate N-IV and defined the routes to be specific to the wind farm. A renewed licensing procedure within the planned time frame is regarded as critical by the state. With regard to the possible coastal waters route, BfN also points out that a route without return in the region of the N-IV gate to the EEZ would be preferable. Despite the state's clear statement, the TSOs have continued to state that only Büttel would be available as a possible grid connection point for 2027 and also envisage NOR-7.2 as the connection to Büttel in their own plans.

With regard to the explanations of the necessity for NOR-7-2, reference is made to the explanations in 5.2, 5.3, 5.5 and 8.9 of the Site Development Plan and chapter 9 of the North Sea Environmental Report. The routing within coastal waters is not stipulated. In the North Sea, the Site Development Plan merely makes rules for the EEZ. Otherwise, the planning and licensing procedures for routes in coastal waters are in the jurisdiction of the respective coastal federal state.

While the Site Development Plan was being compiled, the renaming of the BFO-N 2016/2017 gate IV to gate N-V was reversed at the request of the TSO. The aim was to minimise inconsistencies between the various plans. However, due to the chronological order of the various plans, this currently leads to the border corridors in the second grid development plan draft to be differently designated as in the Site Development Plan, which the state of Schleswig-Holstein explicitly points out. It may be assumed

that this inconsistency may be eliminated with confirmation of the grid development plan.

The state of Lower Saxony expressly welcomes the best possible utilisation of the border corridors and points out that the route corridors in coastal waters are strictly delimited and that planning resistance should be anticipated when exploring new routes.

GDWS (Generaldirektion Wasserstraßen und Schifffahrt - Directorate General for Waterways and Shipping) has fundamental concerns about gate N-III. However, the use of this gate is absolutely necessary. On the one hand, this corridor was defined in a spatial planning procedure for interconnectors in the Jade estuary. On the other hand, it can be assumed that an increase in the offshore ceiling or the future development of offshore wind energy will make this gate necessary. The width in the EEZ is determined by the number of possible systems that can be implemented in coastal waters from this gate to land. Appropriate studies on this topic are ongoing.

In addition, it has been demanded that all gates are opened for all cables. However, this is not possible in the Site Development Plan, because the Site Development Plan may only define specifications for live cables.

In addition, the TSOs have asked to consider to what degree it would be possible to specify the NOR-6-3 system at 66 kV instead of 220 kV. Please refer to chapters 5.7 and 8.3.1 for this.

With regard to the possible site configuration of site N-3.7 and the possible connection of this site, as well as OWFs "Gode Wind III" and "Gode Wind 04" featured in the transitional system, various configurations and connection options were proposed during Site Development Plan compilation. No concerns were raised against the representations consulted on in the second draft.

With regard to possible interconnections, the question was raised as to what degree the interconnections proposed in the Site Development Plans, which lead to platforms of different types, are both technically feasible with regard to a connection system to be built before 2025. Please refer to chapters 5.11 and 8.4.3 with regard to interconnections.

A number of concerns were also presented with regard to cross-bordercable systems. One project in the North Sea request different routing for their project. Because GDWS does not object to relocation at the boundary or in the reserved shipping area, the submitted route was accepted with some adjustments.

In the Baltic Sea there are concerns, in particular with regard to the possible "Hansa Power Bridge" cross-border submarine cable system (interconnector), which runs from gate O-III to gate O-IX. On the one hand, a capacity increase for the planned system to 1,400 MW was demanded, and thus to install only one system instead of the planned two systems. However, the Site Development Plan does not stipulate any capacities for interconnectors. They result from the European energy industry demand; in the current TYNDP, two systems between Germany and Sweden continue to be cited.

Moreover, there are conflicting demands with regard to routing. The neighbouring wind farm operator argues that a subsequent reduction of distances could lead to risks in wind farm operation, which must be borne by the cable operator. On the other hand, BAIUDBw asks that the submarine diving area already overlapping with the wind farm not be restricted further and that the planned interconnectors be installed as close as possible to the wind farm.

Because the wind farm operator basically demands that the distances be reduced in the statement and only refuses in this individual case, the BAIUDBw request is granted. Please refer to the explanations in Chapters 5.10 and 7.1.4.

8.13 Pilot offshore wind turbines

Chapter 6 was previously included in the Site Development Plan pre-draft. Section 6.1 shows available grid connection capacities for the construction of pilot offshore wind turbines, depending on the grid connection system.

In addition, in their statement dated 19/12/2018, the TSOs also listed the actual available capacities on the AC connection systems in the North Sea. This information was appropriately taken into consideration in the second draft of the Site Development Plan. The pre-draft of the Site Development Plan stipulated in Chapter 6.2 that pilot offshore wind turbines should be integrated into an existing OWF project. On the basis of the statements submitted on the preliminary draft, this requirement was subsequently waived and, at the same time, it was aligned with necessary agreements or consent with or from affected third parties.

8.14 International statements

Poland was involved as agreed (agreement dated 10 October 2018 between the Government of FRG and the Government of the Republic of Poland on Environmental Impact Assessments and Environmental Impact - Assessments in a Transboundary Context and submitted several statements, claiming that the documents were insufficient for participation, because not all sections had been translated and the documents did not meet the requirements of Article 7(2) and Annex 4 of the Espoo Convention. In addition, the technical plan should be regarded as a spatial planning plan in the context of the EU Maritime Spatial Planning Directive and thus be consulted objectively as well as from an environmental perspective in the HELCOM Vasab working group. Moreover, the effects of the provisions on Poland are not sufficiently explained.

Pursuant to Section 60 (2), sentence 2 UVPG (Environmental Impacts Assessment Act) and the Espoo Convention, the responsible German agency shall transmit the content of the notice, the non-technical summary of the environmental report and the parts of the plan or draft programme, and the environmental report to the government agencies involved and enable the public of the other country to assess the probable, significantly adverse transboundary - environmental impacts of the project and to comment on them or express their concerns.

Moreover, this plan is not a spatial plan, but a technical plan for offshore wind turbines and power grids. This is not controlled by the EU directive for maritime spatial planning, because spatial planning already exists for German territorial sea and includes regulations for this field. Nevertheless, the spatial planning - agencies of neighbouring countries were also involved. Coherent planning with neighbouring countries was already aimed for in the Federal Requirements Plan (BFO - Bundesfachplan).

Following several inquiries from a number of neighbouring countries, BSH will prepare a complete English translation of the final version of the North Sea and Baltic Sea environmental reports following publication of the Site Development Plan and send them to the previously involved neighbouring countries, as well as publishing them on the BSH homepage.

With regard to the shipping routes, it was - suggested that coherent planning was required.

Shipping route rules are not the subject of the Site Development Plan. The Site Development Plan complies with or takes into account the provisions of spatial planning applicable in the EEZ on priority areas and reserved areas for shipping. In this regard, it is assumed that the plan will not affect shipping routes.

Inasmuch as dredging of shipping routes in Natura2000 zones have been addressed by Poland, this is the subject of the respective relevant spatial planning or individual licensing procedures.

The rules for the cable corridors in the EEZ do not lead to detrimental effects for shipping, because the cables are generally buried 1.5 m deep (see planning principle 4.4.4.7) and thus represent no restrictions for shipping. With regard to the installation procedure, please refer to principles 4.4.4.6 and 4.4.4.8. No rules are made regarding the cable routes in coastal waters, only the status is presented for information purposes. Corresponding requirements for depths are the subject of the respective licensing procedures. A risk assessment of the wind farm areas with regard to collisions, as well as possible interference with radar and AIS, is not possible at the technical planning level without a specific layout and without knowledge of the project-specific details of the facilities, and thus remains reserved for the individual procedures and the subsequent suitability testing of the areas.

Please refer to section 1.1 for details of the individual planning stages.

With regard to possible cable routes, Denmark requested that possible routes be provided for "Kontek 2" as well as for a connection from Lolland to Germany. Cable routes are envisaged for the connections (see sections 5.10.2 and 5.10.3).

The wish expressed by Sweden to not stipulate gates, because of insufficient knowledge on the Swedish side, cannot be accepted for the following reasons:

Along the entire length of the border between the Swedish and German EEZs, there are claims for use on the part of NATO, meaning that establishing or securing gates to minimise conflict is imperative (see sections 5.10.2 and 5.10.3). Projects are only named if they are already formally undergoing the licensing procedure or are already licensed. With regard to the planned "Hansa Power Bridge" connection, please refer to the information in section 5.10.2.

In addition, according to the legal requirements, the plan only covers rules for power cables and not for data cables or pipelines. Submitted projects are considered within the framework of the plan. With regard to the "Baltic Pipe" gas pipeline, the last decision in the relevant licensing procedure was that the route would not pass through the German EEZ, because the previously authorised land use and spatial planning, as well as EU law (Natura2000), made the route through the German EEZ considerably more difficult than through the Swedish EEZ. In that regard, the current planning for "Baltic Pipe" is taken into account in planning. Given that there are Natura2000 sites along the entire length of both sides of the EEZ-Polish border, and that the draft Polish spatial planning plan currently does not include cables to Germany, planning is therefore also considered coherent. Routing from Poland to the Danish mainland appears to be much more conflict-free outside of the German EEZ, especially because the direct route would also cross the Swinemünde-Ystad shipping lane, which is also considered critical by the Polish side. In this regard, conflict-free routing from Poland to Denmark through the German EEZ is already no longer possible today. Neither does this contradict UNCLOS requirements, because existing uses must be taken into consideration in the subsequent planning.

Reference is made to section 79, para. 1 and para. 5 UNCLOS.

The plan does not fundamentally exclude all future connections, but only points out currently obvious conflicts.

Regarding the question of Sweden's use of the areas after decommissioning, it should be noted that licenses for offshore wind farms in the German EEZ are generally granted for a limited period of time, meaning that it can be assumed that they will be dismantled. This is already the case in existing projects. The reuse of regions or sites would have to be decided in the context of an update to this plan (section 8, para. 3 Offshore Wind Energy Act).

The dismantling of facilities and the effects of this are the subject of ongoing research. See the planning principle 4.4.1.5.

With regard to the possible effects on fisheries addressed by Denmark, the rules for the plan do not go beyond the provisions laid down in spatial planning. Cables must be installed such that they do not interfere with fisheries. Germany has not defined fishing areas for certain fish species. The fisheries options within the wind farm areas must be clarified in the respective licensing procedure or in the context of the continuation of spatial - planning for the EEZ.

With regard to any disturbance to the migration of the endangered European eel due to power cables, as feared by Sweden, it is assumed that the installed submarine cables will not result in magnetic fields larger than the natural geomagnetic field. Direct electric fields are not significantly measurable either in the DC or in the three-phase submarine cable systems. The magnetic fields of the individual cable systems largely cancel each other out in the planned bipolar (outgoing and return) or three-conductor cable configurations. Any possible impairment of the orientation behaviour of adult specimens of species that use electric or magnetic fields for orientation (such as eels, sharks, salmon) is only short-term, at worst, as shown by experiments on the Baltic Sea eel (see section 4.4.3 Baltic Sea Environmental Report).

During the examination of the impact of the plan's rules in the environmental report, it was requested to include the adjacent Natura2000 sites and migratory species in the deliberations. This was done inasmuch as it can be assumed that it can potentially lead to disturbances in neighbouring countries. This is done in the context of the cumulative deliberations on potential significant environmental impacts (see sections 4.12 and 4.13 of the environmental reports) or as part of the impact assessment (see section 6 of the environmental reports).

The required detailed description of the current state of affairs is given in section 2 of both environmental reports, the equally required description of the likely significant impacts of the plan on the marine environment in section 4 of the environmental reports. With regard to the presentation of possible reduction or compensation measures also requested, see section 8 of the environmental reports, and section 1.6.2 of the environmental reports for a description of lacking information.

9 Summary environmental declaration and monitoring measures

9.1 Summary environmental declaration compliant with section 44 Environmental Impacts Assessment Act

According to sections 4ff. Offshore Wind Energy Act, BSH compiles a Site Development Plan as a technical plan for the use of offshore wind energy by defining regions and areas, as well as sites, routes and route corridors for grid connections and for interconnectors.The Site Development Plan is compiled for the first time and must be published by 30 June 2019 in accordance with section 6 (8) Offshore Wind Energy Act. Compliant with the Environmental Impact Assessment Act (UVPG), a strategic environmental assessment (SEA)[31] was accompanied or integrated in the preparation of the Site Development Plan.

