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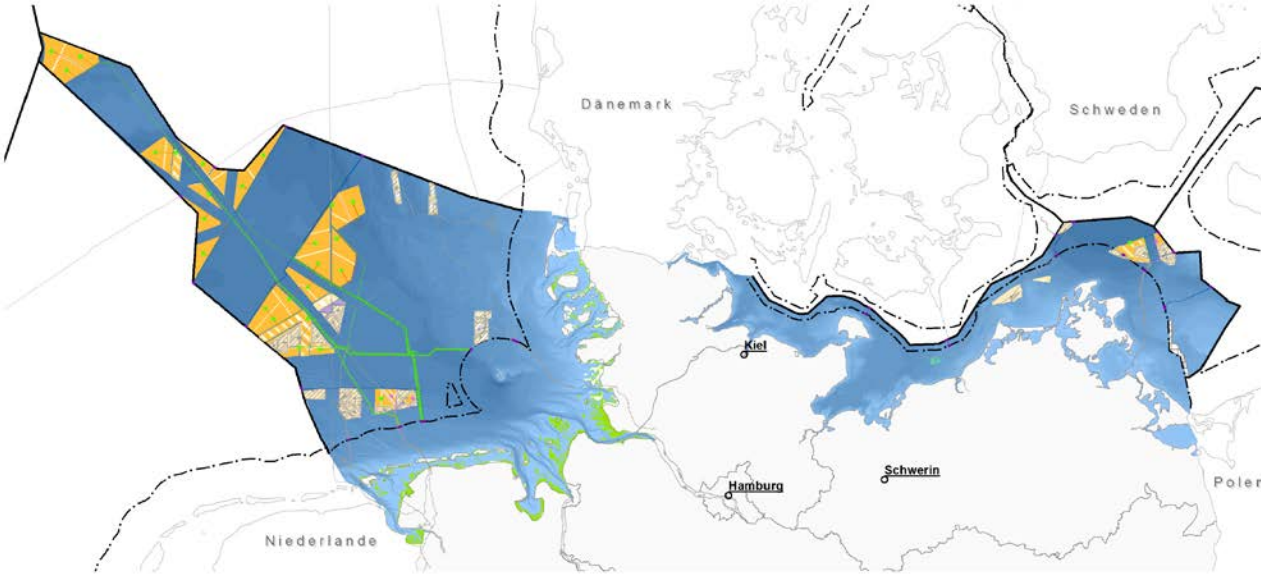
Draft
Site Development Plan
- unofficial translation -



Hamburg, 1 July 2022

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AC	Alternating current
BAW	Federal Waterways Engineering and Research Institute
BFO-N	Spatial offshore grid plan for North Sea
BFO-O	Spatial Offshore Grid Plan - Baltic Sea
BMDV	Federal Ministry of Digital Affairs and Transport
BMU	Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit (Federal Ministry for Environment, Nature Conservation and Nuclear Safety)
BNetzA	Federal Network Agency
BSH	Federal Maritime and Hydrographic Agency
DC	Direct current
DIN	Deutsche Institut für Normung [German Institute for Standardisation]
DIN EN	German Institute for Standardisation, European Standard
EEZ	Exclusive Economic Zone
ESCA	European Subsea Cables Association
GCP	Grid connection point
GDWS	Directorate-General for Waterways and Shipping
GGBL-WBF	Principles of the Federal Government and the Provinces on Wind Farm Sites on Wind Turbines
GIS	Gas insulated switchgear
GW	Gigawatt
HVDC	High-voltage direct current transmission
ICAO	International Civil Aviation Organization
ICPC	International Cable Protection Committee
kV	Kilovolt
LEP M-V	Regional Spatial Development Programme for Mecklenburg-Western Pomerania
MARPOL	International Convention for the Prevention of Marine Pollution from Ships also MARPOL (from marine pollution)
MW	Megawatt
nm	Nautical mile
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
OWF	Offshore wind farm
ROP	Maritime spatial plan
SDP	Site Development Plan
SF6	Sulphur hexafluoride
SOLF	Standard Offshore Aviation for the German Exclusive Economic Zone
StUK	Standard "Investigation of impacts of offshore wind turbines".
TCM	Transmission Capacity Management
TSO	Transmission system operator
UNCLOS	United Nations Convention on the Law of the Sea
VDE	Association for Electrical, Electronic & Information Technologies
VGB	Vereinigung der Großkesselbesitzer e.V. (international association of companies from the electricity and heat supply industry)
VSC	Voltage source converter
WindSeeV	Ordinance on the Implementation of the Offshore Wind Energy Act
WT	Wind turbine

Preliminary remark: *The present draft of the Site Development Plan (SDP) is based on the Federal Government's draft bill of a second law amending the Wind Energy at Sea Act and other stipulations (German Federal Parliament / Printed Matter i.e. official publication) 20/1634 of 02.05.2022, hereinafter referred to as:* ***WindSeeG-E****).*
The draft law contains updates that are relevant for the specifications in the SDP as well as for reviews and assessments within the framework of the environmental reports.
The final version of the new WindSeeG is expected for the period of finalisation of the SDP (3rd and 4th quarter of 2022). Therefore, the SDP will also be able to take into account all legal amendments in the WindSeeG by the time it is expected to be published in early 2023.

I. Designations

1 Areas and sites

The Site Development Plan (SDP) defines the areas and sites shown in the Table 1. In some areas, no site is designated because these areas are expected to be fully developed with wind farms by 2026.

Area N-20 and parts of area O-2 have been identified in the 2021 maritime spatial plan (ROP) as conditional reservation areas and are therefore under review.

Areas N-21 and N-22 are also identified as areas under review, as they partly coincide with the priority areas for shipping SN6 and SN12 from the ROP 2021 and further final consultations with neighbouring Denmark and the Netherlands may be required. The site N-21.1 is also allocated for assessment in the area N-21. For the prospective determination of areas N-21 and N-22, an objective deviation procedure will be carried out within the framework of the present revision procedure. There is an opportunity to inspect the possible determination for N-21 and N-22 within the framework of the present revision procedure of the SDP. Furthermore, the environmental reports on the present draft take account of areas N-21 and N-22.

Areas N-4 and N-5 are under consideration for subsequent use. Table 1 depicts the designated areas and sites including the respective base as well as the designated power expected to be installed. A cartographic representation can be found in Figure 2 and Figure 3.

With the sites shown in Table 1, a total capacity of approx. 48.7 GW can probably be built. Together with the existing wind farms and the additional capacity expected by 2026, a total installed capacity of approx. 60 GW can be realised with the defined sites.

Table 1: Determinations on areas and sites

Designation Area	Base Area [km²]	Designation Site	Base Site [km²]	exp. Installable capacity [MW]
N-1	79			
N-2	223			
N-3	308	N-3.5	29	420
		N-3.6	33	480
		N-3.7	17	225
		N-3.8	23	433
N-4**	148			
N-5**	125			
N-6	249	N-6.6	44	630
		N-6.7	16	270

Designation Area	Base Area [km²]	Designation Site	Base Site [km²]	exp. Installable capacity [MW]
N-7	163	N-7.2	58	980
N-8	124			
N-9	453	N-9.1	158	2,000
		N-9.2	157	2,000
		N-9.3	106	1,500
N-10	195	N-10.1	148	2,000
		N-10.2	31	500
N-11	356	N-11.1	192	2,000
		N-11.2	148	1,500
N-12	494	N-12.1	193	2,000
		N-12.2	187	2,000
		N-12.3	80	1,000
N-13	367	N-13.1	50	500
		N-13.2	92	1,000
		N-13.3	195	2,000
N-14	145	N-14.1	145	2,000
N-15	138	N-15.1	138	2,000
N-16	295	N-16.1	146	2,000
		N-16.2	140	2,000
N-17	325	N-17.1	81	1,000
		N-17.2	152	2,000
		N-17.3	70	1,000
N-18	194	N-18.1	58	1,000
		N-18.2	111	2,000
N-19	560	N-19.1	170	2,000
		N-19.2	180	2,000
		N-19.3	167	2,000
N-20*	67	N-20.1***	67	1,000
N-21*	255	N-21.1***	255	2,000
N-22*	55			
O-1	129	O-1.3	25	300
O-2*	122	O-2.2***	92	1,000
O-3	28			

* Area under review
** Area for subsequent use under consideration
*** Site under review

Questions for consultation

Possible extension of site N-11.1

The planned areas for the use of offshore wind energy in the Netherlands adjacent to the German Exclusive Economic Zone (EEZ) according to the Additional Draft North Sea Program 2022-2027 of October 2021 (Dutch Ministry of Infrastructure and Water Management, 2021) call into question the designation of shipping route SN6 of ROP 2021. In addition to the determination of areas N-21 and N-22 under consideration, this gives rise to the possibility of extending area N-11 and site N-11.1 in a south-easterly direction. In doing so, the site originally belonging to SN6 to the extent of approximately 23 km² would be added to site N-11.1.

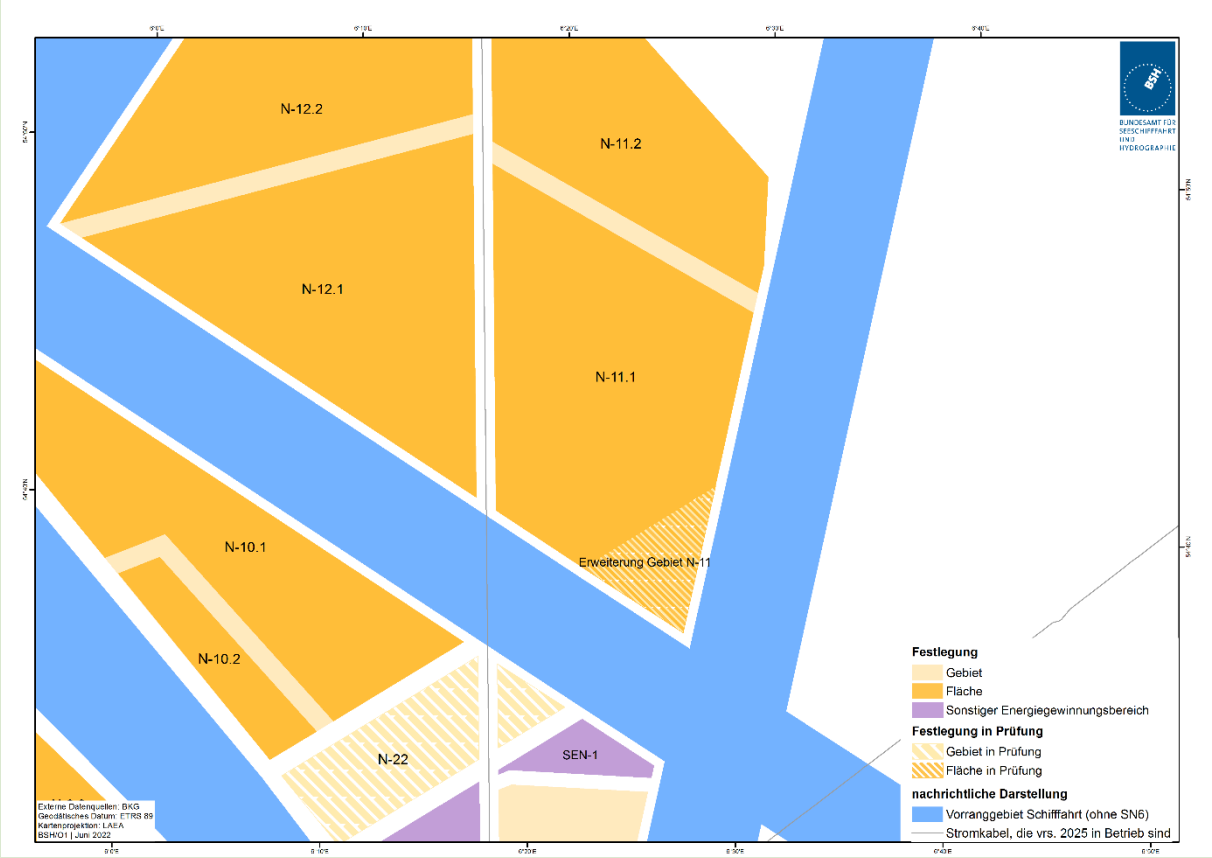

Figure 1: Possible extension of area N-11 and site N-11.1 towards SN6

Provided that the assessment for areas N-21 and N-22 is in favour of designating the areas for wind energy use, the extension of area N-11 and site N-11.1 is therefore also proposed. As a consequence, there would be further spatial adjustments:

- The division between sites N-11.1 and N-11.2 would be shifted in a southerly direction in the sense of an approximately equal distribution, so that site N-11.2 would also be enlarged.
- A shift of the locations for the converter platforms NOR-11-1 and NOR-11-2 could be dispensed with due to the comparatively small site adjustment. Only the routing of NOR-11-1 would have to be adjusted on a small scale.
- The systems running directly along N-11.1 within the ROP 2021 reservation area for subsea cables and pipelines would have to be shifted to the southwest over a small area in the area of the site extension.

Q.1 Are there any justified objections to the possible expansion shown and the associated spatial adjustments?