The implementation of a Strategic Environmental Assessment with the preparation of an environmental report results from section 35 subsection 1 no. 1 of the Environmental Impact Assessment Act in conjunction with no. 1.17 of Annex 5, since Site Development Plans are subject to the SEA obligation according to section 5 Offshore Wind Energy Act.

According to Art. 1 of the SEA Directive 2001/42/EC, the objective of strategic environmental assessment is to ensure a high level of environmental protection in order to promote sustainable development, and thereby to contribute to ensuring that environmental considerations are taken into account in an appropriate manner well in advance of concrete project planning, when the plans are compiled and adopted. The purpose of the strategic environmental assessment is to identify, describe and evaluate the probable significant environmental impacts with the plan's implementation. It will provide effective environmental protection in accordance with applicable law and will be implemented in accordance with consistent principles and public participation.

The extent and level of detail of the two environmental reports for the German North Sea and the Baltic Sea (scope) were discussed with representatives of government agencies, associations and private parties on 27 June 2018 during a scoping meeting. The investigation - framework was defined on 25 October 2018. Based on the consultation, a separate environmental report has been drawn up for each of the two sea areas compliant with section 40 Environmental Impact Assessment Act and the criteria of Annex I of the SEA Directive. The investigation areas have been differentiated as far as possible into other sub-areas according to the natural and geological conditions.

In particular, the environmental reports focus on describing and assessing the likely significant impact of the implementation of the Site Development Plans on the marine environment in accordance with the principles of environmental impact assessments, whereby this is based on the description and assessment of the state of the marine environment. According to section 39 (2), sentence 2 Environmental Impact Assessment Act, the environmental report contains the information that can be determined with reasonable effort, taking into consideration the current state of knowledge and generally recognised investigation methods.

[31] In the officially published version dated 24.02.2010, Federal Law Gazette I S. 94, last amended by article 2 of the law of 30 November 2016, Federal Law Journal. I p. 2749.

Simultaneously, both environmental reports outline the measures that are designed to prevent, reduce and, as far as possible, offset significant negative impacts caused by implementation of the Site Development Plan on the marine environment. In addition to providing a summary of the reasons for the choice of seriously considered alternatives, the planned measures to monitor the likely significant impact of implementation of the Site Development Plan on the environment will be identified and the results of the species conservation assessment and the conservation area compatibility assessments will be presented.

By ordinances of 22 September 2017, the existing bird reserve and FFH areas declared as conservation areas and partially regrouped in this context. For example, the North Sea EEZ now contains the conservation areas "Fehmarn Belt", "Kadetrinne" and "Pomeranian Bight – Rönnebank", while the Baltic Sea EEZ now includes the conservation areas "Sylt Outer Reef – Eastern German Bight", "Borkum Reef Ground" and "Dogger Bank".

On the basis of an administrative agreement with the state of Mecklenburg-Vorpommern, M-V areas and a testing ground are defined in coastal waters. Ruleswithin coastal waters are assessed in terms of cumulative impacts in the SEA framework of the Site Development Plan. Otherwise, for coastal waters, reference is made to the assessment of the environmental effects and descriptions in the environmental report as part of the preparation of the Mecklenburg-Western Pomerania regional development programme for 2016.

The Site Development Plan 2019 is the result of this preceding, comprehensive strategic environmental assessment. Environmental interests and the knowledge gained compiling the environmental reports were included in deliberations of the plan's rules For example, the results of the strategic environmental assessment regarding the importance of individual spatial subregions for protected biological assets were adopted as the basis for decision-making when defining areas and sites, platform locations and submarine cable system routes. Simultaneously, the Site Development Plan rules were continuously investigated in terms of their environmental impacts and adapted while compiling the plan.

The anticipated significant negative impacts of the offshore WT areas and sites, and the platforms and submarine cable systems discussed in the environmental reports, led to general and source-related provisions in the Site Development Plan aimed at preventing and mitigating these impacts. These provisions aimed at preventing and reducing significant negative impacts, in addition to taking into account the importance of individual sub-areas for protected biological assets, also ensure that the Site Development Plan implementation does not cause any significant adverse effects, but rather – compared to the described development of the marine environment when the plan is not implemented – adverse effects are avoided or reduced. Among other things, this applies to planning principles for noise and emission - reductions and to avoiding the use of conservation areas and known occurrences of legally protected biotopes compliant with section 30 Federal Nature Conservation Act.

In the Site Development Plan, only those regions are defined which, according to the assessment of the implications in the environmental report and based on current knowledge, have no significant impact on the conservation areas in their constituent parts for the purposes of conservation and the conservation objective within the meaning of section 34 (2) Federal Nature Conservation Act and which do not allow the fulfilment of prohibitions under endangered species protection law according to section 44 Federal Nature Conservation Act. Inasmuch as the anticipated significant environmental impacts

cannot be determined and assessed with the necessary certainty on the basis of the available data and information at the level of these technical plans, a more detailed examination of the interests of the area and endangered species protection is reserved for the preliminary investigation of the designated areas or the individual licensing procedure once the project-specific framework is known.

The present environmental reports for the North Sea and Baltic Sea, as well as the results of the national and international consultations, were taken into account in the preparation of the Site Development Plan 2019 in accordance with section 43 Environmental Impact Assessment Act (see in detail the summary consideration in section 8).

National and international consultations were held on the draft Site Development Plan and the draft environmental reports in the context of the participation procedure. The hearing was held on 31/01/2019.

The consultation primarily focussed on:

- the cumulative evaluation of bird migration for the Baltic Sea Environmental Report.
- new insights regarding the avoidance behaviour of the divers for the North Sea Environmental Report.

North Sea Environmental Report

The current results from the operational monitoring of OWFs, as well as from research projects, which in part employ investigation methods independent of the standardised monitoring according to the standard investigation concept (StUK) (e.g. telemetry study within the framework of the DIVER project), consistently show that the OWF avoidance behaviour of the divers is much more pronounced compared to what was anticipated in the original wind farm project licensing decisions (see North Sea Environmental Report, section 4.6.). The cumulative consideration of the avoidance behaviour of divers to OWFs revealed a mathematical total habitat loss of 5.5 km and a statistically significant decrease in abundance up to a distance of 10 km from the periphery of a wind farm (Garthe, et al., 2018). For the quantification of habitat loss during early decision-making on individual licensing procedures, a 2 km avoidance response distance (defined as a complete avoidance of the wind farm site including a 2 km buffer zone) was adopted for divers. The assumption of a habitat loss of 2 km was based on monitoring data from the Danish wind farm "Horns Rev" (Petersen, Christensen, Kahlert, Desholm, & Fox, 2006). The recent Garthe et al. (2018) reveals more than a doubling of the avoidance response distance to an average of 5.5 km (Garthe, et al., 2018). The mathematical total habitat loss is subject to the purely statistical assumption that no divers are found up to 5.5 km from an OWF.

The main area of concentration represents a particularly important part of the marine environment with regard to marine and resting birds, especially with regard to the species group divers. Delineation of the main concentration area of the divers in springtime in the German North Sea comprises all areas of extremely high and most of the areas with high diver density (BMU 2009). Based on a total mathematical habitat loss of 5.5 km, it follows that 19% of the 7,332 km^2 main concentration area are no longer available for divers due to the avoidance behaviour in relation to existing wind farm projects and those considered in the position paper. Based on the 2 km avoidance response distance assumption made in the position paper (BMU 2009), 9% loss of area in the main concentration area was anticipated. This means that the loss of area in this important diver habitat is already greater than was originally assumed. Taking the new findings into consideration, additional cumulative effects on the diver population due to the implementation of further wind farm projects in the main concentration area must be expected. In addition to the

question of permissibility under endangered species protection law, the cumulative effects that have already occurred put the marine environment at risk in accordance with section 5, para. 3, sentence 2, no. 2 Offshore Wind Energy Act. For this reason, a designation of site N-5.4 is not permitted. Areas N-5 and N-4 were examined for possible afteruse (see sections 7.4 and 7.5 of the Site Development Plan).

Baltic Sea Environmental Report

On the one hand, a risk potential for migratory birds arises from the risk of collision with the platforms and the individual offshore wind turbines, and on the other hand from adverse effects on the energy budget of the animals due to forced changes of the flight route.

Rapidly developing fog and rain, which lead to low visibility and low flight levels, represent a potential hazard situation for collisions with offshore structures. Particularly problematic is the simultaneous occurrence of poor weather conditions with mass migration events. However, taking into consideration the short migration routes across the open sea in the Baltic Sea EEZ and correspondingly shorter migration times, the probability of the simultaneous occurrence of poor weather - conditions with mass migration events is low. However, cumulative effects in some areas may lead to an increased collision risk.

This applies to the O-2.2 site, in particular, and particularly affects crane migration. In the spring the cranes, migrating towards Bornholm island, must first cross the licensed ARCADIS Ost I wind farm in coastal waters, only to then encounter the planned wind farm on the O-1.3 site. In the autumn the same applies – only in the reverse order direction Although a large proportion of cranes migrate across the Baltic Sea in the altitude range between 100 and 400 m, a significant risk of collision cannot be derived per se, because it is common knowledge that the cranes avoid the obstacles vertically or horizontally.

In order to verify the level of knowledge, a preliminary investigation of the O-1.3 site was commissioned over and above StUK 4 (Federal Maritime and Hydrographic Agency, 2013) to additionally monitor migratory land birds, with the focus on cranes, birds of prey and geese, using Rangefinder. For this reason, and due to the high rate of crane sightings in the area of the neighbouring western area O-4 (up to 20% of the biogeographical population), site O-2.2 has been deferred while awaiting the above investigation results.

The potential impairment to bird migration in the sense of a barrier effect is dependent on numerous factors and the orientation of the wind farm to the main migratory routes, in particular, must be taken into consideration. The orientation and size of the wind farms to be cumulatively considered provide information about the extent of the potential barrier effect or the additional distance of the migration routes. Adopting the offshore wind energy areas defined in the EEZ and in coastal waters, the east-west and north-south aligned migration routes and migration routes extensions are approximately 73 km and 50 km. Taking into account that the non-stop flight performance of the majority of migratory - bird species, including small bird species, is in excess of 1000 km (Berthold, 2000), no significant impact on the energy budget of migratory birds is anticipated.

An examination of the available knowledge on the migratory behaviour of the various bird species, the common flight altitudes and the daily distribution of bird migration suggests that significant effects on bird migration as a result of the implementation of the previously approved projects in the priority areas of the Baltic Sea EEZ's spatial plan are currently unlikely in line with current knowledge, even if the cumulative effects are considered. There are gaps in knowledge in terms of species-specific migratory

behaviour, in particular. This especially applies to poor weather conditions (rain, fog). Due to the gaps in knowledge discussed above, a concluding cumulative examination of all necessary OWFs, including those in areas where there are no final licenses or planning - approval decisions as a result of the - implementation of an EIA, is not possible for the Baltic Sea at the current time. Against the backdrop of an observed increased incidence of narrow-fronted migratory birds, e.g. cranes, significant cumulative effects as a result of drifting due to unfavourable changing winds cannot be ruled out around the O-2 area at the present time.

In summary, according to the current state of knowledge and at the more abstract level of technical planning, it can be said that the implementation of the Site Development Plan specifications, cannot be expected to have a significant impact on the marine environment, in particular because of the general and source-related provisions for the avoidance and reduction of effects. The potential effects are small-scale and mostly short-term, as they are limited to the construction phase. To date, however, there is a lack of sufficient scientific evidence to assess the impact on individual protected assets, in particular protected biotopes, and a cumulative examination of bird migration in the Baltic Sea. In this regard, detailed information from the preliminary site investigation and individual licensing procedures must be awaited before a concluding evaluation is carried out. These effects therefore cannot be conclusively evaluated in the available environmental reports or are subject to uncertainties and require closer examination in the context of the downstream preliminary site investigation or the individual licensing procedure.

An impact assessment of the Site Development Plan with regard to areas, sites, platforms and submarine cable systems has revealed that significant impairment to the protection function in the "Borkum Reef Ground", "Sylt Outer Reef – Eastern German Bight" and "Dogger Bank" conservation areas, taking into account avoidance and reduction measures, can be ruled out with the required certainty. Even in the adjacent conservation areas of neighbouring - countries and in coastal waters, no significant effects on the respective conservation areas and their constituents relevant to the purpose of protection or the conservation objectives are discernible within the meaning of section 34 (2) Federal Nature Conservation Act. An in-depth examination of possible routes outside the German EEZ is not carried out, only the long-term effects of the regulations are considered.

It should be noted that, in the absence of comprehensive biotope mapping, a considerable impairment in relation to FFH habitat types cannot currently be determined with reasonable effort and therefore also cannot be ruled out with the required degree of certainty.

Examination of the cumulative effects resulting from the construction and operation of OWFs on protected species, in particular harbour porpoises and divers, has shown that measures at Site Development Plan level, as well as under subsequent licensing and enforcement procedures, are required to prevent significant harm to the conservation objectives of the conservation areas with certainty.

Noise abatement measures have been implemented out and monitored during pile driving since 2011 in order to protect the harbour porpoises. The development of technical noise abatement systems has progressed so far since 2014 that the binding limit values for driving noise are continuously complied with. In line with the current state of knowledge, a significant impairment of the conservation objectives in the conservation areas with regard to protected species of marine mammals can therefore be ruled out by implementing the rules presented in the Site Development Plan.

The Site Development Plan defines a number of different measures to protect the diver. In addition to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety's (BMU) preventive measure (2009) of limiting offshore wind energy within the divers' main concentration area, the Site Development Plan provides for an avoidance measure by excluding area N-5.4 designated in the (preliminary) drafts of the Site Development Plan. The exclusion of the "Butendiek" offshore wind farm for eventual reuse also constitutes a significant mitigation measure, which is a direct consequence of Objective 3.5.1. (3) is the EEZ North Sea ROV. According to this, the implementation of OWFs in Natura 2000 sites is inadmissible, with the exception of the cases mentioned in the objective. Ultimately, the requirement to examine any reuse of areas N-4 and N-5 represents an additional monitoring - measure.

Taking into account the measures adopted in the Site Development Plan, which ensure the protection of the divers within and outside the "Sylt Outer Reef – Eastern German Bight" conservation area, a significant impairment of the conservation objectives can be ruled out with the necessary certainty.

Overall, it can be concluded that the coordinating and concentrating effects of the Site Development Plan provisions, taking into account the current level of compliance with effective prevention and mitigation measures, are not expected to have a significant impact on the protected assets discussed here. In fact, compared to the failure to implement the plan, adverse effects on the marine environment are either avoided or reduced.

9.2 Monitoring measures compliant with section 45 Environmental Impact Assessment Act

The potential significant effects on the environment resulting from the implementation of the plan are to be monitored in accordance with section 45 UVPG. The aim is to identify unforeseen adverse effects at an early stage and take appropriate remedial action.

Accordingly, compliant with section 40 (2), no. 9 Environmental Impact Assessment Act, the environmental report is to specify the measures envisaged for monitoring the significant environmental effects of implementation of the plan. BSH is responsible for monitoring, because this is the agency responsible for the strategic environmental assessment (see section 45 (2) Environmental Impact Assessment Act). As intended by Article 10 (2) of the SEA Directive and section 45 (5) Environmental Impact Assessment Act, existing monitoring mechanisms can be used to avoid duplication of monitoring. The results of the monitoring must be taken into account when updating the Site Development Plan pursuant to section 45 (4) Environmental Impact Assessment Act.

With regard to the planned monitoringactivities, it should be noted that the actual monitoring of the potential effects on the marine environment can only begin when the Site Development Plan is implemented, i.e. when the decisions made within the framework of the plan are implemented. Nevertheless, the natural development of the marine environment, including climate change, should not be disregarded when assessing the results of monitoring activities. However, general research cannot be carried out within the framework of monitoring. Therefore, project-related monitoring of the effects of the uses regulated in the plan is of particular importance.

The main function of plan monitoring is to bring together and evaluate the results of different phases of monitoring at the level of individual projects or clusters of projects developed in a spatial and temporal context. The assessment will also cover the unforeseen significant effects of the implementation of the plan, the marine environment and the review of the forecasts in the environmental report. In this context, in accordance with section 45 (3) Environmental Impact Assessment Act, the Federal Maritime and Hydrographic Agency will ask the competent authorities for the monitoring results available there; these are required for implementation of the monitoring activities.

Results from existing national and international monitoring programmes must also be taken into account, also with a view to preventing multiple examinations. The monitoring of the conservation status of certain species and habitats required under Art. 11 of the Habitats Directive must also be included, as must the investigations to be carried out in the context of the management plans for the nature conservation areas "Sylt Outer Reef – Eastern German Bight" and "Borkum Reef Ground". It will also provide links with the measures provided in the Marine Strategy Framework Directive and the Water Framework Directive.

In summary, the planned measures for monitoring the potential effects of the plan can be summarised as follows:

- Consolidation of data and information for the description and evaluation of the status of areas, factors and possible effects from the development of individual projects,
- Development of suitable procedures and criteria for evaluation of the results from effect monitoring of individual projects,
- Development of procedures and criteria for evaluation of cumulative effects,
- Development of procedures and criteria for forecasting possible effects of the plan in a spatial and temporal context,

- Development of procedures and criteria for evaluating the plan and adapting or, where appropriate, optimising it as part of the update,
- Evaluation of measures to prevent and mitigate significant effects on the marine environment,
- Development of norms and standards.

The following data and information are required in order to assess the possible effects of the plan:

1. data and information available to BSH within the scope of its responsibilities, in particular data from previous environmental compatibility studies and monitoring of offshore projects available to BSH for examination purposes (according to SeeAnlV - Offshore Installations Regulations);
2. data and information from the fields of responsibility of other federal and state agencies (on request), among other things, data from monitoring of Natura 2000 sites;
    - data and information from federal and state research projects, among others HELBIRD/DIVER and Sediment AWZ;
3. data and information from evaluations produced by international bodies and conventions, such as OSPAR, HELCOM, ASCOBANS or BirdLife International.

For reasons of practicability and appropriate implementation of requirements from the strategic environmental assessment, the Federal Maritime and Hydrographic Agency will pursue an approach focusing on the interdisciplinary compilation of information on the marine environment that is as ecosystem-oriented as possible when monitoring the possible effects of the plan. To be able to assess the causes of planned changes in parts or individual elements of an ecosystem, the anthropogenic variables from spatial observation (e.g. technical information on shipping traffic from AIS data resources) must also be considered and included in the assessment.

When combining and evaluating the results from monitoring at project level and from other national and international monitoring programmes, and from the accompanying research, it will be necessary to review the gaps in knowledge and uncertain forecasts presented in the environmental report. This applies in particular to forecasts concerning assessment of significant effects on the marine environment from the uses regulated in the Site Development Plan. The cumulative effects of defined uses are to be assessed regionally and supraregionally.

9.2.1 Monitoring of the potential effects of the areas and sites for offshore wind turbines and the platforms.

Investigation of the potential environmental - impacts of offshore wind energy production areas and sites shall be carried out at the down-stream project level in accordance with the "Investigating the Impacts of Offshore Wind - Turbines (StUK4)" standard and in consultation with the BSH. An investigation of the site in terms of the protected biological assets must be based on the investigation results of the respective future OWF projects. Monitoring of the construction of the driven foundations comprises measurements of submarine noise and acoustic assessments of the impacts of driving noise on marine mammals using POD measuring devices. Moreover, additional monitoring measures are planned in order to detect the effects of stratification under certain hydrographic conditions on the propagation of ramming noise in the Baltic Sea and, if necessary, to take further measures. These measures may include, among other things, additional sound measurements coupled with CTD measurements at different water depths to detect possible changes in sound propagation attenuation due to stratification of the water body.

Investigations are required for all factors in accordance with the requirements of StUK4 for the entire duration of the construction phase and for a period of between three and five years. A continuation of in-service monitoring over and above the period specified in StUK 4 may be necessary in terms of project-specific or area-specific circumstances to an appropriate extent and depending on objectives. BSH, as the enforcement and monitoring agency, expressly reserves the right to decide on the necessity and scope of continued operational monitoring.

The Federal Maritime and Hydrographic Agency implements many projects as part of its accompanying research into the possible impacts of offshore wind turbines on the marine environment.

The Federal Maritime and Hydrographic Agency's research projects directly related to the possible effects on factors and the development of norms and standards include the following:

- Project ANKER "Approaches to cost - reduction in the surveying of monitoring data for offshore wind farms", FKZ 0325921, with funding from the Federal Ministry for Economic Affairs and Energy/PtJ,
- F&E-Study BeMo "Bewertungsansätzen für Unterwasserschallmonitoring im Zusammenhang mit Offshore-Genehmigungsverfahren, Raumordnung und MSRL", BMVI/BSH funding,
- R&D project "Sound mapping", with funding from the Federal Ministry of Transport and Digital Infrastructure/Federal Maritime and Hydrographic Agency,
- F&E Cooperative project NavES "Naturverträgliche Entwicklungen auf See" with funding from the BMU's Departmental Research Plan; NavES includes several subprojects, among them MultiBird (study of migratory bird collision risk), ProBird (prognosis of migratory bird movements), ERa (driving noise experience report), Sound I and II (development of a thematic information system for submarine sound), Sound I and II (evaluation of underwater - sound measurements).

The measures implemented to date include development of measurement regulations for measuring underwater noise (2011), development of measurement regulations for determining the effectiveness of noise mitigation systems (2013), and cooperation on the development of ISO 18406:17 and DIN SPEC 45653.

The results from ongoing Federal Maritime and Hydrographic Agency projects will be directly incorporated into the further development of standards, such as the development of StUK5.

9.2.2 Monitoring of the potential effects of submarine cables

For submarine cable systems, the potential impact on the marine environment can also only be assessed in a specific project. For the first time, StUK4 also contains minimum requirements for the investigation of submarine cable routes with regard to benthos, biotope structure and biotope types during the baseline survey and the operating phase of the submarine cable systems. For example, during the baseline survey, each biotope structure determined from sediment surveys along the cable route must have at least three transverse transects for benthic studies. An additional transverse

transect must be located at the beginning and at the end of the route. Each transverse transect, in turn, consists of five stations. Identified areas suspected to be biotope types protected in accordance with section 30 Federal Nature Conservation Act must also be examined in - accordance with the current BfN mapping instructions to allow spatial demarcation.

After the cable system has been laid, its position must be indicated annually to the licensing authority during the first five years of operation, in accordance with current licensing practice, by implementing at least one survey of the depth of the system. The number of surveys in subsequent years is determined by the licensing authority on a case-by-case basis. Marine environment investigations are carried out in coordination with the licensing authority on a project-specific basis. The investigation methods are to be presented, as far as possible, as described in the "Standard – Investigation of the impacts of offshore wind turbines on the marine environment (StUK4)". Investigations of the benthic communities on the same transects as in the baseline survey are to be carried out one year after commissioning of the submarine cable systems in order to examine possible effects from the construction and operation phases.

In addition, measures are planned to monitor the implementation of the plan, which will help to verify established forecasts regarding the significant impacts of offshore wind energy and, where appropriate, to review utilisation - strategies, avoidance and mitigation measures and review evaluation criteria, in particular with regard to cumulative impacts

The plan's strategic environmental assessment will use new findings from environmental impact assessments, as well as from the joint analysis of research and environmental compatibility study data. In addition, thanks to the joint analysis of the research and environmental compatibility study data, products will be produced that allow an improved overview of the distribution of protected biological assets in the EEZ. Consolidation of information is leading to an increasingly solid basis for impact forecasting.

In general, the intention is to ensure that data from research, projects and monitoring is consistent and make this available for competent evaluation. In particular, attempts should be made to create common overview products in order to review the effects of the plan. The existing geodata infrastructure at the Federal Maritime and Hydrographic Agency, which includes data from physics, chemistry, geology, biology and uses of the sea, will be used as a basis for consolidating and evaluating ecologically relevant data and will be further developed accordingly.