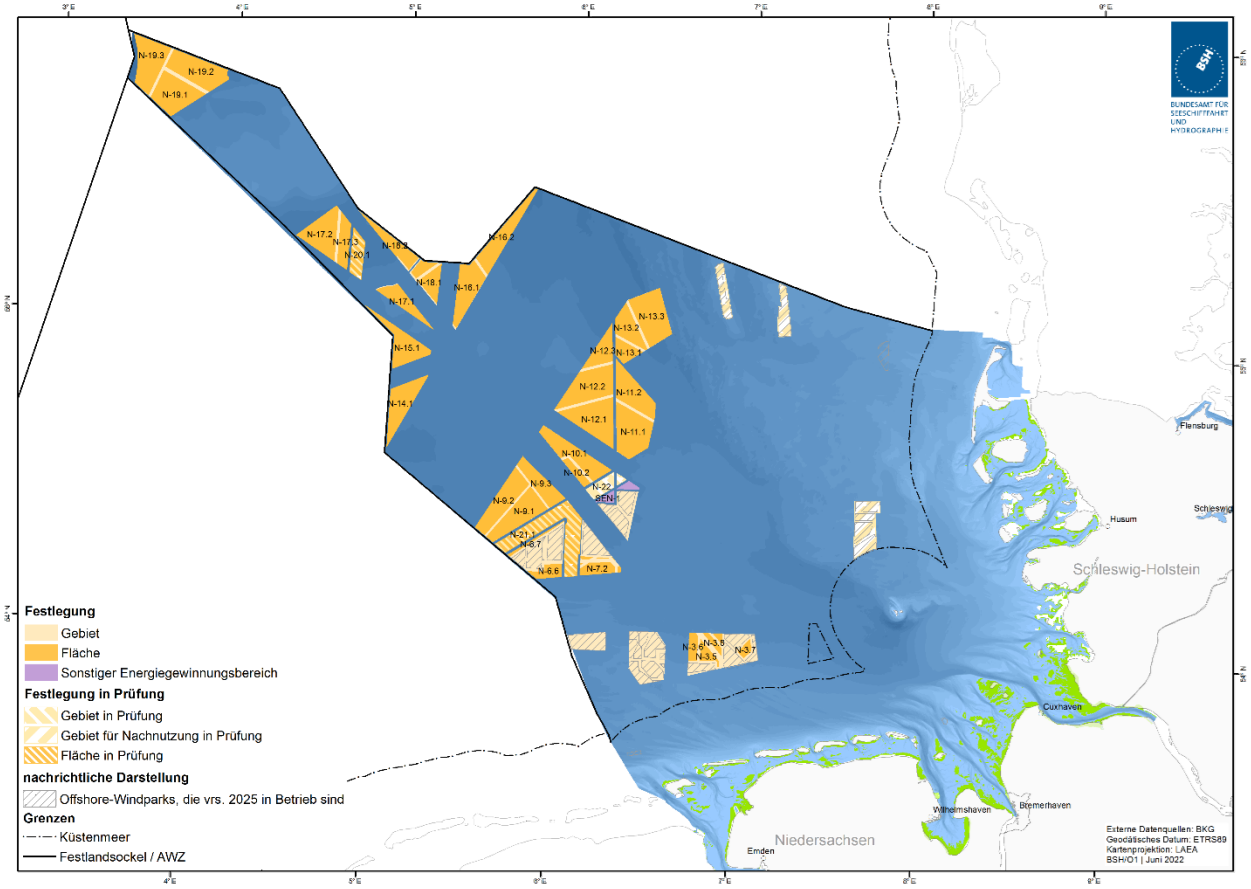

Figure 2: Determinations concerning areas and sites in the EEZ of the North Sea.

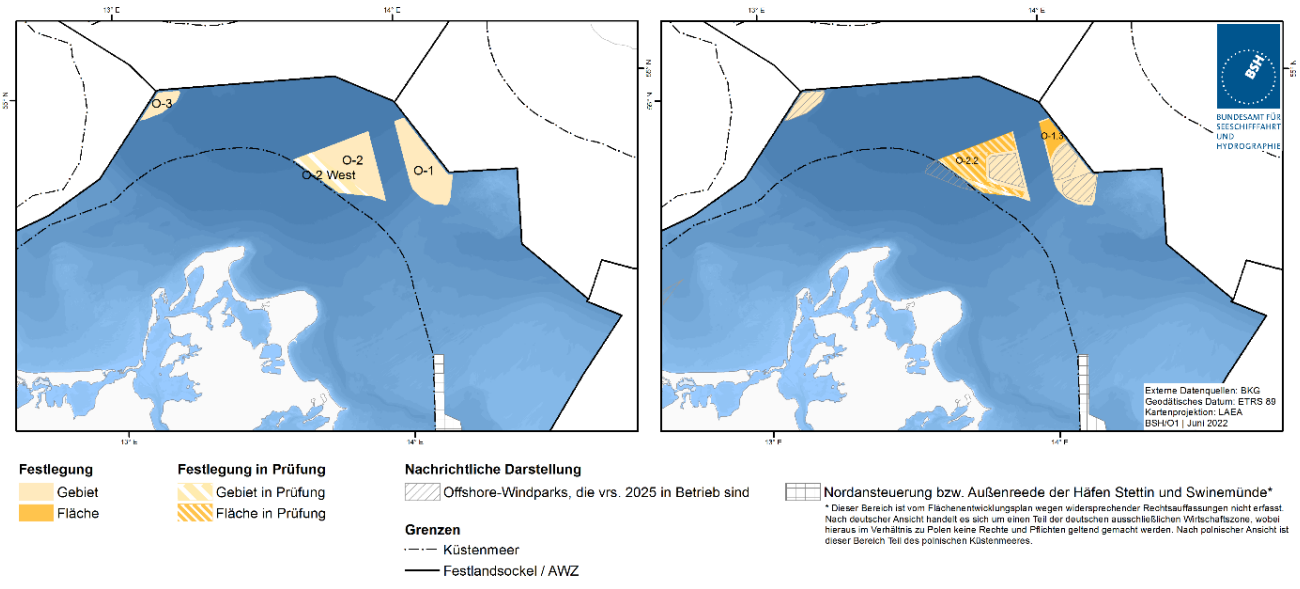

Figure 3: Determinations concerning areas and site in the EEZ of the Baltic Sea.

2 Subsea cables and pipelines

2.1 Gates to the territorial sea

Pursuant to Sec. 5 para. 1 no. 8 WindSeeG-E, the SDP determines locations where the offshore grid connecting cables cross the boundary between the EEZ and the territorial sea (so-called gates).

The gates from EEZ to territorial sea for the North Sea and Baltic Sea are listed in Table 2. Each gate is also assigned to existing subsea cables that are planned or defined in this SDP.

Table 2: Allocation of the defined subsea cable system to the gates to the territorial sea.

Gate	subsea cables
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 (11) NOR-10-1 (12) NOR-21-1
N-III	(1) NOR-9-2 (2) NOR-9-3 (3) NOR-12-1 (4) NOR-13-1 (5) NOR-11-2 (6) NOR-14-1 (7) NOR-15-1 (8) NOR-17-1 (9) NOR-17-2 (10) NOR-19-1 (11) NOR-19-2 (12) NOR-19-3 (13) NOR-20-1 (-) NeuConnect
N-V	(1) NOR-7-2 (2) NOR-11-1 (3) NOR-12-2 (4) NOR-13-2 (5) NOR-16-1 (6) NOR-16-2 (7) NOR-18-1
N-IV	(1) NOR-4-2/HelWin2 (2) NOR-4-1/HelWin1 (3) NOR-5-1/SylWin1 (4) NordLink
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) OST-2-4 (9) subsea cable to Denmark (10) subsea cable to Denmark
O-II	(1) OST-2-1 / Ostwind 2
O-III	(1) OST-3-1 (2) OST-3-2 (3) subsea cable to Sweden (4) subsea cable to Sweden (5) subsea cable to Denmark
O-IV	(1) Kontek (2) subsea cable to Denmark
O-V	(1) subsea cable to Denmark
O-XIII	(1) subsea cable to Denmark

2.2 Grid connection systems

The offshore grid connection systems shown in Table 3 are defined and serve to connect the sites defined in Chapter 1.

The onshore grid connection points (GCP) shown up to and including the year of commissioning 2031 and the calendar years of commissioning are based on the information in the comment of the Federal Network Agency (BNetzA) of 06.04.2022 and are only included here for information. Compared to the comment of the BNetzA, updates have been made on the basis of the comment of the transmission system operators (TSOs) dated 5 May 2022. The NOR-12-2 grid connection system is now routed via the N-V gate to Heide/West. The designation of the grid connection system NOR-12-3 will be adjusted to NOR-13-1, and NOR-13-1 will be changed to NOR-13-2 accordingly. Furthermore,

the GCP of the grid connection system NOR-13-1 (previously NOR-12-3) Blockland was replaced by the GCP Rastede.

The further GCPs starting with the year of commissioning 2032 must be identified in the upcoming network development plan 2023–2037 and confirmed by the BNetzA. Accordingly, the route of the grid connection systems with commissioning from 2032 onwards is currently being examined.

The defined sites can be connected with the grid connection systems defined in Table 3. At the same time, the capacities available on the existing gates to the territorial sea will be almost completely exhausted. Accordingly, to achieve the expansion target of at least 70 GW by 2045, it will be necessary to identify further gates to the territorial sea or to expand the capacity of the existing gates.

Starting with the NOR-9-1 grid connection system, the standard concept based on Table 3 direct current technology with a transmission capacity of 2,000 MW is specified for all further grid connection systems. An exception to this is the OST-2-4 grid connection system in the Baltic Sea EEZ. Due to the limited capacity of site O-2.2 to be connected, an alternative grid connection concept in direct current technology with a transmission voltage of +/- 320 kilovolts (kV) and a transmission capacity of 1,000 MW is specified for this grid connection. For the further standard technical principles for OST-2-4, please refer to the corresponding specifications for zones 1 and 2 of the North Sea of the SDP 2020.

For the grid connection concepts of the grid connections coming into operation beforehand, please refer to the SDP 2020.

Table 3: Specifications for grid connection systems

Grid connection system	Transmission capacity [MW]	Gate	For information purposes based on the comments of the BNetzA and the TSOs:	
			Grid connection point	Commissioning[1]
OST-1-4	300	O-I	Lubmin	2026
NOR-7-2	980	N-V	Büttel	2027
NOR-3-2	900	N-II	Hanekenfähr	2028
NOR-6-3	900	N-II	Hanekenfähr	2028
NOR-9-1	2,000	N-II	Wehrendorf	2029
NOR-9-2	2,000	N-III	Wilhelmshaven 2	2029
NOR-9-3	2,000	N-III	Unterweser	2029
OST-2-4*	1,000	O-I	Brünzow	2030
NOR-10-1	2,000	N-II	Westerkappeln	2030
NOR-11-1	2,000	N-V	Heide/West	2030
NOR-12-1	2,000	N-III	Unterweser	2030
NOR-12-2	2,000	N-V	Heide/West	2030
NOR-11-2	2,000	N-III	Wilhelmshaven 2	2031
NOR-13-1	2,000	N-III	Rastede	2031
NOR-13-2**	2,000	N-V	n.a.	n.a.

[1] At this point, the SDP only provides information on the years of commissioning for the grid connection systems up to and including 2031, as stipulated in the comment by the BNetzA. The SDP makes its own quarterly specifications for the commissioning of the offshore wind turbines surcharged on the defined sites and the corresponding offshore grid connections (see Chapter 4).

Grid connection system	Transmission capacity [MW]	Gate	For information purposes based on the comments of the BNetzA and the TSOs:	
			Grid connection point	Commissioning[1]
NOR-14-1**	2,000	N-III	n.a.	n.a.
NOR-15-1**	2,000	N-III	n.a.	n.a.
NOR-21-1*/**	2,000	N-II	n.a.	n.a.
NOR-16-1**	2,000	N-V	n.a.	n.a.
NOR-17-1**	2,000	N-III	n.a.	n.a.
NOR-16-2**	2,000	N-V	n.a.	n.a.
NOR-18-1**	2,000	N-V	n.a.	n.a.
NOR-17-2**	2,000	N-III	n.a.	n.a.
NOR-19-1**	2,000	N-III	n.a.	n.a.
NOR-19-2**	2,000	N-III	n.a.	n.a.
NOR-20-1*/**	2,000	N-III	n.a.	n.a.
NOR-19-3**	2,000	N-III	n.a.	n.a.

* The site to be connected is currently being examined.
** The route of the grid connection system is currently being examined.

According to Sec. 5, para. 1, No. 6 WindSeeG, the SDP shall designate the locations of converter platforms, collector platforms and, as far as possible, transformer stations.

Converter or transformer platforms are identified only in those areas in which sites are also designated. Transformer platforms are only defined to the extent that they are required for the grid connection concept. Consequently, no transformer platforms are defined for the 66 kV direct grid connection concept.

According to Sec. 5, para. 1, No. 7 WindSeeG, the SDP shall designate routes or route corridors for offshore grid connecting cables. Please refer to the planning scale of 1:400,000 and the associated inaccuracies of the graphic determinations. For this reason, possible bending radii of the subsea cables and the associated towing radii of the laying vehicles are not shown exactly when defining the routes. This is done in the respective approval procedures.

Beginning with the NOR-9-1 grid connection system, the converter locations should always be placed within the site to be connected. Figure 5 and Figure 6 show the spatial representations.

Questions for consultation

Availability of the route corridor via the island of Langeoog

Q.2Is the route corridor in the territorial sea via the island of Langeoog available for grid connection systems with commissioning from 2029?

Location of the converter platform OST-2-4

In the joint comment of the TSOs of 5 May 2022, the TSO 50 Hertz pointed out that no subsoil data are available for the location of the converter platform OST-2-4 shown in the extended preliminary draft. In addition, it was known that the water depth and the proportion of non-load-bearing soil layers were increasing in this area. It could therefore not be ruled out that no suitable construction space for the converter platform could be identified at the northern edge of site O-2.2. For this reason, the SDP should identify possible alternative sites. An area between the western boundary of the Baltic Eagle offshore wind farm (OWF) and site O-2.2 is proposed. Two additional sites are therefore proposed as an alternative to the site at the northern edge of area O-2.2 in the following figure.