With regard to the consolidation and archiving of ecologically relevant data from project-related monitoring activities and accompanying research, it is specifically provided that data collected within the scope of accompanying ecological research will also be consolidated at the Federal Maritime and Hydrographic Agency and archived on a long-term basis. The Federal Maritime and Hydrographic Agency is already collecting and archiving the data on biological factors from the baseline surveys of offshore wind energy projects and the monitoring of construction and operating phases in the MARLIN (MarineLife Investigator), a specialist information network for environmental - assessments.

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11 Annex: maps (information purposes)

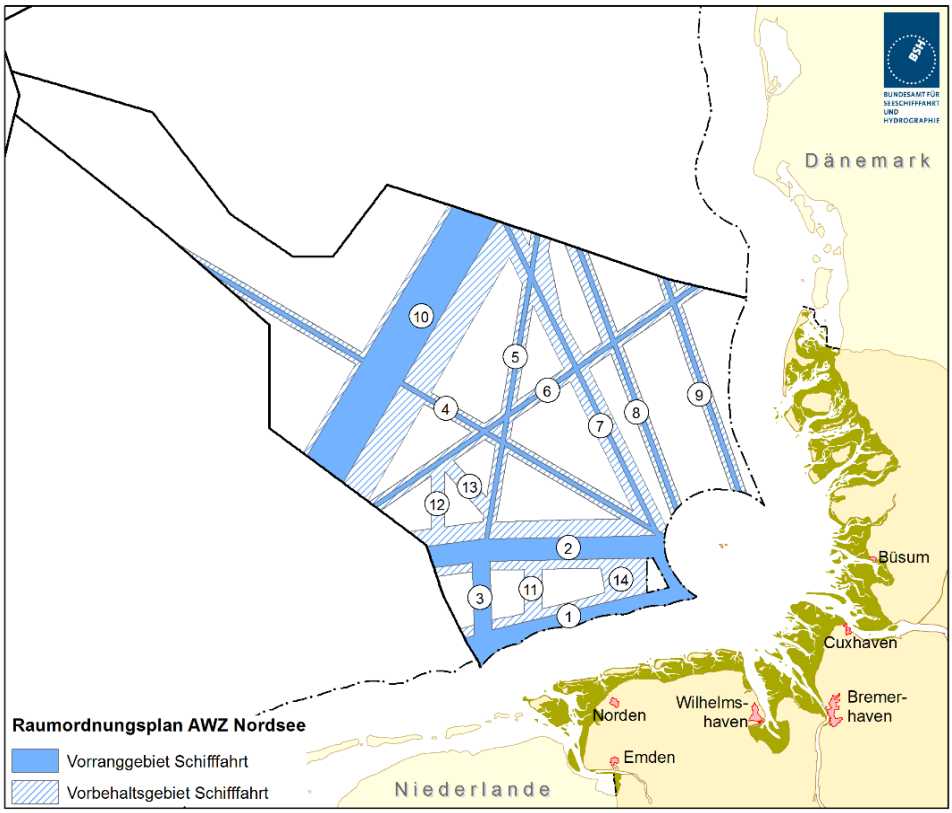