The cable route for the northern alternative site would follow the northern boundary of the Baltic Eagle OWF and then follow the same route of the northern site towards the coast. Due to the distance of 500 m on both sides of the cable, the site O-2.2 would be reduced by approx. 2.18 km² with this routing.

In the southern alternative location, the cable route is routed to the original route along the southern boundary of the Baltic Eagle OWF. In this case, the legal requirement for distance leads to a reduction in the site of O-2.2 by approx. 1.34 km². Figure 4 shows with a buffer representation of 500 m around the route, which areas of the site O-2.2 would have to be kept free accordingly.

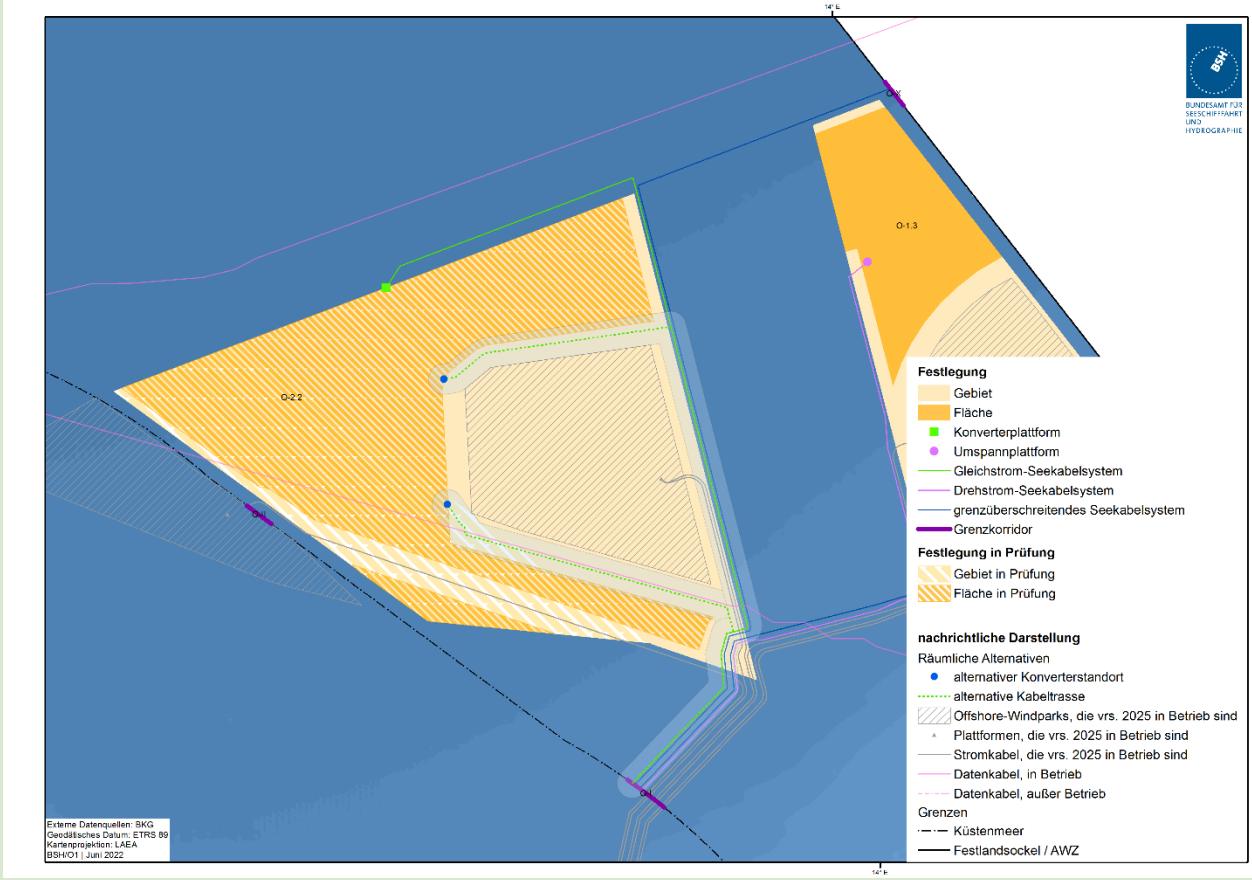

Figure 4: Location of the converter platform OST -2-4 with two alternative locations and routes

Q.3Do the consultation participants have any justified reservations about the alternative locations of the OST-2-4 converter platform shown, for example with regard to accessibility by helicopters?

Q.4Which of the locations shown should be determined, assuming a suitable building ground respectively?

2.3 Interconnectors

For the purposes of this plan, interconnectors are subsea cables which run through at least two countries bordering the North Sea or the Baltic Sea.

Several interconnectors run through the German North Sea EEZ. On the one hand, there is an operational interconnector called "NorNed", which connects Norway and the Netherlands. Furthermore, the "COBRAcable" project linking the Netherlands and Denmark is in operation. In addition, the NordLink project, a link between Norway and Germany, is in operation in the German EEZ. The "Viking Link" project linking Denmark to the UK has been approved.

Interconnectors in operation also run in the German EEZ of the Baltic Sea: "Kontek" (connecting Denmark and Germany) and "Baltic Cable" (between Sweden and Germany). Furthermore, the interconnector called "Kriegers Flak Combined Grid Solution" is in operation. This project links Denmark and Germany by connecting a Danish OWF project to a German OWF project. Table 4

presents the gates and routes for interconnectors identified in the SDP.

Table 4: Gates and routes for interconnectors identified in the SDP

Gate A	Gate B	Country A	Country B
North Sea			
Bundling point	N-VI	Germany	Norway
N-III	N-XV	Germany	UK
N-VI	N-XIV	Denmark / Norway	Netherlands
N-VI	N-XIV	Denmark / Norway	Netherlands
N-VII	N-XIII	Denmark / Norway	Netherlands
N-VIII	N-XII	Denmark	UK
NOR-1-1	N-XV	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.n.

2.4 Cross connections between installations

According to Sec. 5, paragraph 1, No. 10 WindSeeG, the SDP shall contain routes or route corridors for possible cross connections of offshore installations, grid connecting cables, and interconnectors as well as locations of converter platforms. The so-called cross connections are subsea cables that can connect the individual grid connection systems (according to the direct current (DC) or alternating current (AC) grid connection concept) and thus the OWFs with each other. They thus contribute to ensuring system security and increase feed-in security through (partial) redundancy, thereby reducing outage damage. The SDP merely ensures the spatial requirements for any cross connection. The decision on "whether" and "when" a cross connection is implemented is determined on a case-by-case basis within the framework of a damage mitigation concept to be submitted to the BNetzA by the grid operators, and is subject in particular to the condition of economic efficiency. Table 5 represents the route defined in the SDP for cross connections between installations.

Table 5: Overview of the routes defined in the SDP for cross connections between installations

Platform A	Platform B
North Sea	
NOR-9-1	NOR-9-2
NOR-9-1	NOR-21-1
NOR-9-2	NOR-9-3
NOR-9-3	NOR-10-1
NOR-10-1	NOR-12-1
NOR-12-1	NOR-11-1
NOR-11-1	NOR-11-2
NOR-11-2	NOR-13-2
NOR-13-1	NOR-13-2
NOR-12-2	NOR-13-1
NOR-14-1	NOR-15-1
NOR-15-1	NOR-17-1
NOR-16-1	NOR-16-2
NOR-16-1	NOR-18-1
NOR-18-1	NOR-20-1
NOR-17-2	NOR-20-1
NOR-19-1	NOR-19-3
NOR-19-3	NOR-19-2
Baltic Sea	
-	-

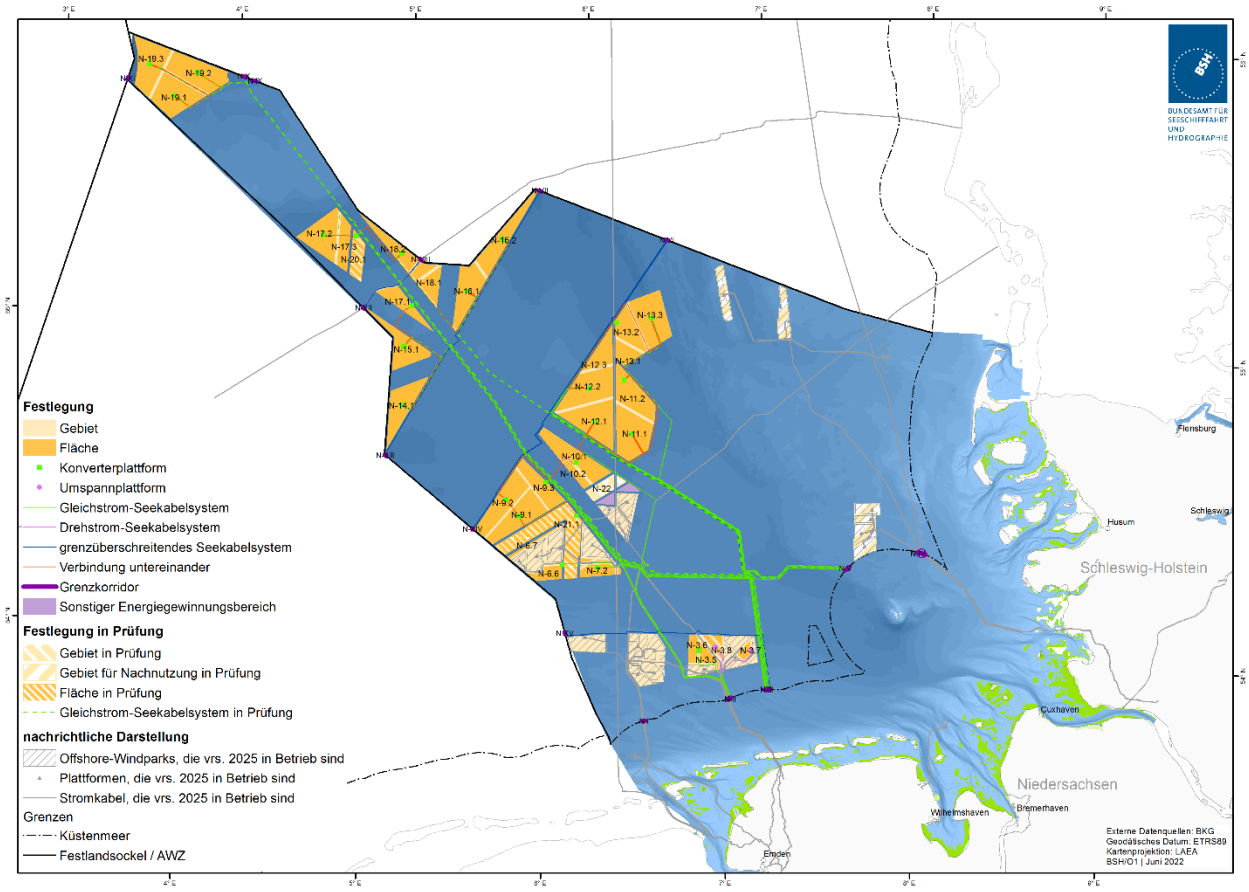

Figure 5: Specifications for subsea cables and pipelines in the EEZ of the North Sea.

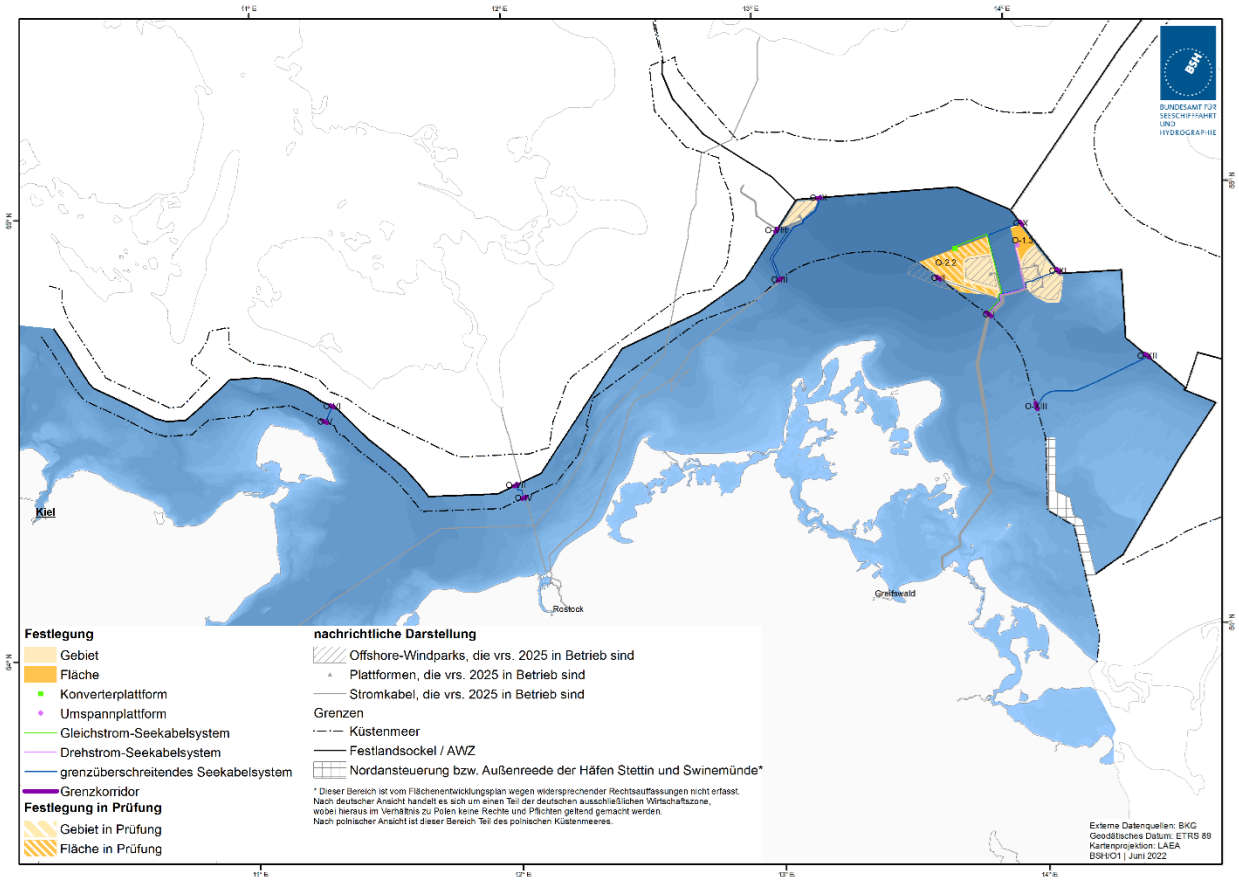

Figure 6: Specifications for subsea cables and pipelines in the EEZ of the Baltic Sea.