Figure 26: Shipping routes in the North Sea EEZ Spatial Plan

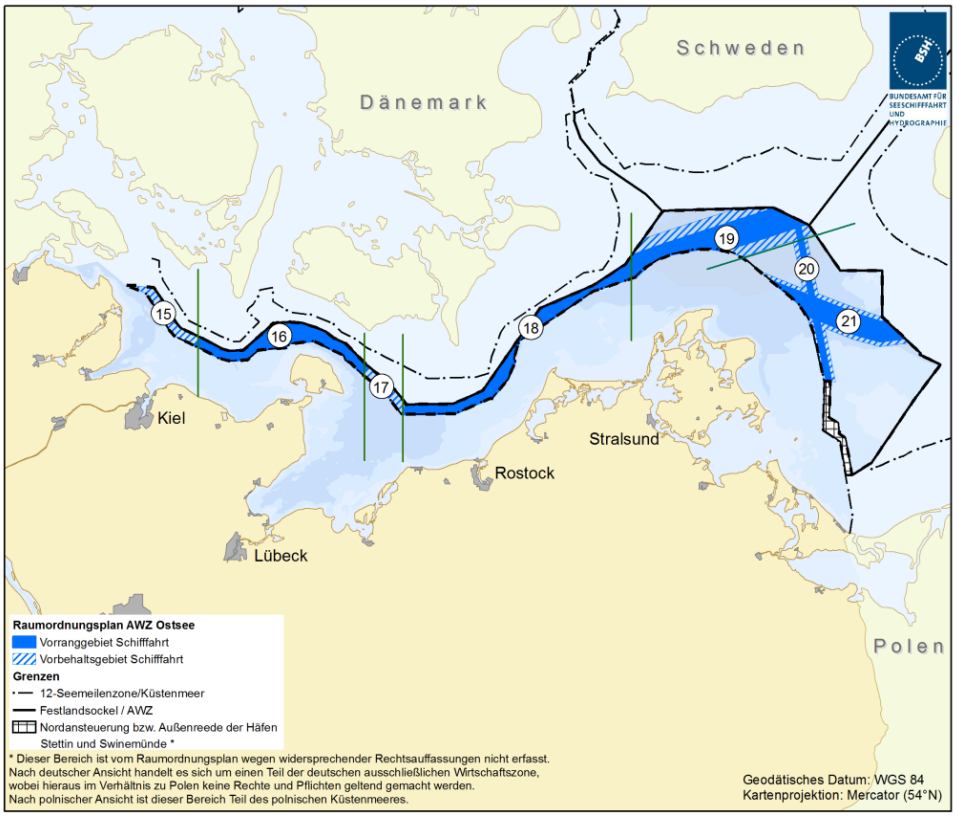

Figure 27: Shipping routes in the Baltic Sea EEZ Spatial Plan

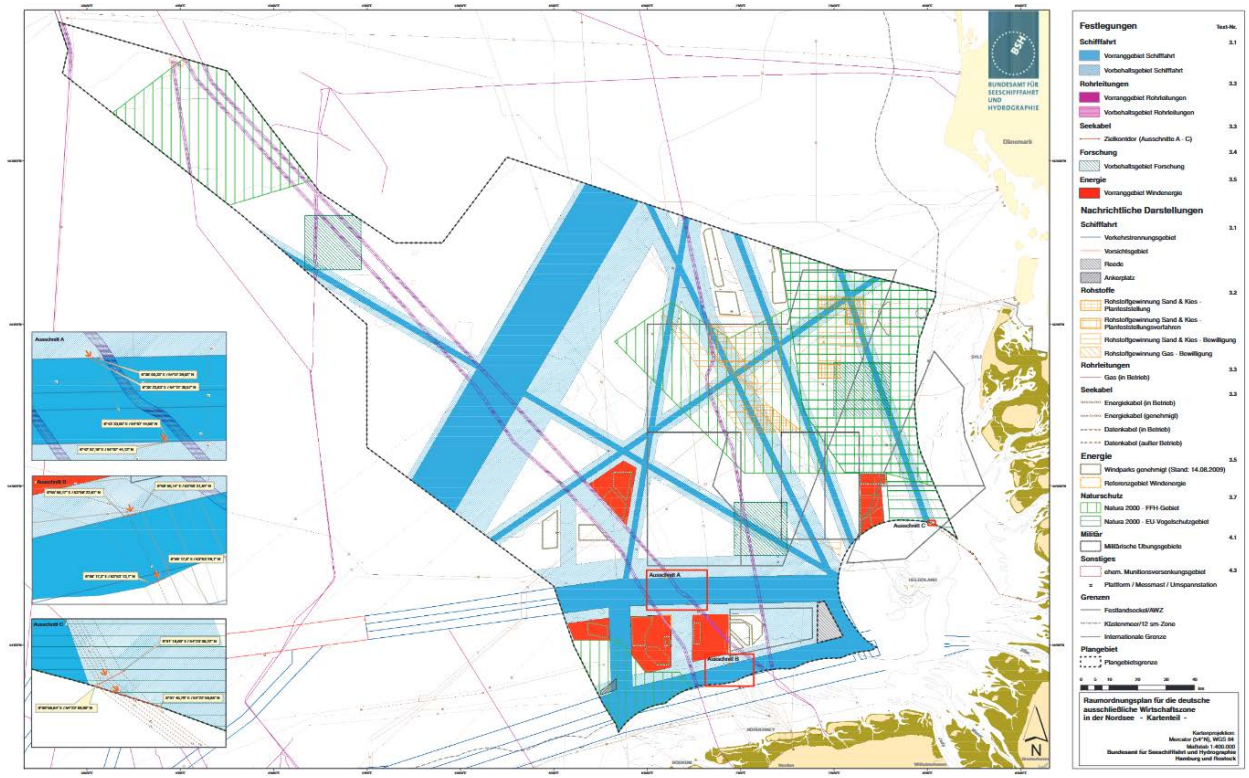

Figure 28: North Sea EEZ spatial plan

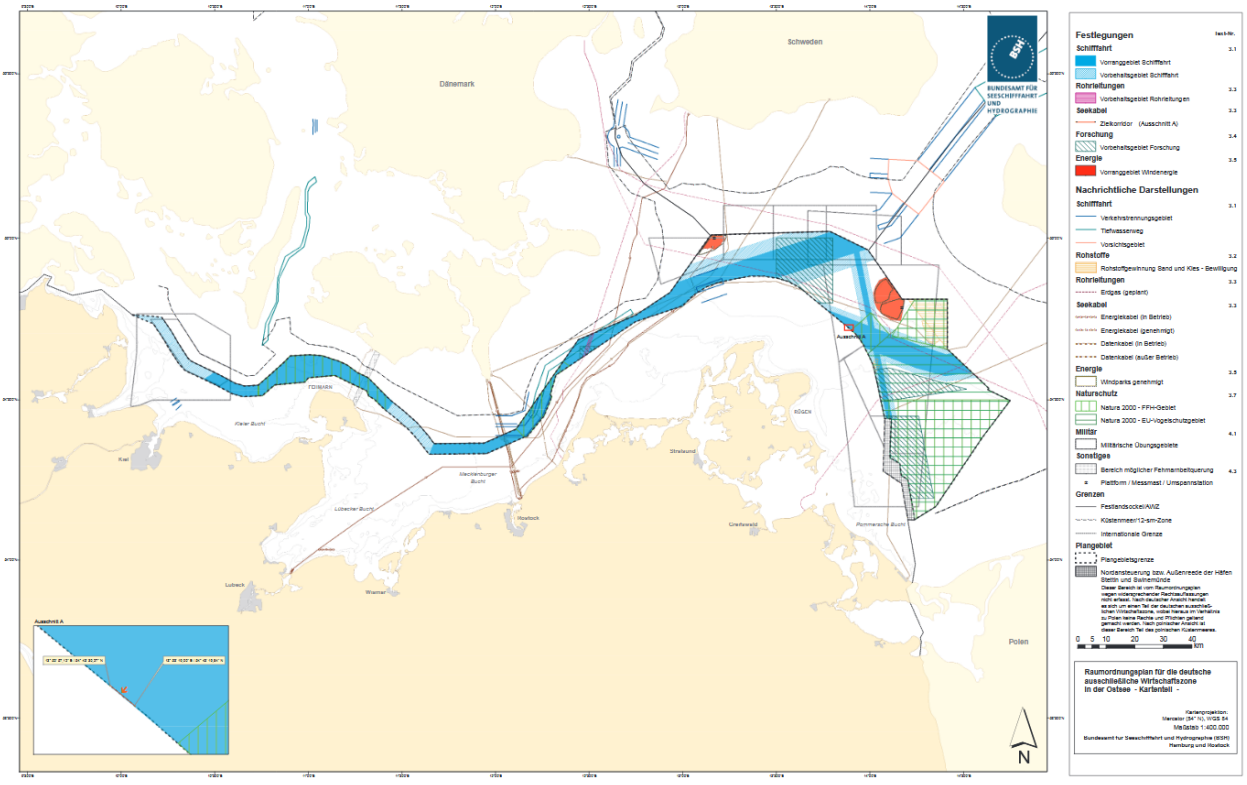

Figure 29: Baltic Sea EEZ spatial plan

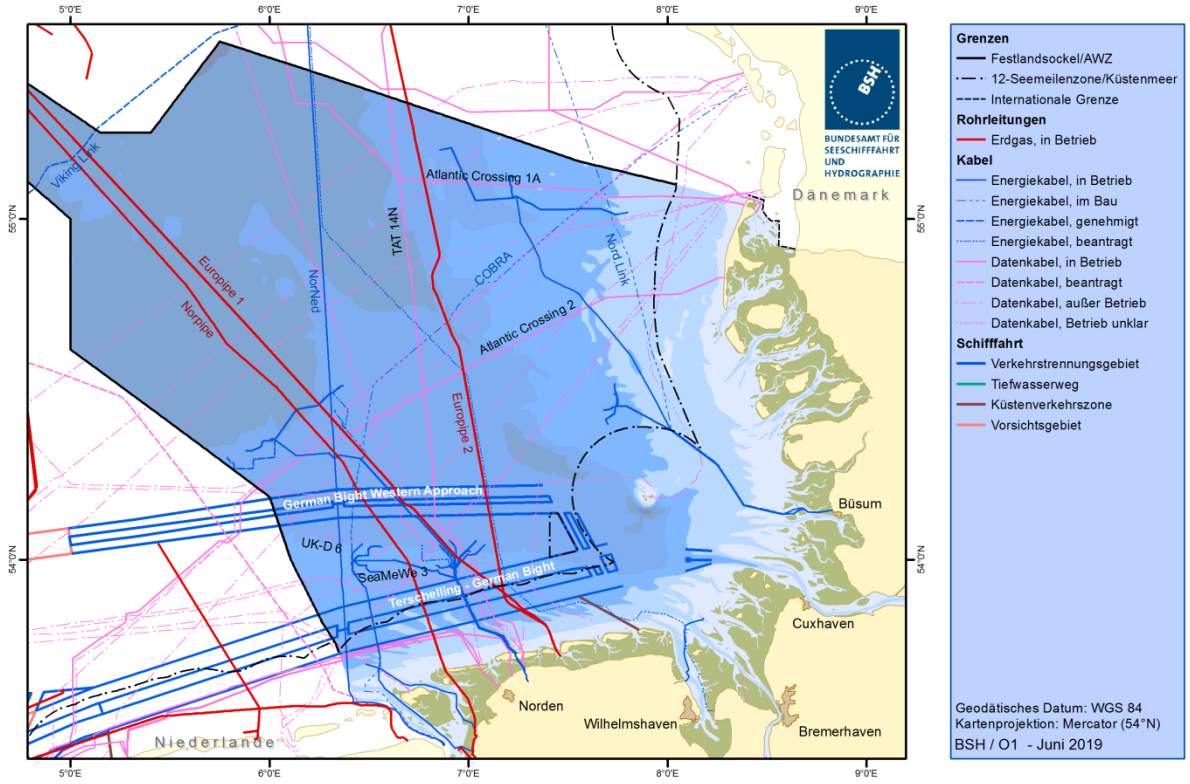

Figure 30: Designations: submarine cables, pipelines, traffic separation areas (North Sea)

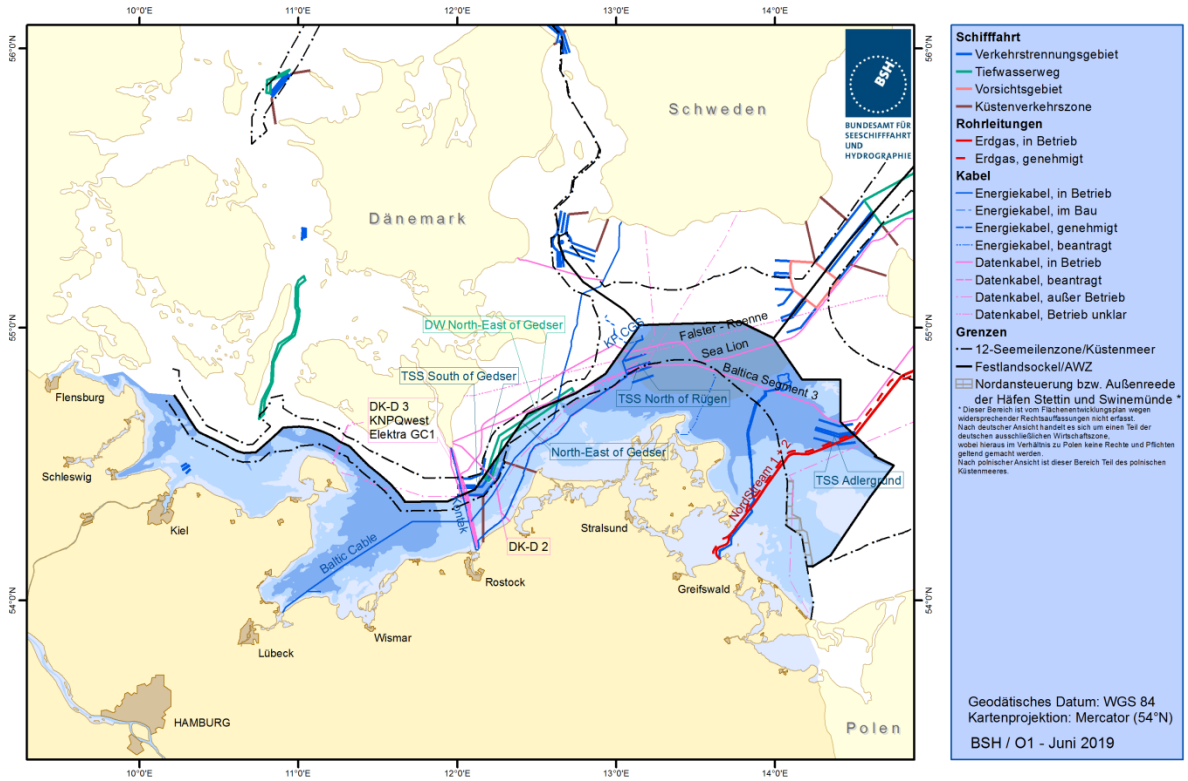

Figure 31: Designations: submarine cables, pipelines, traffic separation areas (Baltic Sea)

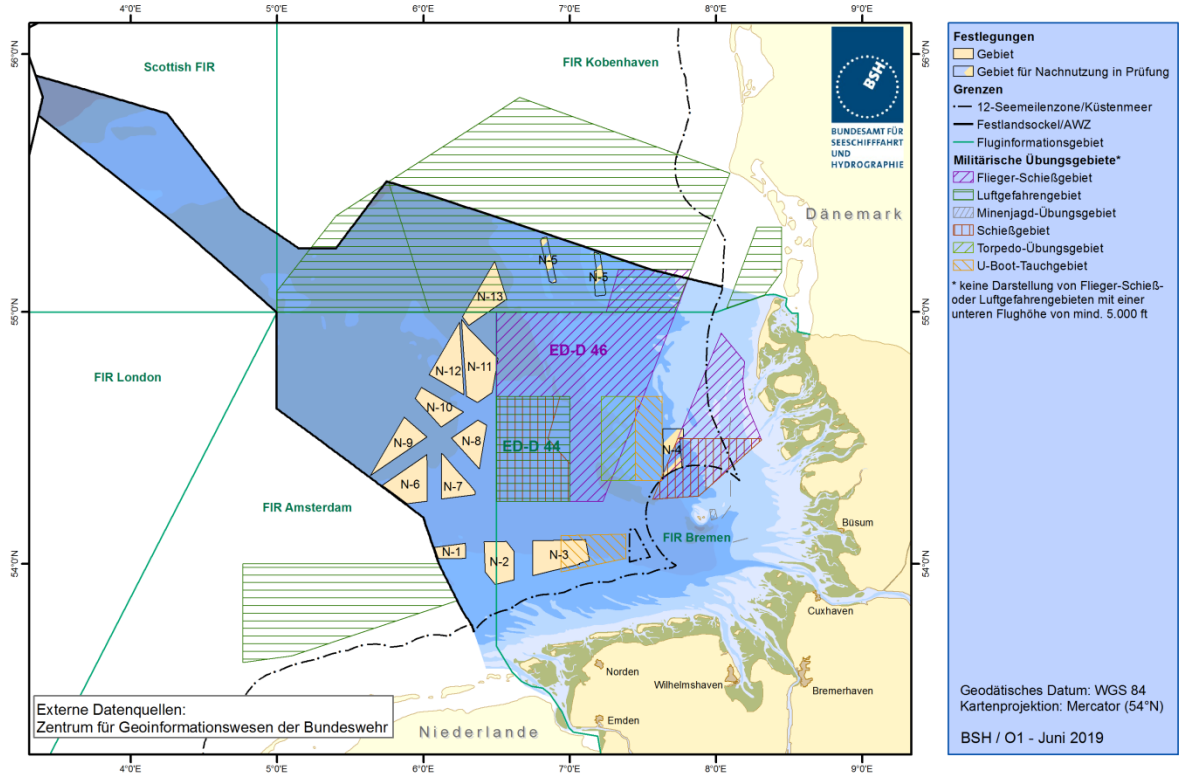

Figure 32: National defence territories (North Sea)

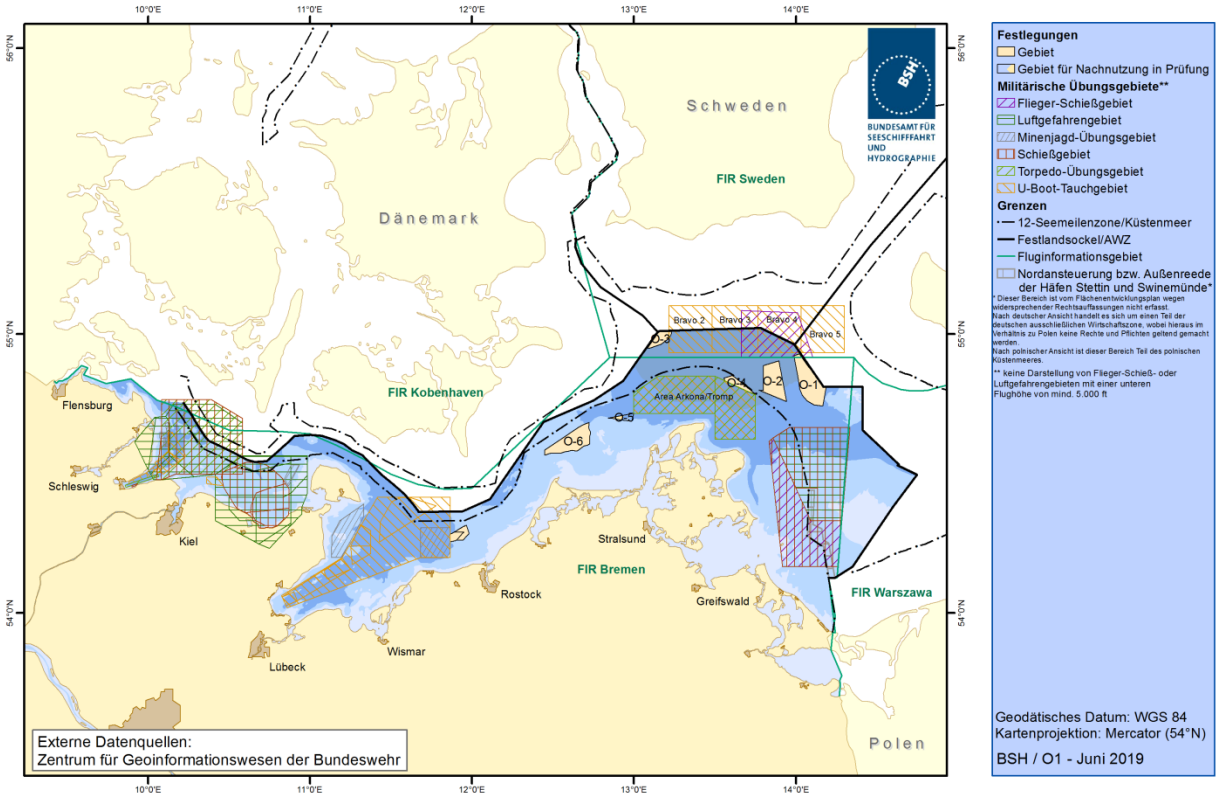

Figure 33: National defence territories (Baltic Sea)