3 Specifications for the territorial sea

For the territorial sea, the SDP adopts the priority and reservation areas submitted by Mecklenburg-Western Pomerania as areas O-4 and O-6. Area O-5, which is defined in the Mecklenburg-Western Pomerania Regional Spatial Development Programme as a marine reservation area for wind turbines, is under review as area O-5.

No sites beyond the OWFs expected to be in operation in 2025 are identified within the areas.

A designation of the testing ground north of Warnemünde designated by the state of Mecklenburg-Western Pomerania is under consideration. The procedure for amending the SDP 2020, which was initiated with the announcement by the Federal Maritime and Hydrographic Agency (BSH) of 17.09.2021, will not be continued separately. It is included in the present revision of the SDP 2020.

No specifications are made for the territorial sea of the federal states of Lower Saxony and Schleswig-Holstein.

Questions for consultation

Testing ground and testing ground grid connection

Q.5 What year can realistically be set for the commissioning of the testing ground and testing ground grid connection?

Q.6 Is there interest in using the testing ground on the part of potential operating companies under the legal regulations?

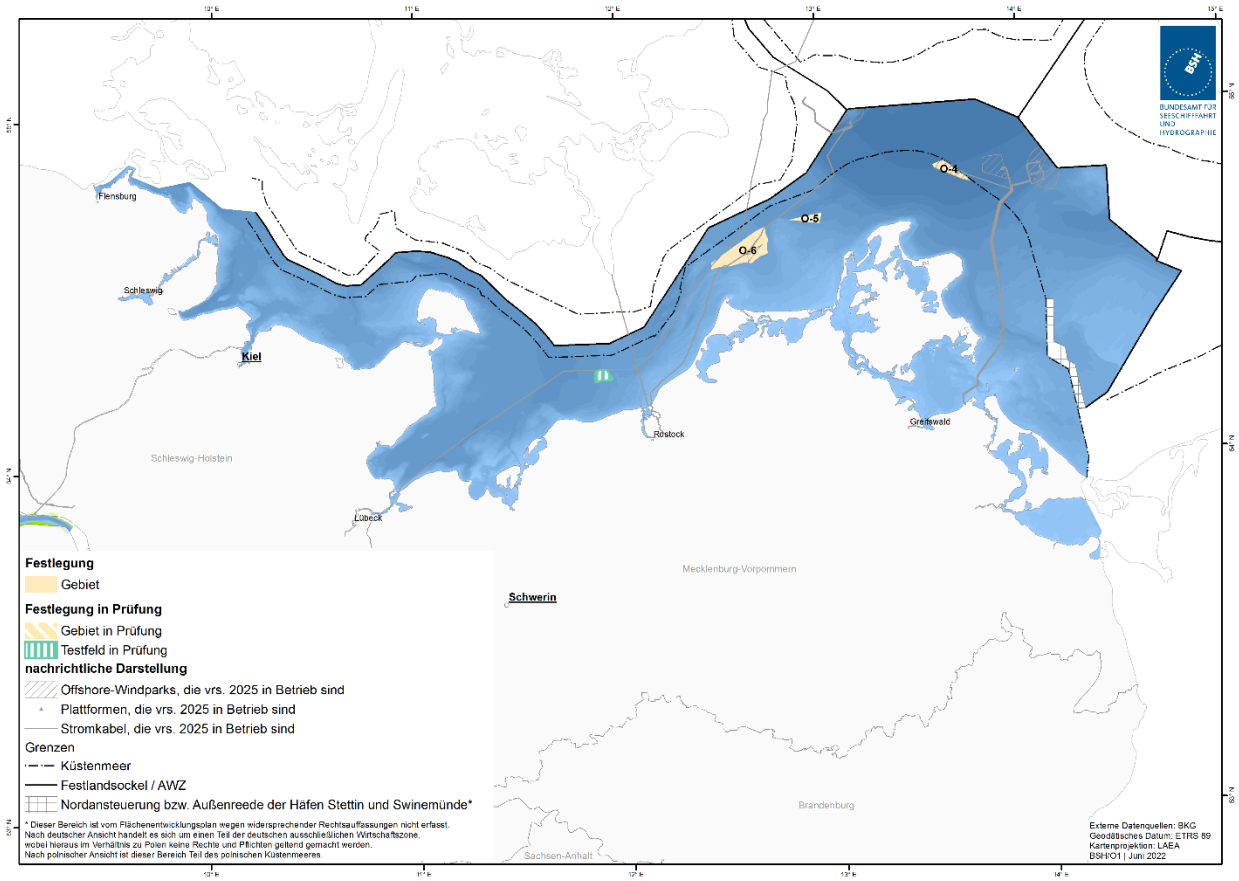

Figure 7: Determinations in the territorial sea of the Baltic Sea

4 Calendar years of tendering and commissioning

Pursuant to Sec. 5 para. 1 no. 3 WindSeeG-E, the SDP determines the chronological order in which the defined sites are put out to tender and in which quarter of the respective calendar year the wind turbines for which tenders are invited and the associated grid connection are to be commissioned.

In order to ensure synchronisation between the wind farm and the grid connection, the SDP also determines the quarter of the respective calendar year in which the interarray cabling of the wind farm to be connected must be installed in the converter platform of the TSO.

In addition to specifying the calendar years for the tendering and commissioning of sites and grid connections, the SDP will in future specify whether the tendering of the respective site is to take place within the framework of the central model with preliminary site investigation or as a site which is not centrally pre-investigated. In the latter case, a correspondingly longer period between tendering and commissioning will be taken as a basis due to the investigations to be carried out by the tendered bidder and the presumably longer duration of the required approval procedure.

Table 6 presents the specifications on the chronological order of tendering and commissioning of the specified sites and grid connection systems.

Table 6: Overview of the calendar years of tendering and commissioning for offshore wind turbines and the associated offshore grid connection systems including the respective quarters (QI - QIV) in the calendar year.

Designation of site	Tender year	Commissioning of the subsidised WT on the respective sites	Installation of interarray cabling of the subsidised WT in platform	Name of grid connection	Commissioning of grid connection
N-3.7	2021	2026 (QIII)	n/a	NOR-3-3	n/a
N-3.8	2021	2026 (QIII)	n/a		
O-1.3	2021	2026 (QIII)	2026 (QII)	OST-1-4	2026 (QIII)
N-7.2	2022	2027 (QIV)	2027 (QIII)	NOR-7-2	2027 (QIV)
N-3.5	2023	2028 (QIII)	2028 (QI)	NOR-3-2	2028 (QIII)
N-3.6	2023	2028 (QIII)	2028 (QII)		
N-6.6	2023	2028 (QIV)	2028 (QI)	NOR-6-3	2028 (QIV)
N-6.7	2023	2028 (QIV)	2028 (QII)		
N-9.1	2024	2029 (QIII)	2029 (QI-II)	NOR-9-1	2029 (QIII)
N-9.2	2024	2029 (QIII)	2029 (QI-II)	NOR-9-2	2029 (QIII)
N-9.3	2024	2029 (QIV)	2029 (QI)	NOR-9-3	2029 (QIV)
N-10.2	2025	2030 (QIV)	2030 (QII)		
N-11.1	2023*	2030 (QIII)	2030 (QI-II)	NOR-11-1	2030 (QIII)
N-12.1	2023*	2030 (QIII)	2030 (QI-II)	NOR-12-1	2030 (QIII)
N-12.2	2023*	2030 (QIV)	2030(QI-II)	NOR-12-2	2030 (QIV)
O-2.2**	2023*	2030 (QIII)	2030 (QI)	OST-2-4	2030 (QIII)
N-10.1	2025	2030 (QIII)	2030 (QI-II)	NOR-10-1	2030 (QIII)
N-11.2	2024*	2031 (QIII)	2031 (QI)	NOR-11-2	2031 (QIII)

Designation of site	Tender year	Commission-ing of the sub-sidised WT on the respective sites	Installation of in-terarray cabling of the subsidised WT in platform	Name of grid connection	Commission-ing of grid connection
N-13.1	2026	2031 (QIII)	2031 (QII)		
N-12.3	2024*	2031 (QIII)	2031 (QI)	NOR-13-1	2031 (QIII)
N-13.2	2026	2031 (QIII)	2031 (QII)		
N-14.1	2025*	2032 (QIII)	2032 (QI-II)	NOR-14-1	2032 (QIII)
N-13.3	2027	2032 (QIII)	2032 (QI-II)	NOR-13-2	2032 (QIII)
N-15.1	2026*	2033 (QIII)	2033 (QI-II)	NOR-15-1	2033 (QIII)
N-21.1**	2028	2033 (QIII)	2033 (QI-II)	NOR-21-1	2033 (QIII)
N-16.1	2029	2034 (QIII)	2034 (QI-II)	NOR-16-1	2034 (QIII)
N-17.1	2027*	2034 (QIII)	2034 (QI)	NOR-17-1	2034 (QIII)
N-18.1	2027*	2034 (QIII)	2034 (QII)		
N-16.2	2030	2035 (QIII)	2035 (QI-II)	NOR-16-2	2035 (QIII)
N-18.2	2028*	2035 (QIII)	2035 (QI-II)	NOR-18-1	2035 (QIII)
N-19.1	2031	2036 (QIII)	2036 (QI-II)	NOR-19-1	2036 (QIII)
N-17.2	2029*	2036 (QIII)	2036 (QI-II)	NOR-17-2	2036 (QIII)
N-19.2	2032	2037 (QIII)	2037 (QI-II)	NOR-19-2	2037 (QIII)
N-17.3	2030*	2037 (QIII)	2037 (QI)	NOR-20-1	2037 (QIII)
N-20.1**	2030*	2037 (QIII)	2037 (QII)		
N-19.3	2033	2038 (QIII)	2038 (QI-II)	NOR-19-3	2038 (QIII)

* These tenders are expected to be issued as tenders for sites that have not been centrally pre-investigated. The period between tendering and commissioning is extended accordingly.
** Site under review

5 Standard technical principles

Pursuant to Sec. 5 para. 1 no. 11 WindSeeG-E, standard technical principles are to be defined in the SDP for the purpose of planning. With regard to the technical grid connection concepts, a distinction was previously made in the SDP between the North Sea and the Baltic Sea. Starting with this revision, this distinction is no longer made and only one standard concept is defined for the North Sea and the Baltic Sea. Specifically, this standard concept refers to all grid connection systems defined in this plan, starting with the NOR-9-1 system. For the grid connections commissioned prior to this, up to and including NOR-6-3, there will be no update to the respective specifications in the SDP 2020.

Nevertheless, in individual cases there is still a need to deviate from the standard concept, especially in cases where the generation capacity to be connected does not permanently reach the transmission capacity of the standard concept. If such a deviation is necessary, this shall be indicated for the grid connection system concerned within the framework of the determination.

A deviation from the standard technical principles is generally not possible in order to achieve the objectives associated with the determination. This is only possible if a deviation is necessary in a justified individual case or makes sense due to new findings. In particular, due to the possible impact of a deviation on interfaces between TSO and OWF, but also due to the different planning and realisation progress, deviations must be introduced very early - before the announcement of the invitation to tender for the site(s) in question or before the awarding of contracts for the offshore grid connection system.

5.1 Standard concept - DC system

The standard concept is a direct current system.

5.2 Interface between TSO and OWF project developer

The primary interface or ownership boundary between TSO and OWF project developer is the inlet of the 66 kV subsea cables on the converter platform (cable termination of the 66 kV submarine cables).

(a) The responsibility of grid connection to the WT to the converter platform lies with the OWF project developer.
(b) The pull-in of the 66 kV subsea cables on the platform will be carried out according to the direct pull-in concept,[2] according to which the subsea cables will be routed by the OWF project developer to the gas-insulated switchgear (GIS).
(c) For the grid connection of the 66 kV submarine cable, the OWF project developer shall ensure a free usable length (from cable hang-off) of the submarine cable after direct pull-in on the platform of a maximum of 15 m. The dimensioning of the free usable length of the submarine cable required in individual cases shall be carried out according to the requirements of the TSO.
(d) Optionally, the TSO may specify the interface at a connector as a result of the platform design. In this case, the 66 kV subsea cables are routed to a plug-in connection pre-installed on the platform, which also represents the ownership boundary. The connector then forms the transition point between the in-park subsea cable system and a pre-installed platform cable connection leading up to the GIS. The OWF project developer carries out the submarine cable pull-in and termination with a suitable plug for the

[2] The direct feed procedure is defined as direct feed of the cable onto the platform up to the GIS or pre-installed connector.

pre-installed plug connection on the platform. Here, too, the maximum usable length (from cable hang-off) is 15 m to the plug connection. The TSO shall announce the concept prior to the tendering of the respective sites.