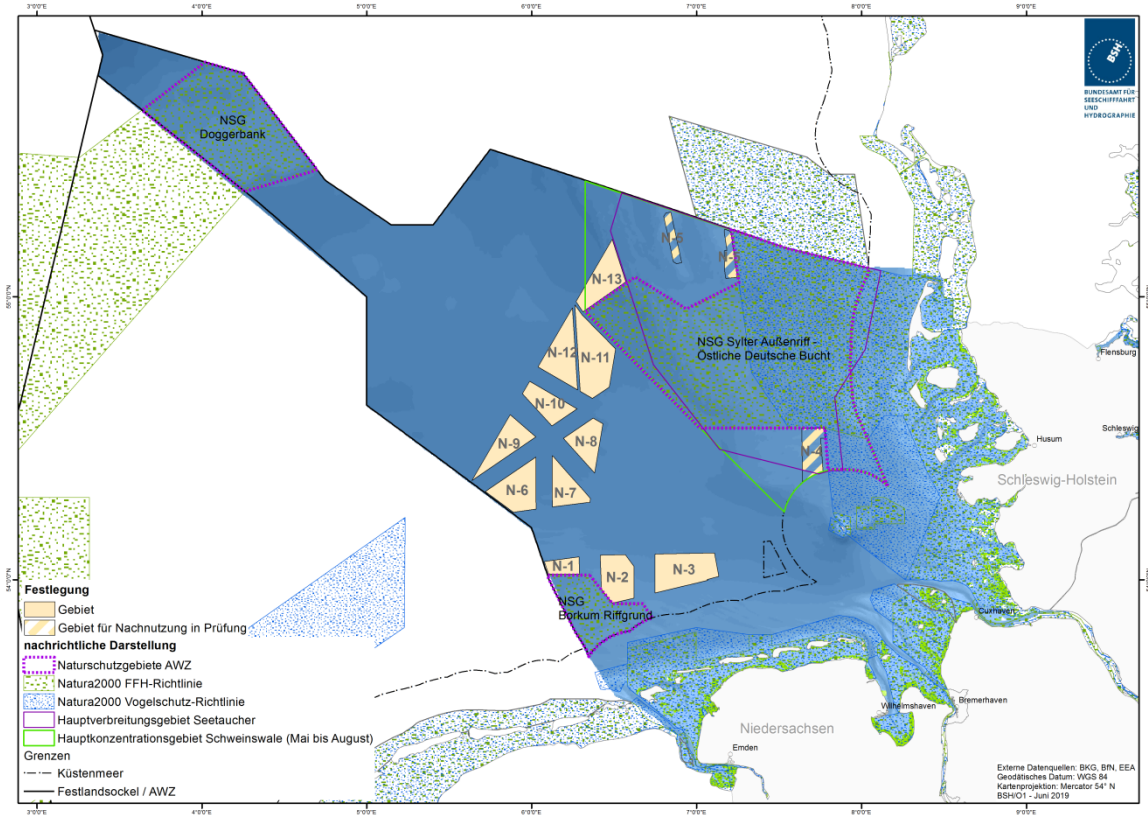

Figure 34: Areas for the construction and operation of offshore wind turbines in the German North Sea EEZ and nature conservation areas.

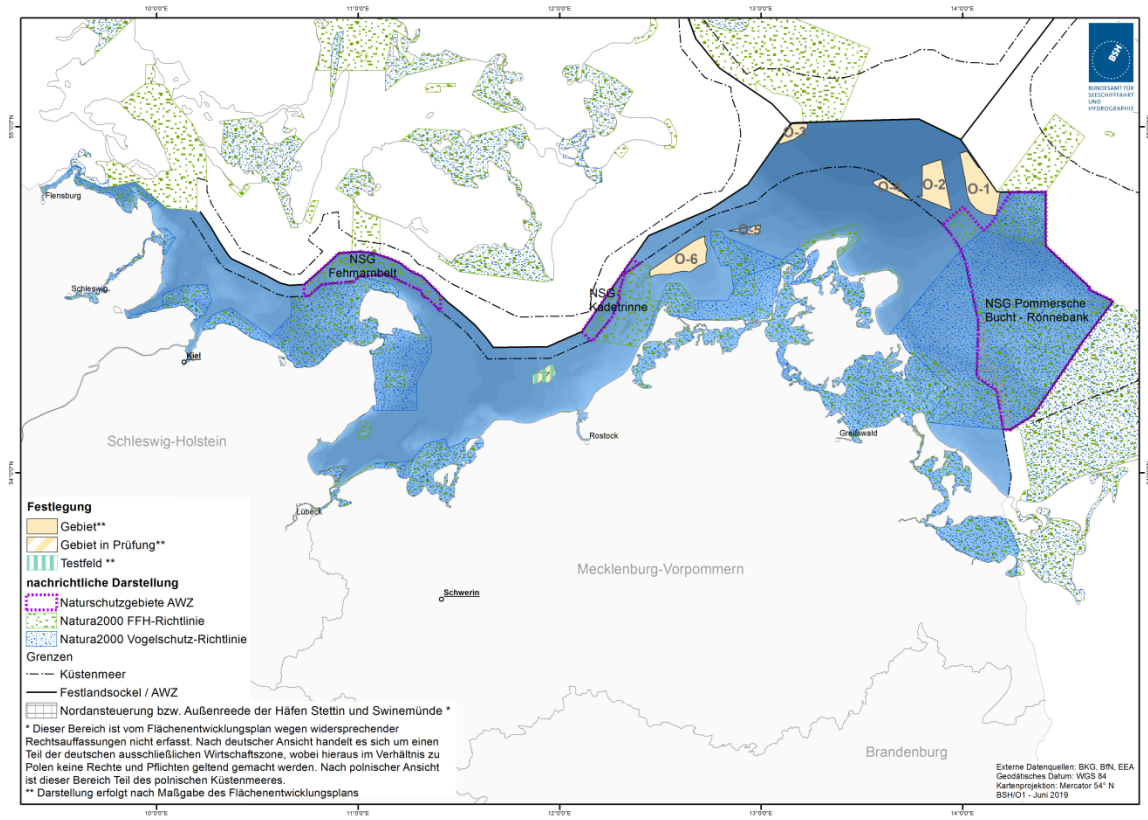

Figure 35: Areas for the construction and operation of offshore wind turbines in the German Baltic Sea EEZ and nature conservation areas

12 Annex: summary table

Calendar year of call for tender	Calendar year of commissioning	Site designation (TF= sub-area)	Expected generation capacity [MW]	Total expected generation capacity to be installed [MW]	Grid connection system				
					Name	Commissioning year	Transmission capacity [MW]	Grid Connection	Connection concept
2021	2026	N-3.7	225	900	NOR-3-3[1)]	2023	900	Emden Ost	155 kV
		N-3.8	375		NOR-3-3[1)]	2023	900	Emden Ost	155 kV
		O-1.3	300		OST-1-4[1)]	2026	300	Raum Lubmin	AC connection
2022	2027	N-7.2	900	900	NOR-7-2[1)]	2027	900	Büttel	66 kV
2023	2028	N-3.5	420	900	NOR-3-2[1)]	2028	900	Hanekenfähr	66 kV
		N-3.6	480		NOR-3-2[1)]	2028	900	Hanekenfähr	66 kV
2024	2029	N-6.6	630	900	NOR-6-3[1)]	2029	900	Hanekenfähr	220 kV
		N-6.7	270		NOR-6-3[1)]	2029	900	Hanekenfähr	220 kV
2025	2030	N-9.1 TF 1	600	600	NOR-9-1[1)]	2030	1000	Wilhelms-haven II[)]	66 kV
Total target system				4.200					
Probable implementation by end of 2025				10.800					
Probable implementation by end of 2030				15.000					

1) Reference is made to the preparation, assessment and confirmation of the network development plan 2019-2030.

13 Annex: Informational illustration of an increased development path (scenario framework 2019-2030)

The scenario framework 2019-2030 approved by BNetzA on 15 June 2018 contains, under the terms of the coalition agreement of 12 March 2018, the development of offshore wind energy which deviates from the goals of the Renewable Energy Act and thus from the legal requirements of the Site Development Plan. In statements on the preliminary draft of the Site Development Plan, it was requested with reference to the scenario framework 2019-2030 that the Site Development Plan present a corresponding scenario before a legal modification. In order to meet this requirement, the scenarios B/C 2030 and A 2030 of the scenario framework 2019-2030, with possible definitions for each scenario, are presented here **for information purposes only**. With scenario B 2035, the 2019-2030 scenario framework includes an outlook beyond the year 2030 until the year 2035, where the scenario for development until the year 2030 is based on the B/C 2030 scenarios. A description of this scenario in the Site Development Plan annex has been dispensed with. In contrast to the draft documents, a new long-term scenario informing about possible specifications and their connecting lines for the period after 2030 has been added, without, however, naming specific tendering or commissioning years.

In principle, if the expansion target is increased by 2030, bringing a higher output per year to tender than with the implementation of 15 GW by 2030 (base case) presents a **challenge.** For this reason, besides increasing the target from 15 GW by 2030 in accordance with section 4 subsection 2 no. 1 WindSeeG in connection with section 4 no. 2 b of the Renewable Energy Sources Act, a **legal modification** of the annual expansion corridor from 700 MW to 900 MW and an average of 840 MW according to section 5 subsection 5 WindSeeG **would also be required**.

However, due to the lead times for the implementation of the grid connection systems and the preliminary site investigations, increased tendering volumes will only be possible as from 2024, meaning that the additional tendering volume will be cumulated for the 2024 and 2025 tendering years. The prerequisite for bringing forward to the tendering year 2023 is that the necessary legal and budgetary framework conditions for the preliminary investigation of additional sites are created at short notice. These must allow the initiation of the preliminary investigation of all necessary sites in 2019, as well as their conclusion by determining their suitability compliant with the legal deadlines prior to the tender process in 2023.

Furthermore, one of the challenges is that of the **timely completion of grid connection systems**. An **additional challenge** may lie in the **availability of grid connection points**, onshore **grid** expansion and the **routing through coastal waters**.

In contrast to the descriptions in the annex to the draft Site Development Plan, the challenges in terms of the grid connection systems can be partially reduced by increasing the transmission voltage to +/- 525 kV and, analogously, the power to 2,000 MW per connection system. Nevertheless, in addition to the uncertainty surrounding the implementation of this previously untested technology, further - challenges remain, which will be discussed below in the individual scenarios.

Reference is made to the preparation, assessment and confirmation of the network development plan 2019-2030.

13.1 Scenarios B 2030 and C 2030 (17 GW by 2030)

Scenarios B 2030 and C 2030 in the 2019-2030 scenario framework both envisage offshore wind energy expansion to 17 GW by 2030. According to the scenario framework licence dated 15 June 2018, this increased expansion target is accompanied by an increase in the average annual expansion from 840 MW to 1240 MW. However, due to the lead times for the implementation of the grid connection systems and the preliminary site investigations, increased tendering volumes will only be possible as from 2024, meaning that the additional tendering volume will be cumulated for the 2024 and 2025 tendering years. Reference is made to the requirements for bringing forward to before 2024 discussed above.

Figure 36 shows the sites and offshore connection cables necessary to meet the 17 GW expansion target by 2030 under scenarios B 2030 and C 2030.

The probable additional sites required to achieve the expansion target of 17 GW are located in areas N-9 and N-10. Accordingly, an additional site, N-9.2, would need to be specified for area N-9, in addition to site N-9.1. The site is bordered to the north by shipping routes. In addition, site N-9.2 is delimited to the east by the "Norpipe" pipeline. N-9.2 is connected via the NOR-9-2 DC system, which leads out of the site to the east and then runs parallel to "Norpipe" or the NOR-9-1 connection system to gate N-II.

Area N-10 will also be divided into two sites. To the north, east and south, the sites are delimited by shipping routes, and in the west by the "Europipe 1" pipeline. In the context of the possible implementation of scenarios B 2030 and C 2030, initially only a sub-section of site N-10.2 would be required. The connection system for this area leads from the converter via "Europipe 2" to the NOR-9-2 connection system and then runs parallel to this to gate N-II.

Compared to the Site Development Plan's rules based on 15 GW by 2030, it would then be necessary for the NOR-9-1 grid connection system to be operational as early as 2029. Based on a capacity of 1,000 MW each for NOR-9-1 and NOR-9-2, as well as 1,700 MW for the NOR-10-1 connection system, this scenario would require the commissioning of two further connection systems (NOR-9-2 and NOR-10-1) in 2030.

There is an indication from the TSOs that insufficient onshore GCPs are available to connect the sites in areas N-9 and N-10 via N-II gate to Lower Saxony before the year 2030. Limiting the maximum grid connection capacity to a GCP to 3,000 MW, the GCPs that are suitable for connecting 2,000 MW grid connection systems are severely limited. For this reason, it is necessary to connect the sites in area N-9 to two separate GCPs using two grid connection systems. The Wilhelmshaven II and Unterweser GCPs, which would have capacity for one system each with up to 2,000 MW in addition to these connection cables, appear conceivable. The option of transferring of at least one additional grid connection system via gate N-V to GCP Heide/West in Schleswig-Holstein, in addition to the NOR-7-2 connection system to GCP Büttel, should also be examined for feasibility. According to the TSOs, a maximum grid connection capacity of 1,000 MW can be connected to GCP Heide/West. In the second draft of the Site Development Plan it was explained that connecting the NOR-10-1 grid connection system to Schleswig-Holstein was most preferable. However, notwithstanding the second draft of the Site Development Plan, only NOR-9-1 and NOR-9-2 can be considered for connecting to Schleswig-Holstein due to the capacity limitations. From a spatial planning perspective, and in order to prevent crossings, NOR-9-2 should be preferred in this case. However, based on the currently available information, the routing of additional offshore connecting cables through Schleswig-Holstein's

coastal waters is problematic. An increase in the expansion target of more than 15 GW by 2030 would therefore require cooperation with Schleswig-Holstein on the options for an additional connection system.

GCPs are specified in the context of confirmation of the 2019-2030 grid development plan by BNetzA.

Based on the information given in section 4.2.1, the sites are connected to the offshore converter platform using the direct connection concept (66 kV), even given a transmission capacity of up to 2,000 MW. It is therefore not necessary to construct additional transformer platforms on the sites.

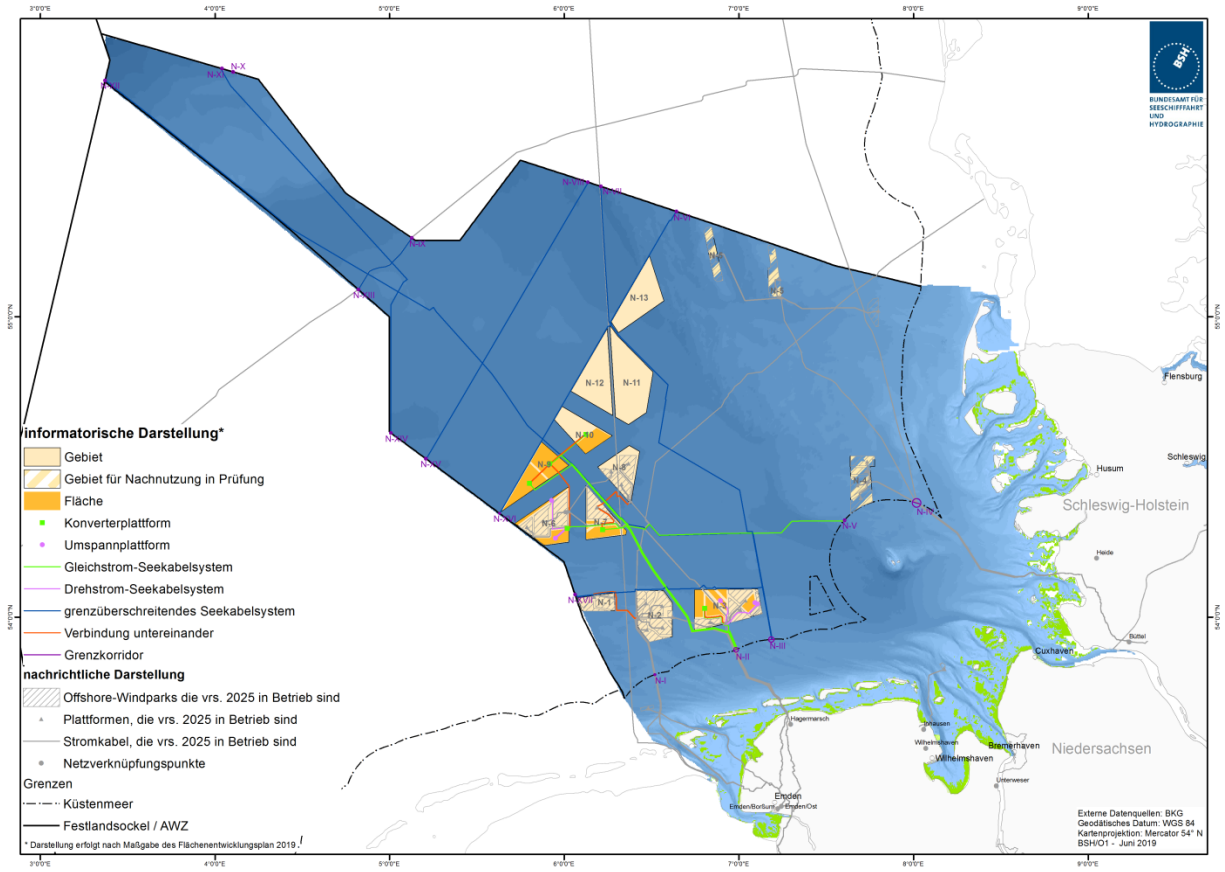

Figure 36: Informational illustration of possible scenario B and C 2030 rules (17 GW by 2030)

Table 19 represents the possible chronological order of the call for tenders for the sites required to achieve the objectives, including the anticipated capacity to be installed. Compared with the 15 GW stipulation discussed in section 5.5, it is clear that tendering and commissioning for site N-9.1 would need to be advanced by one year and in 2025 sites N-9.2 and N-10.2 additionally tendered as a sub-sites in order to achieve 17 GW by 2030. In addition, it is possible to increase the anticipated installed capacity on individual sites if the expansion corridor is based on a more flexible 700 to 900 MW per calendar year (see section 5.3.1).

<u>Challenges and requirements for implementing the scenario:</u>

- Clarification of the (technical) feasibility of the grid connection systems NOR-9-1 and NOR-9-2 employing the +/- 320 kV concept with a transmission capacity of 1,000 MW and NOR-10-1 employing the +/- 525 kV concept with a transmission capacity of 1,700 MW
- Timely availability of onshore GCPs
- As necessary, clarification of possible routing through Schleswig-Holstein's coastal waters
- Lead time for updating the Site Development Plan and carrying out preliminary site investigations requires timely implementation of the amendment to the law regarding the expansion target

Table 19: Informational illustration of the sequence of defined sites including the anticipated installed capacity for scenarios B 2030 and C 2030 in the 2019-2030 scenario framework

Calendar year of call for tender	Calendar year of commissioning	Area designation (TF=sub-site)	Grid connection system	Expected generation capacity [MW]	Total expected generation capacity to be installed [MW]
2021	2026	N-3.7	NOR-3-3	225	958
		N-3.8	NOR-3-3	433	
		O-1.3	OST-1-4	300	
2022	2027	N-7.2	NOR-7-2	930	930
2023	2028	N-3.5	NOR-3-2	420	900
		N-3.6	NOR-3-2	480	
2024	2029	N-6.6	NOR-6-3	630	1.900
		N-6.7	NOR-6-3	270	
		N-9.1	NOR-9-1	1000	
2025	2030	N-9.2	NOR-9-2	1000	1.512
		N-10.2 TF 1	NOR-10-1	512	
Total target system					6.200
Probable implementation by end of 2025					10.800
Probable implementation by end of 2030					17.000

13.2 Scenario A 2030 (20 GW by 2030)

Scenario A 2030 models one possible development path, strongly based on large and centralised generating units. As a result, the expansion path for renewable energy is the lowest in this scenario, with the exception of offshore wind energy. For offshore wind energy, on the other hand, an installed capacity of 20 GW by 2030 will be adopted in the 2019-2030 scenario framework, representing the maximum expansion by 2030 in the scenarios.

Figure 37 shows the anticipated sites and offshore connection cables necessary to meet the 20 GW expansion target by 2030 under scenario A 2030.

In addition to those sites shown in Figure 36 required to achieve an expansion target of 17 GW, in scenario A 2030 additional sites would probably be required to achieve 20 GW by 2030. Area N-10 would be divided into two sites, as previously described for scenarios B 2030 and C 2030. In contrast to these scenarios, development of both sites in area N-10 would probably be necessary for scenario A 2030. Area N-12 would be divided into three sites, of which the two southern sites are approximately the same size. The sites are bounded to the north-west and south by shipping lanes, to the west by "NorNed".

The additionally required NOR-12-1 grid connection system when compared to scenarios B and C 2030 would run east from the converter platform to the "NorNed" interconnectors system and then parallel to this to the south-east corner of area N-12. Here, it crosses "NorNed" and then runs parallel to shipping route 4 as far as "Europipe 2", then parallel to the pipeline to gate N-III.

The site connection to the NOR-12-1 converter platform would utilise the 66 kV direct connection concept. The exact route of the submarine cables passing through gate N-III (in particular their east-west layout) is then to be defined in the individual procedure for the region from the shipping route 2 reservation area of the Spatial Plan to the boundary with the coastal waters (see also Figure 21).

Table 20 represents the possible chronological order of the call for tenders for the sites required to achieve the objectives, including the anticipated capacity to be installed.

Since, based on the information currently available, it must be assumed that it will not be possible to accelerate the planning and implementation periods for the NOR-3-2 and NOR-6-3 grid connection systems during the years 2028 to 2029 when compared to the base case, it would only be possible to increase the expansion volume in 2029 and 2030 in order to achieve 20 GW by 2030. Similar to scenarios B and C 2030, scenario A 2030 would not be preferable either, because it would not be possible to bring forward the necessary - additional sites prior to the tendering years 2024 and 2025, due in part to the extended planning and implementation periods for the offshore connection cables and the anticipated availability of GCPs, as well as the necessary lead times for the preliminary investigation and suitability testing. The NOR-9-1 grid connection system would need to be completed in 2029, in contrast to the rules of the Site Development Plan. In addition, NOR-9-2 in 2029 and the NOR-10-1 and NOR-12-1 connection cables will probably be required by the end of 2030 compared to the base case (15 GW).

Against this background, it is pointed out that the previous descriptions were already based on a significant increase in the transmission capacity of future grid connection systems up to 2,000 MW. It is thus possible to reduce the number of systems necessary and therefore considerably diminish the spatial challenges. According to the statements of the TSOs in the 2nd draft of the NEP 2019-2030 grid development plan of 15 April 2019, it does not appear possible to connect 20 GW by 2030. For example, the TSOs point out that commissioning of grid connection systems with GCPs in the search area municipalities of Ibbenbüren/Mettingen/Westerkappeln and Wehrendorf (each in the Amprion grid region) is not realistic before 2030 as a result of long onshore route. However, the scenario presented in this section dispenses with a connection to the GCP that is critical in terms of implementation time.

Against this background, and as a result of increasing the transmission power to up to 2,000 MW per grid connection system, it would be necessary to reassess feasibility.