(e) The start of the quarter specified for the respective sites or grid connection systems for the installation of the interarray cabling represents the point in time from which the TSO must have completed all the necessary requirements for the installation of the in-park cabling.

(f) The installation of the interarray cabling in the TSO's platform shall be carried out by the successful bidder within the quarter specified in the SDP. The installation of the interarray cabling for all surcharged wind turbines shall be completed by the end of the quarter specified in the SDP.

(g) By the end of the quarter specified for the respective site, the TSO shall commission all associated AC cables of the interarray cabling to such an extent that a complete commissioning of all wind turbines (WT) to be connected to a site is possible.

(h) In all phases, both parties shall keep each other informed of project-relevant developments and coordinate deadlines.

5.3 Self-commutated technology

The existing grid connection systems and those planned within the framework of the SDP will be implemented in self-commutated (so-called VSC) technology.

5.4 Transmission voltage +/- 525 kV

A transmission voltage of +/- 525 kV is specified for the grid connection systems planned within the framework of the SDP.

5.5 Standard capacity 2,000 MW

A standard transmission capacity of 2,000 MW is specified for the high voltage direct current (HVDC) transmission systems.

5.6 Version with metallic return conductor

HVDC systems shall be designed as a bipolar system with a metallic return conductor for the purpose of increased reliability and improved controllability.

5.7 Connection on the converter platform / switch bays to be provided

For a connected load of 1,000 MW, 14 switchgear panels and J-tubes shall be provided and made available by the TSO. If the connected load deviates from 1,000 MW, the number of cubicles and J-Tubes to be provided changes accordingly depending on the connected load.

5.8 Requirements for cross connections / switchgear panels to be provided

To ensure a possible connection between platforms, two connection options for direct current connections and two J-tubes shall be provided on each converter platform.

5.9 66 kV direct grid connection concept

For the connection of wind turbines to the converter platform, the 66 kV direct grid connection concept shall be defined as the standard grid connection concept. The connections are made in AC technology with a transmission voltage of 66 kV.

5.10 Interconnectors: Bundled subsea cable system

Interconnectors are to be implemented in HVDC and with the highest possible transmission capacity in line with demand. The connections shall be designed with supply and return conductors, which shall be laid in bundles.

5.11 Interconnectors: Consideration of overall system

The planning and construction of interconnectors shall take into account the various provisions of this Plan, in particular for the grid connection of OWFs.

Questions for consultation

Standardised technology principle 5.9: Possible increase in voltage level

Already in the SDP 2020, an increase of the voltage level of the park-internal cables from 66 kV to, for example, 110 kV was discussed and consulted on. The result showed that no such increase would be sought in the foreseeable future. In the comments on the extended preliminary draft of the SDP of 14.04.2022, it was now suggested that an increase in the voltage level to, for example, 132 kV should be examined.

A recent project report by the Carbon Trust concludes that a voltage level of 132 kV is recommended for the development of a new standard for interarray cabling (Carbon Trust, 2022). The report shows significant cost benefits from increasing the voltage level. Due to the significant reduction in the number of required in-park cables, spatial bottlenecks can also be relieved and the impact on the marine environment reduced. The cited report recommends a changeover to the new standard as soon as possible. The technology is expected to be available from the end of the 2020s.

Q.7 Do you consider an increase in the voltage level of the interarray cabling to be reasonable in principle? In your view, would the voltage level of 132 kV be suitable for establishing a new standard?

Q.8 How do you assess the availability of the necessary technologies for increasing the voltage level of the interarray cabling to e.g. 132 kV?

Q.9 Do you consider the introduction of a corresponding standardised technology principle for grid connection systems and wind farms with commissioning from 2031 onwards to be reasonable?

6 Planning principles

According to Sec. 5 para. 1 no. 11 WindSeeG-E, the SDP contains determinations on planning principles.

The planning principles apply to the German EEZ and are based on the objectives and principles of the ROP for the German EEZ.

6.1 General principles

The following are planning principles for offshore wind turbines, platforms, subsea cables and plants for other forms of energy generation.

6.1.1 Overall time coordination of the construction and installation work

To avoid or reduce cumulative impact, overall time coordination of the construction and installation work is to be planned, taking into consideration the project-specific framework conditions.

6.1.2 No adverse effect of the safety and efficiency of shipping

The construction and operation of offshore wind turbines, platforms, submarine cables and plants for other forms of energy generation must not impair the safety and efficiency of shipping.

(a) In order to ensure the safety of shipping as well as the integrity of the installations, safety zones are established around the installations according to Sec. 74 WindSeeG - in particular in the case of adjacent priority or reservation areas for shipping. These are usually 500 m around the wind turbine, platform, or separate energy generation installation. Within the designated areas, the safety zone shall be defined such that it is contiguous and gaps are avoided. The safety zone shall be established outside the priority and reservation areas for shipping (ROP 2021).

(b) The structure shall be designed and constructed in such a way as to minimise damage to the hull in the event of a ship collision; this includes the work vehicles used in construction and operation. The requirements of the Standard Design shall be taken into account.

(c) The construction of platforms at the edge of an area as well as the development of the site shall be integrated into the overall ensemble of the development of the area in which the platform or site is located and shall be carried out in a coherent manner.

(d) In addition, in the course of conflict minimisation, shipping concerns are taken into account when choosing the routing of subsea cables (especially with regard to priority and reservation areas). The routes run as far as possible away from the main shipping routes. However, if the installation depth is sufficient, planning on the edge of those reservation areas adjacent to the OWF projects to be connected will also be considered provided that no negative impact on the routes is to be expected as a result of the laying of the subsea cables.

(e) During the installation and operation phase, appropriate measures shall be taken to ensure the safety of shipping traffic, these include, for example:

- Safeguarding measures during the construction phase including makeshift marking, buoyage and optical-mobile traffic safety (traffic safety ship),
- visual and radio-technical marking including professional implementation,
- Maritime Observation
- Provision of additional towing capacity if necessary

6.1.3 No adverse effect on the safety and ease of air traffic

The construction, operation, and deconstruction of offshore wind turbines, platforms, submarine cables, and separate energy generation installations may not adversely affect the safety and ease of air traffic.

(a) The regulations of Appendix 14 Volume II to the Convention on International Civil Aviation, as amended from time to time, shall apply to the device and operation of helicopter landing decks in the EEZ. After the entry into force of the "Standard Offshore Aviation for the German Exclusive Economic Zone"[3] (SOLF) of the Federal Ministry of Digital Affairs and Transport (BMDV), its provisions shall be adhered to.

(b) The SOLF, Part 5 of the BMDV, as amended from time to time, shall apply to the marking of aviation obstructions in the EEZ. Sec. 9 para. 8 the Renewable Energy Sources Act[4] (RESA) shall be observed.

(c) For the device, marking and operation of wind farm sites on wind turbines, the provisions of the Joint Principles of the Federal Government and the States on Wind Farm Sites on Wind Turbines (GGBL-WBF (Principles of the Federal Government and the Provinces on Wind Farm Sites on Wind Turbines)) of 18 January 2012 (Federal Gazette No. 16, p. 338) shall apply. After the entry into force of the SOLF, its provisions shall be observed. *[The SOLF is expected to be enacted before the updated SDP enters into force, in which case the reference to the Common Principles will be omitted.]*

(d) For the device, marking and operation of wind farm sites on platforms, the regulations in Chapter 7 of the International Civil Aviation Organization (ICAO) document 9261 Guide to Helidecks, as amended in 2021, to Appendix 14 Volume II to the Convention on International Civil Aviation of 7 December 1944 (BGBl. 1956 II pp. 411, 412), as last amended by the Protocols of 6 October 2016 (BGBl. 2018 II pp. 306, 307), shall apply until the entry into force of the SOLF. After the entry into force of the SOLF, its provisions shall be observed. *[The SOLF is expected to be adopted before the entry into force of the updated SDP, in which case the reference to the helipad guidance will be omitted].*

(e) Around offshore heliports (helidecks), airspace shall be established free from obstructions to permit the safe conduct of the intended operations there.

(f) Helidecks shall be prevented from becoming unusable due to the increase of obstacles in their vicinity.

(g) Obstacles along the approach and departure areas of helicopter landing decks shall be additionally equipped with tower illumination if they are also to be operated at night. Until the SOLF enters into force, the regulations pursuant to TF11 of the WSV framework for the marking of offshore installations in the version of 1 July 2019 shall be applied in this respect. After the entry into force of the SOLF, its provisions shall be observed. *[The SOLF is expected to be enacted before the updated SDP enters into force, in which case the reference to TF11 of the WSV framework will be omitted].*

[3] To be obtained after publication from the Federal Maritime and Hydrographic Agency, Bernhard-Nocht-Straße 78, 20359 Hamburg, Germany.

[4] Act on the Expansion of Renewable Energies of 21 July 2014 (Federal Law Gazette (BGBl) I p. 1066). Last amended by Art. 1 G to reduce the cost burden of the RESA surcharge and to pass on this reduction to final consumers of 23.5.2022 (BGBl. I p. 747).

(h) Approach and departure sites of helicopter landing decks should not be located beyond the boundaries of the German EEZ.

6.1.4 No adverse effect on the security of military

The construction and operation of offshore wind turbines, platforms, subsea cables, and separate energy generation installations may not adversely affect the security of military.

(a) In the course of conflict minimisation, the selection of sites for wind turbines at sea as well as platforms and plants for other forms of energy generation or the routing of subsea cables shall take into account the concerns of national defence and the alliance commitment.

(b) If the construction or operation work touches military exercise or prohibited areas, or if the use of acoustic, optical, optronic, magnetic sensor, electrical, electronic, electromagnetic or seismic measuring devices as well as unmanned underwater vehicles is planned, this shall as a rule be notified to the naval command at least 20 working days in advance, stating the coordinates of the respective area of operation as well as the period of operation. The use of measuring equipment shall also be limited to what is necessary.

(c) Wind farms and their safety zones may be navigated by Bundeswehr vehicles in accordance with the principles of good seamanship, provided that the operation and maintenance of the wind farms are not or only insignificantly impaired.

(d) Sonar transponders shall be installed at suitable corner positions of the wind farms, platforms and plants for other forms of energy generation. The arrangement and specification of the sonar transponders shall be adapted to the requirements of the Bundeswehr with regard to functionality.

(e) The Bundeswehr should be able to install and operate fixed device such as transmitters and receivers on installations for energy generation. This is subject to the proviso that the operation of military installations on installations for energy generation is necessary from a military point of view for military, and that the operation of installations for energy generation are thereby impaired as little as possible.

6.1.5 Deconstruction obligation and security deposit

After permanent cessation of use, offshore wind turbines, platforms, subsea cables, and separate energy generation installations shall be deconstructed.

(a) If possible, the devices shall be completely dismantled insofar as this is possible taking into consideration the state of the art in science and technology at the time of the decision on deconstruction.

(b) During deconstruction, the components are where possible to be reused in preference to recycling and this in turn in preference to energy recovery or, as a last resort, their certified proper disposal on land.

(c) The excavation pits created during deconstruction are to be backfilled with the material naturally occurring on site; stone packing is to be avoided.

(d) To ensure that the deconstruction obligation is fulfilled, a security deposit is to be provided prior to the start of construction up until the final deconstruction of the installations.

6.1.6 Consideration of all existing, approved and established uses.

Due regard shall be given to existing and approved pipelines and existing, approved and established subsea cables and pipelines, sites and offshore wind turbines and areas for other forms of energy generation, platforms and approved

other structures under this plan. Where subsoil conditions do not require greater distances, the following principles shall apply:

(a) In a protection zone of 500 metres on both sides of pipelines, no impact on the seabed may be undertaken as a matter of principle.

(b) A distance of 6.4.2 100 m or 200 m alternately shall be maintained from subsea cables in accordance with the explanations in principle.

(c) In principle, no wind turbines may be erected within a protection zone of 1000 metres around the location of the converter platform specified in the SDP. Exceptions to this are possible in agreement with the TSO in an area of 500 to 1000 metres around the site. Work within the entire protected area of 1000 metres may only be carried out in agreement with the TSO.

(d) In the specific selection of locations for offshore wind turbines and wind farm operator platforms as well as plants for other forms of energy generation, consideration shall be given to existing and approved uses, rights of use and other concerns worthy of protection.

(e) A distance of 500 m shall be maintained between wind turbines, platforms of the wind farm operator or other energy generation plants and subsea cables of third parties. Interarray cabling of wind farms or areas for other forms of energy generation shall be designed such that, as far as possible, existing, approved subsea cables and pipelines identified in this plan are not crossed.

(f) The planning, construction and operation of offshore wind turbines, platforms and subsea cables shall be carried out in close coordination between the TSO and the OWFs.

6.1.7 Observance of environmental and nature conservation framework conditions

Environmental and nature conservation framework conditions shall be observed in the selection of sites and routes as well as in the context of the construction, operation and deconstruction or any subsequent use planning of wind turbines, platforms, subsea cables and plants for other forms of energy generation.

6.1.8 Consideration of cultural assets

Known sites where cultural assets have been found should be taken into account when selecting a site or route. If, during the planning or construction of the wind turbines, platforms or subsea cables and plants for other forms of energy generation, previously unknown cultural assets are found on the seabed, appropriate measures must be taken for safeguarding the cultural assets.

6.1.9 Noise mitigation

The introduction of sound into the marine environment should be avoided as far as possible during the implementation of the projects.

(a) For noise mitigation, the use of alternative, low-noise forms of foundation should be considered.