Challenges and requirements for implementing the scenario:

- Clarification of the (technical) feasibility of the grid connection systems NOR-9-1 and NOR-9-2 employing the +/- 320 kV concept with a transmission capacity of 1,000 MW, as well as NOR-10-1 and NOR-12-1, employing the +/- 525 kV concept with a transmission capacity of 1,700 MW and 2,000 MW
- Timely availability of onshore GCPs
- As necessary, clarification of possible routing through Schleswig-Holstein's coastal waters
- Timely creation of the legal and budgetary conditions for the preliminary investigation of additional sites in 2019
- Timely completion of the significantly increasing number of additional preliminary investigations for the sites appears critical

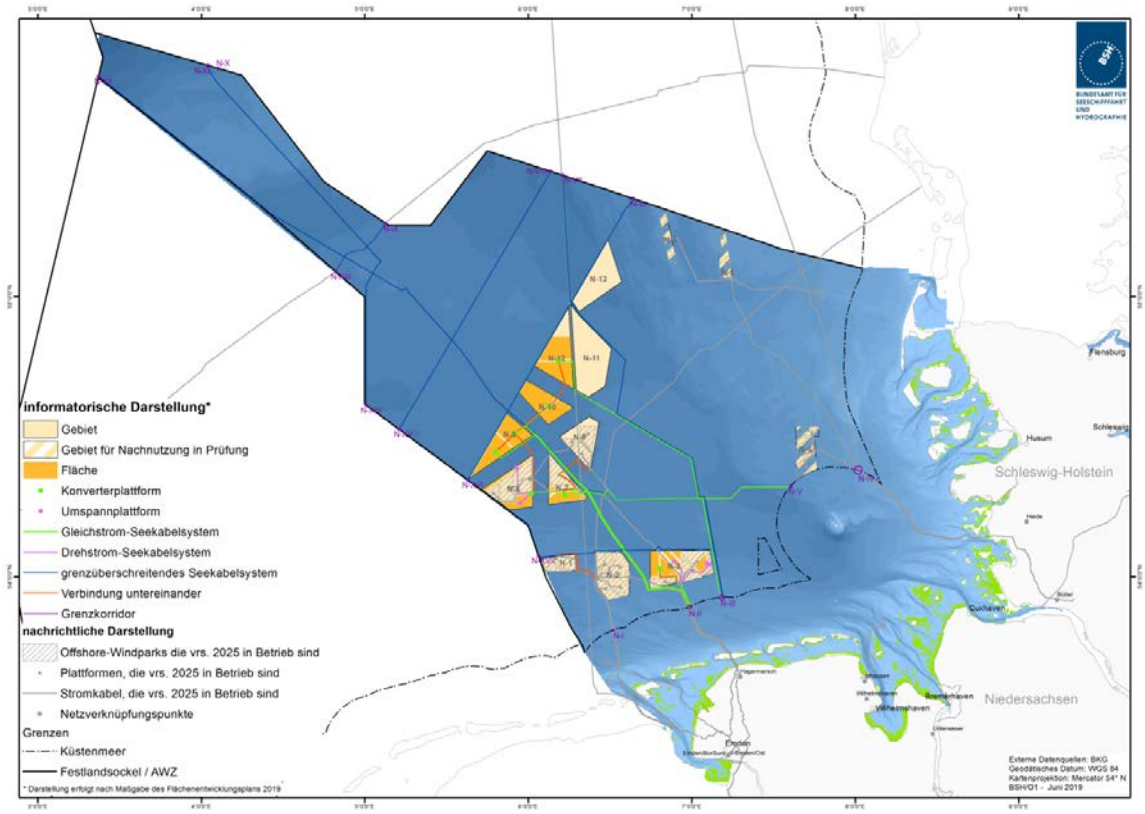

Figure 37: Informational illustration of possible scenario A 2030 rules (20 GW by 2030)

Table 20: Informational illustration of the sequence of defined sites including the anticipated installed capacity for scenario A 2030 in the 2019-2030 scenario framework

Calendar year of call for tender	Calendar year of commissioning	Area designation (TF=sub-site)	Grid connection system	Expected generation capacity [MW]	Total expected generation capacity to be installed [MW]
2021	2026	N-3.7	NOR-3-3	225	958
		N-3.8	NOR-3-3	433	
		O-1.3	OST-1-4	300	
2022	2027	N-7.2	NOR-7-2	930	930
2023	2028	N-3.5	NOR-3-2	420	1.900
		N-3.6	NOR-3-2	480	
		N-9.1	NOR-9-1[1)]	1000	
2024	2029	N-6.6	NOR-6-3	630	1.900
		N-6.7	NOR-6-3	270	
		N-9.2	NOR-9-2	1000	
2025	2030	N-10.1	NOR-10-1	1000	3.512
		N-10.2	NOR-10-1	700	
		N-12.1	NOR-12-1	1000	
		N-12.2 TF 1	NOR-12-1	812	
Total target system					9.200
Probable implementation by end of 2025					10.800
Probable implementation by end of 2030					20.000

[1)] Bringing forward site N-9.1 to 2028 is only possible if the requirements discussed in section 13 are met.

13.3 Long-term scenario: possible sites for the period post-2030

This section presents an overview of the sites available after the target year 2030 for the purpose of long-term planning. To this end, the capacity of the sites in areas N-11 to N-13, which are available over and above scenario A 2030 (20 GW by 2030), was determined. This scenario therefore represents the theoretical total potential that would result from complete development of the areas defined in the Site Development Plan, amounting to a total of approximately 26 GW. The time frame for unlocking this potential is highly dependent on development until 2030. Compared to scenario A 2030, which aims at an installed capacity of 20 GW in 2030, it would be necessary to construct three additional grid connection systems (NOR-11-1, NOR-11-2 and NOR-13-1).

Compared to scenario A 2030, the third site in area N-12, i.e. N-12.3, and all sites in areas N-11 and N-13, would be included. The NOR-11-1 and NOR-11-2 connection systems would each extend to the east, cross shipping route 5 and then run parallel to the planned cross-border submarine cable to gate N-III. Alternatively, a route to gate N-V in the direction of Schleswig-Holstein would be possible from the crossing point north of shipping route 2. The route depends on the possible GCP for the additional systems. With regard to possible routing in coastal waters beginning at gates N-III to N-V, studies are currently being undertaken by the TSOs. The aim is to allow further routes in coastal waters for OWF connection systems to be specified and estimate the maximum possible gates.

Table 21: Informational illustration of the possible available sites in zones 1-3 beyond 2030 based on scenario A 2030 in the 2019-2030 scenario framework (20 GW by 2030)

Calendar year of call for tender	Calendar year of commissioning	Area designation (TF=sub-site)	Grid connection system	Expected generation capacity [MW]	Total expected generation capacity to be installed [MW]
Post 2025	Post 2030	N-12.2 TF 2	NOR-12-1	188	6.188
		N-11.1	NOR-11-1	1000	
		N-11.2	NOR-11-1	1000	
		N-11.3	NOR-11-2	700	
		N-11.4	NOR-11-2	850	
		N-12.3	NOR-11-2	450	
		N-13.1	NOR-13-1	1000	
		N-13.2	NOR-13-1	1000	
Total potential in zones 1-3					approx. 26,200[1)]

[1)] Additional potential of up to 900 MW may result from developing the remaining sites in area O-6. However, this is subject to the actual availability of the sites.

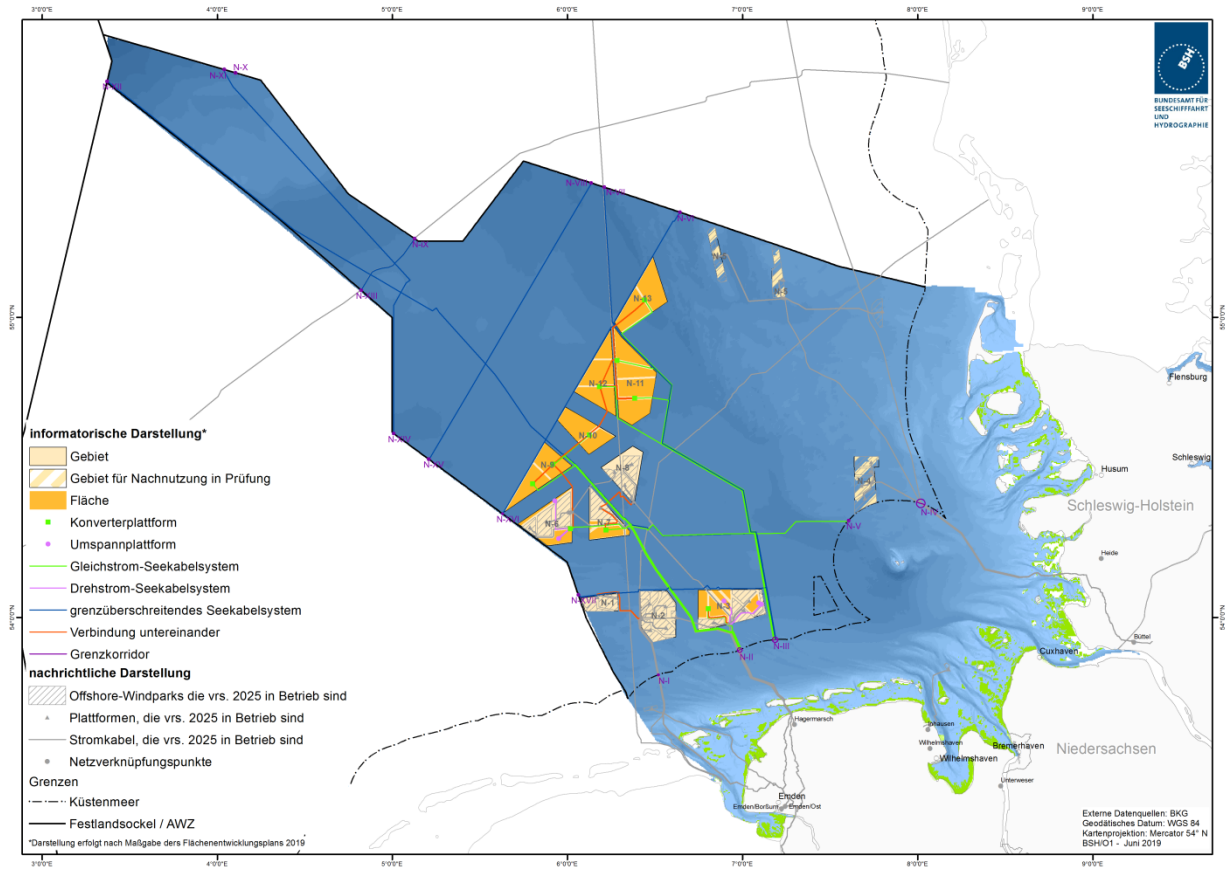

Figure 38: Informational illustration of the possible available sites in zones 1-3 beyond 2030

13.4 Connecting lines that may be required for the scenarios

The introduction to this chapter highlighted the **challenges** related to the **connection cables** that may be required for the described scenarios, which would **needed for implementation, among other things**.

Table 22 represents the respective calendar years for commissioning required for the grid - connection systems in the individual scenarios.

Table 22: Overview of the commissioning years which may be necessary for the offshore connecting lines in the various scenarios

Designation	Transmission capacity [MW]	possible Grid Connection Point[2)]	Calendar year of commissioning for offshore connecting lines		
			Basis 15 GW	Scenario B and C 2030 17 GW	Scenario A 2030 20 GW
OST-1-4[1)]	300	Lubmin	2026	2026	2026
NOR-7-2[1)]	931	Büttel	2027	2027	2027
NOR-3-2[1)]	900	Hanekenfähr	2028	2028	2028
NOR-6-3[1)]	900	Hanekenfähr	2029	2029	2029
NOR-9-1[1)]	1000	Wilhelmshaven II	2030	2029	2028[3)]
NOR-9-2[1)]	1000	Unterweser[4)]		2030	2029
NOR-10-1[1)]	1700	Wilhelmshaven II		2030	2030
NOR-12-1[1)]	2000	Unterweser			2030
NOR-11-1[1)]	2000	N.N.			
NOR-11-2[1)]	2000	N.N.			
NOR-13-1[1)]	2000	N.N.			

[1)] Reference is made to the preparation, assessment and confirmation of the network development plan 2019-2030.

[2)] The information on possible grid connection points and the earliest possible completion form part of the examination of the grid development plan's endorsement process, in particular taking into account the modified connection concept for NOR-10-1 and NOR-12-1 in +/- 525 kV DC technology.

[3)] Implementation of the NOR-9-1 grid connection system in 2028 is only possible if the requirements discussed in section 13 are met.

[4)] Alternatively, Heide/West in Schleswig-Holstein may be considered as a grid connection point.