(b) If wind turbines or platforms and plants for other forms of energy generation are installed by means of impulse pile driving, the use of effective technical noise mitigation measures in accordance with the state of the art in science and technology shall be provided for during the pile driving of the foundations. The noise mitigation concept of a planned project must be integrated at an early stage in the design of the foundation structure. The noise mitigation concept of the Federal Ministry for the Environment, Nature

Conservation, Nuclear Safety and Consumer Protection (BMU)[5] must be observed.

(c) In the case of pile driving, the duration of the pile driving operation, including the entanglement, shall be kept to a minimum.

(d) Blasting is generally not permitted. If blasting is unavoidable for the removal of ammunition that cannot be transported, a noise mitigation concept must be submitted to the BSH in good time beforehand.

(e) In order to avoid or reduce significant cumulative impacts, an overall temporal and spatial coordination of the pile driving work should be ordered within the framework of the subordinate approval procedure, taking into consideration the project-specific framework conditions.

6.1.10 Minimisation of scour and cable protection measures

Scour and cable protection measures must be reduced to a minimum.

6.1.11 Consideration of official standards, legal requirements or concepts

The planning, construction and operation of wind turbines, platforms, subsea cables and plants for other forms of energy generation shall take into account official standards, legal requirements and concepts as amended from time to time.

6.1.12 Emission reduction

Emissions shall be avoided or, where unavoidable, reduced.

(a) Structural installations shall be designed such that neither their construction nor their operation cause emissions that are avoidable according to the state of the art or, insofar as the generation of emissions is unavoidable due to the actions required to fulfil the safety requirements, e.g. of shipping and air traffic, cause the least possible adverse effect of the marine environment and do not generate electromagnetic waves capable of interfering with the functioning of customary navigation and communication systems as well as frequency ranges of the correction signals.

(b) The dumping and discharge of waste into the marine environment shall be prohibited except as specified in this planning principle.

(c) The corrosion protection used by the project developer for the installation must be as free of pollutants and low in emissions as possible.

(d) A closed cooling system shall be used for installation cooling, with no discharges of cooling water or other substances into the marine environment.

(e) The project developer shall in principle collect sewage water from sanitary devices, sanitation facilities, kitchens and laundries in a professional manner, transport it ashore and dispose of it there in accordance with the applicable waste management regulations.

(f) Drainage water may not exceed an oil content of 5 milligrams per litre when discharged.

(g) On helicopter landing decks, foam agents for firefighting foam production shall not contain perfluorinated and polyfluorinated chemicals.

(h) The legal requirements of Ordinance 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated

[5] Federal Ministry for Environment, Nature Conservation and Nuclear Safety, 2013. *Concept for the protection of harbour porpoises against noise pollution during the construction of offshore wind farms in the German North Sea (noise mitigation concept).* https://www.bfn.de/sites/default/files/BfN/service/Dokumente/positionspapiere/schallschutzkonzept_bmu.pdf

greenhouse gases shall be complied with. In switchgear, cooling and air-conditioning systems as well as fire protection systems, operating materials shall be used that have the lowest possible greenhouse gas potential. Where technically feasible and available, switchgear without sulphur hexafluoride (SF_6) shall be used.

(i) Diesel generators used on platforms shall be certified to the emission limits of MARPOL Appendix VI, Regulation 13, paragraph 5.1.1 or to emission standards equivalent to those defined in MARPOL Appendix VI, Regulation 13, paragraph 5.1.1. For wind turbine installations, the use of diesel generators for emergency power supply is to be avoided.

6.1.13 Consideration of sites where explosive ordnance has been found

Known sites where explosive ordnance has been found shall be taken into account when selecting the site or route. Should previously unknown explosive ordnance be found in the seabed during the planning or construction of wind turbines, platforms or subsea cables and plants for other forms of energy generation, appropriate protective measures shall be taken.

6.2 Sites and offshore wind turbines at sea as well as areas for other forms of energy generation and installations

The following are planning principles for sites, primarily for the construction and operation of offshore wind turbines and areas for other forms of energy generation and facilities. Please refer to Chapter 6.3, which defines planning principles for platforms, as well as for transformer and residential platforms. The planning principle 6.2.2 is not applicable to areas for other forms of energy generation.

6.2.1 Distances between sites relative to each other and to wind turbines

Wind turbines and plants for other forms of energy generation shall maintain a sufficient distance from wind turbines in neighbouring sites.

(a) The distance between the sites or areas for other forms of energy generation defined in the SDP relative to each other and to wind turbines of approved and existing OWFs shall in principle be at least 750 metres. For sites to be commissioned from 2030 onwards, the distance shall in principle be at least 1,000 metres.

(b) If the distance of the site defined in the SDP or of another energy generation area to the wind turbines of an adjacent wind farm in operation or in planning or other defined sites as well as areas for other forms of energy generation is less than 1,000 m, a distance of at least five times the rotor diameter to wind turbines of the adjacent wind farm shall be maintained.

(c) In the case of adjacent OWFs which are in the planning stage during the same period, proof of coordination with the respective project developer must be submitted as part of the individual project approval procedure.

(d) The construction of wind turbines is only permitted within the defined sites and that of areas for other forms of energy generation plants only in areas for other forms of energy generation.

6.2.2 Deviation of the actually installed capacity from the allocated grid connection capacity

The number of wind turbines to be installed on the site and, if applicable, any generation capacity in excess of the allocated grid connection capacity shall be determined as part of the approval procedure.

(a) In the event of a deviation of the actually installed power from the allocated grid connection capacity, the maximum permissible warming of the sediment by subsea cables must not be exceeded. Provided that the increase in installed capacity does not exceed 10% of the allocated grid connection capacity, the awarded bidder is not required to provide additional evidence of compliance with the 2C criterion (planning principle 6.4.8) for the area of the TSO's grid connecting cable.

(b) For the area of the interarray cabling, the awarded bidder must submit a heating report taking into consideration the additional installed power.

(c) The additional wind turbines are to be erected within the awarded site.

6.3 Platforms

Planning principles for platforms are listed below. Platforms usually include converter platforms, collector platforms, transformer platforms, residential platforms and other platforms located in areas or areas for other forms of energy generation.

6.3.1 Planning and public display of platforms

During planning, construction, operation and deconstruction of the platform, particular attention shall be paid to structural safety, supply and disposal, including the provision of drinking water, sewage water treatment and occupational health and safety concerns, including escape routes and means of rescue.

(a) Compliance with this planning principle shall be set out in a concept in the individual project approval procedure.

(b) The accommodation of personnel on platforms shall take place in accommodation already provided for this purpose during the planning of the platform. The subsequent installation of accommodation units which were not provided for in the concept with regard to the accommodation units already considered in the planning of the platform shall be avoided.

(c) For a platform, at least two and for the purpose of escape and rescue, independent means of access and egress shall be provided, which shall use different transport systems.

(d) On platforms, wind farm sites may be provided as rescue areas for emergencies. Their use is in principle restricted to the prevention of danger to life and limb of persons (emergency) or to necessary sovereign measures; regular access of persons to the platform by means of helicopter wind turbine operation is not permitted.

6.4 Subsea cables

The following are planning principles for subsea cables, which for the purposes of this Plan means power cable systems such as offshore grid connecting cables, interconnectors, cross connections and subsea cables for plants for other forms of energy generation.

6.4.1 Bundling

(a) When laying subsea cables, the aim is to achieve the greatest possible bundling in the sense of parallel routing.

(b) The routing should be as parallel as possible to existing structures and civil engineering works.

6.4.2 Distance for parallel laying

When laying subsea cables in parallel, a distance of 100 m must be maintained between the individual systems and a distance of 200 m after every second cable system. Here, especially in the Baltic Sea, the concrete ground conditions must be taken into account.

6.4.3 Routing through gates

(a) Subsea cables landing in Germany must always be routed through the gates N-I to N-V or O-I to O-V defined at the border to the EEZ and the 12 nmzone.

(b) Interconnectors must also pass through the gates N-VI to N-XV and O-I to O-XIII designated at the border to the EEZ and the 12 mile territorial sea zone.

(c) Interconnectors that do not land in Germany should not be routed through the N-I to N-V gates.

6.4.4 Crossing of shipping lanes

Where it is not possible to run submarine cables parallel to existing built structures, they should be routed by the shortest possible route through traffic separation zones, their continuations and the Kiel-Baltic Sea Route.

6.4.5 Crossings

Crossings are to be kept to the minimum necessary from a planning and technical point of view.

(a) Intersections of subsea cables with each other and with pipelines shall be avoided as far as possible.

(b) If intersections cannot be avoided, they shall be constructed in accordance with the state of the art and as perpendicular as possible.

(c) If both cables are newly laid, a crossing without structures should be aimed for in their planning, e.g. by laying the first system to be crossed sufficiently deep in the expected crossing area.

(d) The design of the crossing construction must be as environmentally friendly as possible, depending on the soil conditions.

(e) When planning a crossing construction, the ground conditions and the respective bending radii of the cables must be taken into account.

(f) In the case of crossings, the conditions of planned crossings are to be contractually agreed with the owners of affected, laid or approved underwater cables and pipelines.

6.4.6 Minimally disruptive cable laying procedure

In order to protect the marine environment, a cable laying procedure that is as gentle as possible should be chosen when laying subsea cables.

(a) Any anchor positions should be placed such that significant adverse effect of legally protected biotopes is avoided as far as possible.

(b) When clearing stone, avoid clearing over large areas. The clearing of individual stones must be carried out within a 20 m wide impact zone (10 m to the right and left of the route) or 30 m in curved areas. The stones shall be deposited as close as possible to their salvage site, avoiding uplift from the water body, and no more than 20 m outside the working strip within the biotopes. Area clearance and clearance outside the impact zone must be applied for separately and approved by the BSH.

(c) In the case of reef occurrences, a minimum distance of 50 m is to be maintained where this is technically possible. Please refer to Planning Principle 6.1.7.

6.4.7 Covering

When determining the permanent covering of subsea cables, it is important to take into account the concerns of the protection of the marine environment, shipping, defence, fisheries and system safety.

(a) In the North Sea EEZ, a minimum cover of 1.5 m is specified.

(b) The coverage for subsea cables in the Baltic Sea is determined in individual procedures on the basis of the comprehensive study in consultation with the Directorate-General for

Waterways and Shipping (GDWS) and with the involvement of BfN. The study and the proposed coverage of the various route segments based on it are to be submitted to the BSH with the application documents.

6.4.8 Increase of sediment temperature

When laying subsea cables, potential adverse effects on the marine environment caused by cable-induced increase of sediment temperature are to be reduced as far as possible. The so-called "2 K criterion", which defines a maximum tolerable temperature increase of the sediment by 2 degrees (Kelvin) at a sediment depth of 20 cm, is to be observed as a precautionary value for nature conservation.

(a) For this purpose, the cable system must be laid at a depth that ensures compliance with the 2 K criterion. Please refer to 6.4.7 planning principle.

(b) Proof of the expected maximum increase of sediment temperature and compliance with the 2 K criterion must be provided as part of the individual project approval procedure. The calculation of increase of sediment temperature must be carried out in accordance with the legal requirements of the supplement to the StUK4 on the benthos as a Protected asset, Table 1.7. For interconnectors, a permanent full load of the cable shall be applied for verification because of the different operating mode.

(c) Compliance with the 2-K criterion during operation is to be verified by the TSOs using model-based procedures, such as TCM II.

6.5 Deviation possibilities

The possibility of deviating from planning principles depends, among other things, on whether the planning principles are based on binding regulations from sectoral law. Deviation from the objectives according to Sec. 4 para. 1 ROG and thus the obligation to observe them in spatially significant planning via the ROP is only possible under the conditions specified therein.

With regard to existing official standards, legal requirements and concepts, the SDP does not make any new stipulations, but only refers to existing rules. Accordingly, it does not make any statements on the possibilities for deviation regulated within this framework.

Furthermore, in justified cases, it is possible to deviate from planning principles that are not based on mandatory sectoral law or which do not represent maritime spatial planning objectives. This concerns cases in which compliance cannot or can no longer be guaranteed due to special framework conditions. Furthermore, some situations are conceivable in which not all principles can be implemented at the same time, as they partly serve conflicting concerns and must therefore be balanced.

Project developers who submit an application to the BSH for the construction and operation of wind turbines at sea, including the corresponding ancillary facilities, plants for other forms of energy generation, grid connecting cables, cross connections or interconnectors, may in justified cases deviate from planning principles that are not resistant to deviation, provided that simultaneous compliance with all planning principles that are not resistant to deviation is not possible.

In an overall consideration, it is necessary that the deviation fulfils the objectives and purposes of the respective principle and of the plan pursued by the rule in an equivalent manner or does not impair them in a significant manner. The basic principles of planning must not be affected. Following the principles developed within the framework of the ROG, atypical individual cases in particular may be an indication of such possible deviations.

Questions for consultation

Planning principle 6.1.6 Consideration of all existing, approved and established uses:

F.10 Can the minimum distance of 500 m to pipelines specified in 6.1.6 (a) be reduced to a minimum necessary for construction purposes? What minimum distance would then need to be established?

7 Pilot offshore wind turbines

The grid connection capacities available for pilot offshore wind turbines under Sec. 95 para. 2 WindSeeG-E are shown in Table 7. These are free capacities on the converters or DC grid connection systems in the North Sea and the AC grid connection systems in the Baltic Sea, for which neither an unconditional grid connection commitment according to Sec. 118 para. 12 EnWG (Energy Industry Act) nor an allocation according to Sec. 17d para. 3 sentence 1 or Sec. 118 para. 19 nor a surcharge according to Sec. 23 or Sec. 34 WindSeeG-E has been granted so far.

Table 7: Grid connection capacities available for pilot offshore wind turbines

Grid connection	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-4-2 /HelWin2/beta	15 MW
NOR-6-2 /BorWin2/beta	14.4 MW
Baltic Sea	
OST-1-3	15 MW
OST-2-1	3 MW
OST-2-3	23.75 MW

In order to avoid spatial conflicts, the SDP also sets out the following legal requirements for the grid connection of pilot offshore wind turbines at sea for the area of the German EEZ:

(a) In accordance with Sec. 5 para. 2 WindSeeG-E pilot offshore wind turbines at sea may only be erected in the areas defined in the SDP.

(b) to take account of public and private concerns, the planning principles set out under 6 are to be observed.

8 Areas for other forms of energy generation

In the North Sea EEZ, the areas for other forms of energy generation SEN-1 is defined.

The identification of a pipeline route for grid connection to SEN-1 will not be undertaken as part of the SDP. If the successful bidder of SEN-1 seeks to discharge the energy produced with a pipeline, it shall be routed within the reservation areas for subsea cables and pipelines identified in the ROP 2021, if possible. The planning principles of the SDP and the objectives and principles of the ROP 2021 must be complied with. Routing the pipeline for grid connection to SEN-1 via the gates defined in the SDP at the transition to the territorial sea N-I to N-V is not permissible.

If the grid connection to SEN-1 is made via a pipeline, this must have a minimum capacity of 2 GW. The possibility of connecting other areas for other forms of energy generation by third parties must be guaranteed by the pipeline operator.

A grid connection of the SEN-1 area to the existing pipeline Europipe I is not excluded. In the case of a grid connection to the existing pipeline, the required pipeline must be planned along the shortest possible route within the areas for other forms of energy generation and crossings with own cables as well as cables of third parties must be avoided as far as possible.

No area for other forms of energy generation is defined in the EEZ of the Baltic Sea and in the territorial sea.

Table 8: Overview of the definition of areas for other forms of energy generation

Name	Position	Size	Distance to shore
SEN-1	EEZ North Sea	approx. 27.5 km²	Zone 2

Questions for consultation

Subsea cables and pipelines for the grid connection of areas for other forms of energy generation

The laying of pipelines for the grid connection of the areas for other forms of energy generation SEN-1 is now made possible in principle by the provisions of the SDP. However, routing of the subsea cables and pipelines through the gates N-I to N-V is excluded.

Q.11 Which routes can be considered from a spatial and technical point of view for a pipeline for the grid connection to SEN-1? At which points outside the gene corridors defined in the SDP are there possible transition points to the territorial sea?

Q.12 What further specifications and planning principles, including technical ones, do you consider necessary, in particular for a hydrogen pipeline and the legal requirements of a corresponding minimum capacity in the SDP?

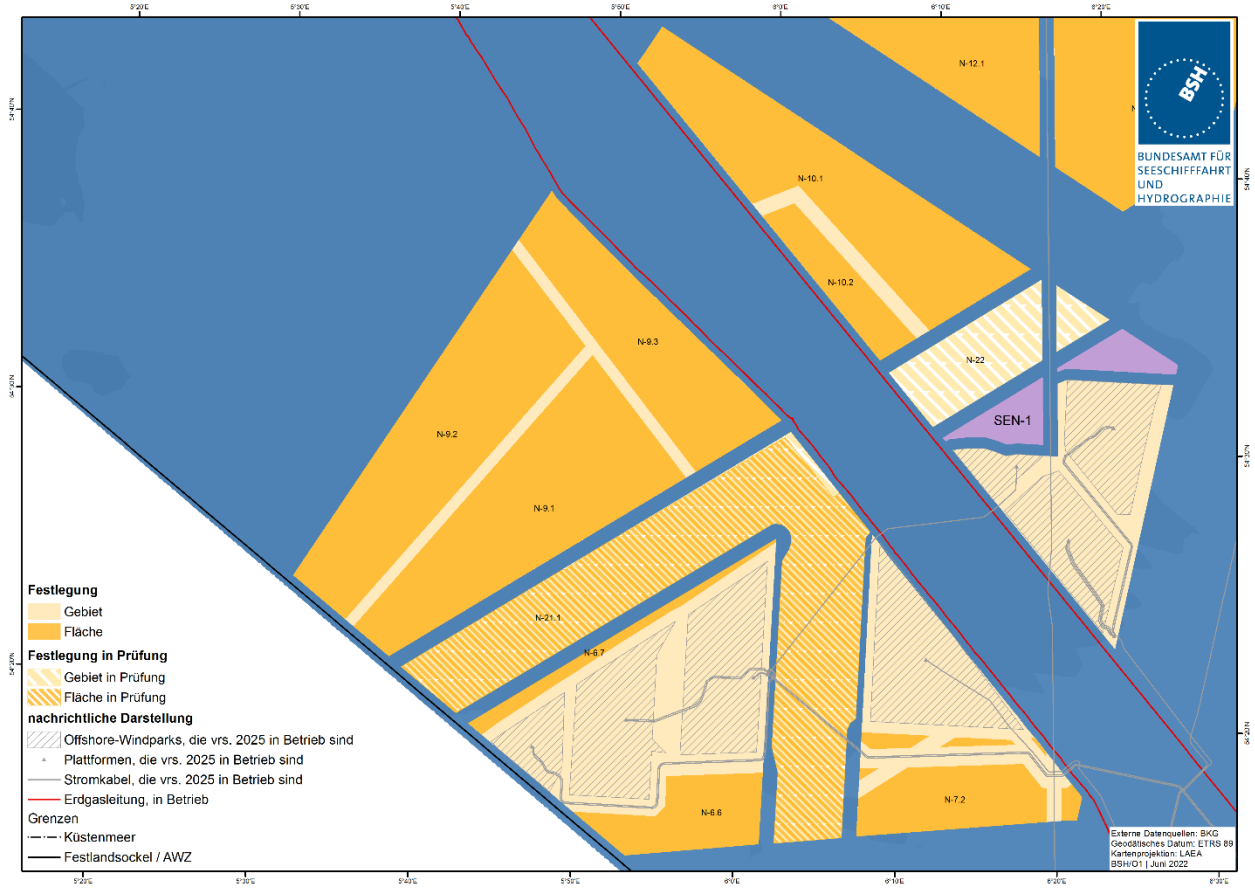

Figure 8: Area for other forms of energy generation SEN-1 in the North Sea EEZ

II. Justification

The German government's draft bill for a second law amending the Wind Energy at Sea Act and other stipulations (official publication 20/1634 of 02.05.2022) stipulates that the installed capacity of offshore wind turbines connected to the grid must be increased to a total of at least 30 gigawatts by 2030, to a total of at least 40 gigawatts by 2035 and to a total of at least 70 gigawatts by 2045 (Sec. 1 para. 2 sentence 1 WindSeeG-E).

The current SDP of 18 December 2020 specifies sites to achieve the previous expansion target of 20 GW by 2030. Within the framework of the SDP revision procedure, the already foreseeable legal innovations (in particular the increase in expansion targets) are to be implemented as simultaneously as possible at planning level. In order to achieve these targets, the additional commissioning of OWFs by 2030 is necessary.

After the BSH published the preliminary draft together with the draft of the assessment scope for the strategic environmental assessment on 17.12.2021, public bodies concerned and the public had the opportunity to comment. On 26 January 2022, an online hearing was held on the aforementioned draft documents and the joint comment of the TSOs. The subject of this hearing was also the written comments received as well as contributions from the participants. In its announcement of 14.04.2022, the BSH published an extended preliminary draft in order to consult in particular on the chronological order of the sites and grid connection systems up to the year 2031 against the background of the comment of the BNetzA. It was also possible to submit comments in this context.

The draft SDP initially maps the areas and sites that were defined as priority and reservation areas for offshore wind energy in the ROP 2021. A total of 48.7 GW of offshore wind turbines can probably be erected on the sites shown in Table 1. Including the expected expansion of 10.8 GW by 2026 and an anticipated additional potential of 1 GW in the territorial sea of Mecklenburg-Western Pomerania, this results in a total potential of approx. 60.5 GW in the North Sea and Baltic Sea. This means that there are enough sites available to achieve the targets set out in the WindSeeG-E of at least 30 GW by 2030 and at least 40 GW by 2035. In order to achieve the expansion target of at least 70 GW by 2045 specified in the WindSeeG-E, a significant amount of additional areas must be developed for the development of offshore wind energy.

The present draft is intended to be the basis for determining further tender quantities. For this purpose, the areas in zones 3 to 5 of the EEZ are divided into sites. Furthermore, it has been possible to achieve an increase in capacity by adjusting the site allocation. These measures contribute at an early stage to supporting the achievement of the increased targets for the development of offshore wind energy.

1 Areas and sites

Pursuant to Sec. 5 para. 3 no. 1 WindSeeG-E, specifications in the SDP must be consistent with the requirements of maritime spatial planning pursuant to Sec. 17 para. 1 ROG. In the context of the revision of the SDP 2020, the area specifications of the ROP 2021 for the EEZ in the North Sea (Figure 10) and in the Baltic Sea (Figure 11) are used and specified.

The ROP for the German EEZ, which came into force on 1 September 2021, defines new priority and reservation areas for offshore wind energy.

Areas EO1 to EO3 (Baltic Sea) and EN1 to EN3 and EN6 to EN13 (North Sea) are defined as priority areas for offshore wind energy in Chapter 2.2.2 (1) of the ROP 2021.

In addition, in Chapter 2.2.2 para. 2 of the ROP 2021, areas EN14 to EN19 and EN 4 and EN5 are designated as reservation areas for offshore wind energy. These are intended for safeguarding sites for the further development of offshore wind energy. Area EN20 is also designated as a reservation area. This is designated as a reservation area for offshore wind energy unless the competent federal ministry proves by a defined date that the respective area is required for other uses for compelling reasons. Please refer to Chapter 2.2.2 Principles 1 and 2 in ROP 2021.

Area O-2 includes parts of both the priority area EO2 and the conditional reservation area EO2-West defined in ROP 2021. However, the intended designation to the extent shown, as well as the expected installed capacity in site O-2.2, is dependent on the outcome of the spatial planning assessment, which results from principle 2 of Chapter 2.2.2 of ROP 2021. Area O-2 and site O-2.2 are therefore under consideration.

The reservation areas N-21 and N-22 result from the announcement by the Netherlands to close the continuation of the shipping route SN6 in the Dutch EEZ in favour of the designation of areas for the use of offshore wind energy. By implementing this project in the Dutch EEZ, there is no need to designate this shipping route within the German EEZ and parts of the route could be used for offshore wind energy. Insofar as the aforementioned areas are designated as an area, it is likely that a target deviation procedure from the ROP 2021 will have to be carried out. Against this background, site N-21.1 is designated as a site under review. Area N-22 does not offer sufficient potential for efficient development with a standard grid connection system. Therefore, no sites will be designated in this area for the time being.

Area N-20 corresponds to the conditional reservation area EN20 of the ROP 2021. The designation is therefore dependent on the outcome of the spatial planning assessment, which results from principle 2 of Chapter 2.2.2 of ROP 2021. Area N-20 and site N-20.1 are therefore under review.

As the revision of the RDP progresses, the examination of the subsequent use of site that has already been used becomes more important, with the possibility of subsequent use being assumed in principle in the priority areas defined in ROP 2021. Please refer to the explanations in this regard in the Appendix 3.

The need to examine N-4 and N-5 areas with regard to possible subsequent use is due to the fact that, according to Sec. 8 para. 3 sentence 1 WindSeeG-E, subsequent use can be determined in the context of a revision of the SDP beyond the year 2030. Up to now, the SDP has only specified areas up to and including the year 2030.

Both areas, N-4 and N-5, are largely located within the main concentration area of loons and completely within the main distribution area of harbour porpoises and thus in important habitats of strictly protected species or species groups. Due to the fact that the adverse cumulative impacts on loons are intensive and permanent according to current knowledge, the North Sea Environmental Report on the SDP 2019 concludes

that the monitoring measures should be continued and the significance of the cumulative impacts with regard to a subsequent use of the area for offshore wind energy should also be assessed in the coming years. In accordance with the Strategic Environmental Assessment, a reassessment would be indicated in the event that other nature conservation findings were to emerge in the future. At the present time, there are no new findings on nature conservation that would allow a reassessment of the subsequent use of N-4 and N-5 areas in the main concentration area of loons. It therefore remains to be identified as areas under consideration for subsequent use.

Capacity

The aim of determining the expected capacity to be installed is to ensure the development of offshore wind energy and offshore grid connection systems in synchronisation and to achieve the expansion targets for offshore wind energy. Accordingly, the required capacity of the offshore grid connecting cable is determined and the grid connection of the sites is defined. The aim is to achieve an orderly and efficient use and utilisation of offshore grid connecting cables.

By determining the expected capacity to be installed, the expected tender volume on the respective site is predetermined. In the case of centrally pre-investigated sites, the share of the respective site in the tender volume is determined on the basis of the preliminary investigation within the framework of the suitability assessment and determination of the respective site with the associated ordinance on the implementation of the Wind Energy at Sea Act (WindSeeV) pursuant to Sec. 12 para. 5 of WindSeeG-E. Therefore, the capacity to be installed determined in the preliminary site investigation may deviate from the specifications of the SDP. For the tendering of sites which are not centrally pre-investigated, the determination of the capacity expected to be installed in the SDP is decisive.

Compared to the preliminary draft of the SDP, the sizes of individual sites were increased by combining adjacent sites to a capacity of up to 2,000 MW each, insofar as this appeared possible from a spatial point of view. This is intended to improve the possibilities for cost-efficient planning, construction and operation of the wind farms and to simplify the grid connection of the wind farms. The vast majority of the consultation participants were in favour of combining the sites.

The methodology for determining the capacity was consulted extensively as part of the preparation procedure for the SDP 2020; for further background information, please refer to the SDP 2020.

For the determination of the expected installed capacity of the respective site in the context of this revision of the SDP, an assessment is made on a case-by-case basis taking into consideration the following competing objectives:

Increase in installed capacity and achievement of targets:

Pursuant to Sec. 1 para. 2 of the WindSeeG-E, the aim of the WindSeeG-E is to increase the installed capacity of offshore wind turbines in order to achieve the expansion targets. The basis for the provisions of this draft are the increased expansion targets, which envisage achieving at least 30 GW by 2030, at least 45 GW by 2035 and at least 70 GW by 2045. Against the background of the limited availability of land in the German EEZ, it must be taken into account when determining the expected capacity to be installed that these expansion targets can be achieved with the available site. In addition, the SDP makes stipulations in accordance with Sec. 4 para. 2 no. 2 WindSeeG-E with the aim, among others, of expanding electricity generation from wind turbines at sea while conserving sites. The basis for the specifications in this draft are the priority and reservation areas for offshore wind energy defined in the ROP. As is clear from the

specifications of the SDP, these are not sufficient to achieve the long-term expansion target of at least 70 GW. Nevertheless, in order to keep the need for additional potential areas as low as possible, a comparatively high power density is taken as a basis on the designated sites.

Cost efficiency:

Pursuant to Sec. 1 para. 2 sentence 2 WindSeeG-E, the development of offshore wind energy should be cost-efficient. A lower power density leads to a reduction in losses due to wake effects within and in adjacent wind farms and thus, to a certain extent, to a reduction in the electricity production costs. From the perspective of cost efficiency, a lower power density is therefore advantageous within a certain range.

In order to determine the expected annual energy generation and the influence of shading effects on the electricity yield, extensive modelling was carried out in various expansion scenarios as part of the scientific expert opinion commissioned by the BSH to accompany the revision procedure of the SDP. The current results are published together with this draft on the BSH website (Dörenkämper, et al., 2022).

The modelling results are used to check the plausibility of the power calculation; an extract of the results of the relevant scenarios is shown in Figure 9. Scenario 0 represents the current expansion status in 2021 without taking wind farms in the territorial sea into consideration. As a comparative scenario, Scenario 1 corresponds to the planning status of the SDP 2020 before implementation of the power densification in areas N-9 to N-13. In addition, OWFs currently in planning in the adjacent EEZ of the Netherlands were taken into account in the calculation (Dutch Ministry of Infrastructure and Water Management, 2021). The calculation basis for scenario 2 is the power distribution in the individual areas according to the intended specifications of the extended preliminary draft. The full load hours are used as a measure of the capacity utilisation of a wind turbine or wind farm. They represent the number of hours in a year during which the wind farm generates energy at full load.

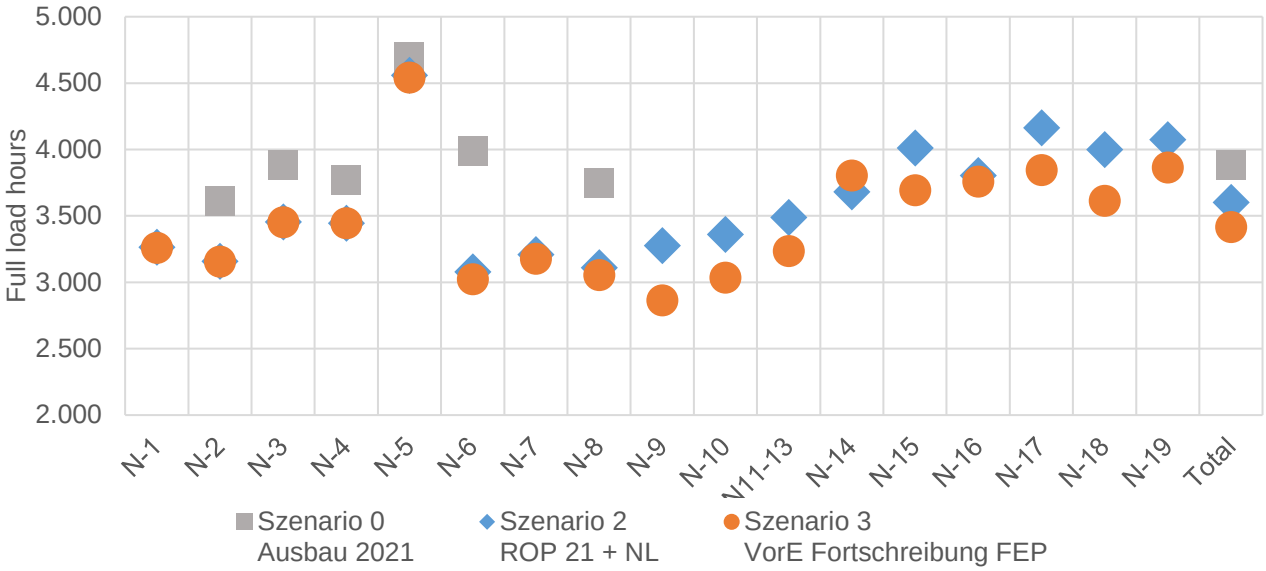

Figure 9: Utilisation of the modelled wind farms in full load hours per year in the current state of expansion (Scenario 0), in the areas of the SDP 2020 (Scenario 1) and the areas of the extended preliminary draft (Scenario 2). (Dörenkämper, et al., 2022)

The increasing development of offshore wind energy in the German and neighbouring EEZs leads to an overall reduction in the expected full load hours. Particularly in areas N-6, N-9 and N-10, there is a significant reduction in annual full load hours compared to the first interim report, in some cases to less than 3,000 h/a. On the one hand, this is due to the power compression in areas N-9 and N-10. In addition, the wake effects of the planning areas in the Netherlands have a particular impact on the potential energy yield of the areas close to the border, such as N-6 and N-9. Compared to the considered areas in zones 1 to 3, the areas in zones 4 and 5 (N-14 to N-20) show significantly higher full load hours. This is due on the one hand to better wind conditions and a more favourable upstream situation, and on the other hand to the underlying assumptions regarding turbine development, which envisage significantly more powerful turbines with larger rotor diameters for zones 4 and 5. On average across all areas, the modelled full load hours in the full development are approx. 3,400 h/a. When assessing the results, it should be noted that they were determined under the assumption of full availability of wind turbines and grid connections, and without considering electrical losses.

Efficiency of grid connection:

Pursuant to Sec. 5 para. 4 sentence 1 WindSeeG-E, the objective of determining the sites in the SDP is also the efficient use and utilisation of the offshore grid connections. Accordingly, inefficiencies, such as residual capacities on grid connection systems or cross-area grid connections, must be avoided when determining the capacity that is likely to be installed. This procedure serves in particular coordinated and systematic overall planning, and the very limited space for the routing of grid connecting cables in the territorial sea can be used efficiently. For determinations in zones 3 to 5, this means that the determination of the expected capacity to be installed is based on the standard capacity of the grid connection systems of 2 GW per grid connection system.

A plausibility check of the expected capacity to be installed is carried out on the basis of the corrected power density and the expected full load hours. These are shown in Table 9. The base is only suitable to a limited extent as an indicator of the expected capacity of a site. In addition to the size of the site, the geometry of the site and the underlying plant technology are important aspects in determining the potential output of a site. For this reason, the SDP 2020 introduced the corrected power density as a comparative value (cf. Chapter 4.7 of the SDP 2020). Here, the expected installed capacity is related to the corrected base, which supplements the defined site with a buffer strip half the width of the minimum installation spacing. This makes it possible to compare sites of different sizes and geometries. The plausibility check of the power calculation shows that the sites in areas N-9 and N-10 in particular have a comparatively high corrected power density. Combined with the influences of neighbouring wind farms, the average full load hours in this area are significantly below the average. The power density in areas N-9 and N-10 was consulted on as part of the preliminary draft and discussed in an expert workshop on 27.01.2022. The vast majority of the consultation contributions agreed that the service densification proposed in the preliminary draft was fundamentally necessary to achieve the target.

In order to outline the expansion path for the period after 2030, the SDP 2020 presented the expected installed capacity in areas N-11 to N-13 in the Appendix for information purposes. With reference to the need for further investigations into the extensive shading losses of the wind farms and the ongoing procedure for revision of the ROP in the EEZ, the possible capacity was given with a range of 8 to 10 GW. As a result of the specifications in the ROP 2021, the base of areas N-11 to N-13 has increased compared to

the specifications in the SDP 2020. Against this background, the determination of 12 GW in areas N-11 to N-13 appears possible in an overall consideration. Even if the corrected power density in areas N-11 to N-13 is comparatively low, the size of the contiguous areas still results in relatively low full load hours. A further increase in the power density in areas N-11 to N-13 is therefore not considered reasonable.

In the areas in zones 4 and 5, a comparatively high corrected power density with relatively high full load hours appears possible against the background of the modelling results of Fraunhofer IWES. The background to this is the significantly better wind conditions in the areas of the EEZ further from the coast, lower shading losses due to surrounding wind farms and the assumed technology development, which enables comparatively high full load hours with greater hub heights and rotor diameters.

Area O-2 includes parts of both the priority area EO2 and the conditional reservation area EO2-West defined in ROP 2021. However, the intended designation to the extent shown, as well as the expected installed capacity in site O-2.2, is dependent on the outcome of the spatial planning assessment, which results from principle 2 of Chapter 2.2.2 of ROP 2021.

Table 9: Plausibility check of the expected installed capacity

Designation Area	Designation Site	corrected power density [MW/km²]]
N-3	N-3.5	8.8
	N-3.6	9.9
	N-3.7	7.5
	N-3.8	9.3
N-6	N-6.6	9.6
	N-6.7	5.7
N-7	N-7.2	9.3
N-9	N-9.1	10.7
	N-9.2	10.6
	N-9.3	11.2
N-10	N-10.1	10.6
	N-10.2	10.2
N-11	N-11.1	8.9
	N-11.2	8.3
N-12	N-12.1	8.7
	N-12.2	9.1
	N-12.3	9.4
N-13	N-13.1	7.5
	N-13.2	8.6
	N-13.3	8.7
N-14	N-14.1	10.4
N-15	N-15.1	10.5
N-16	N-16.1	10.7
	N-16.2	10.3
N-17	N-17.1	8.3
	N-17.2	10.6
	N-17.3	10.4
N-18	N-18.1	12.0
	N-18.2	11.7
N-19	N-19.1	9.7
	N-19.2	9.1
	N-19.3	9.7
N-20	N-20.1	10.6
N-21	N-21.1	6.5
O-1	O-1.3	7.3
O-2	O-2.2	7.3

2 Subsea cables and pipelines

2.1 Gates to the territorial sea

The routes planned in the SDP must be able to be reasonably routed through the territorial sea to the GCP (cf. planning principle 6.4.3). For coordination with the coastal states, the gates serve as locations where the grid connecting cables cross the border between the EEZ and the territorial sea. In this way, the cable systems are to be concentrated at these points as far as possible and bundled for further routing towards the GCP. The routing in the territorial sea is not determined; this is the responsibility of other bodies in the procedures provided for this purpose. When the corridors were defined, no assessment of the further routing, for example with regard to nature conservation concerns in the territorial sea, was carried out.

The dimensioning of the gates at the transition to the territorial sea results from the distances between the cable systems and the number of required or possible systems as well as the respective space situation at the transition to the territorial sea.

With regard to the planned location of the gates, there are already strong restrictions within the EEZ due to the already approved and existing OWFs, so that the existing lack of space cannot be easily solved by specifications in this plan. In addition, existing structures, i.e. in particular cable systems and pipelines already in operation, must be taken into account, whereby the subsea cables planned for the future must fit into the existing system. At the same time, planning in the territorial sea has not yet progressed to the point where a sufficient number of routes have been identified to achieve expansion targets. Therefore, the gates in this plan are to be defined in close consultation with the coastal states.

North Sea

No further systems can be envisaged in the SDP through the gate N-I (Ems route), as this will already be fully occupied after completion of the transition system.

In gate N-II (Norderney route), seven of the twelve available routes will be occupied in 2026. Under this plan, the additionally required grid connecting cables NOR-3-2, NOR-6-3, NOR-9-1, NOR-10-1 and NOR-21-1 will be routed to this gate. The N-II gate will therefore be fully occupied when NOR-21-1 is commissioned. The restriction of only being able to commission one grid connection system per year due to the construction time window can be overcome for the two systems NOR-3-2 and NOR-6-3 with commissioning in 2028 through forward planning of the necessary work in the territorial sea.

Full utilisation of the N-II gate requires early utilisation of the N-III gate. In future, grid connection systems via the N-III gate are to be routed in the territorial sea via the two islands of Baltrum and Langeoog - subject to further testing. The total capacity of the N-III gate has not been finally determined. However, according to findings from the "Seetrassen 2030" project, a potential total of 13 systems could be derived from this corridor from a technical point of view using the methods currently available. Five of these systems would then be routed via the island of Baltrum and a further eight systems via the island of Langeoog. So far, there has only been a state planning decision for two systems via the island of Baltrum.

According to the TSOs in their comment dated 5 May 2022, the line corridor via the island of Langeoog will probably not be available for grid connection systems until 2032 at the earliest. This is justified by complex questions that would have to be clarified beforehand and, if necessary, the need to carry out a maritime spatial planning procedure for the island crossing. For this reason, the grid connection systems with gate N-III NOR-9-2, NOR-9-3, NOR-12-1,

NOR-11-2 and NOR-13-1, which have been defined up to and including 2031, are planned spatially via the island of Baltrum. Should it be possible to route grid connection systems via the island of Langeoog before commissioning in 2031, it would be necessary to modify the route corridors in parallel with Europipe 2. From a planning perspective, such an adjustment is feasible for the EEZ.

However, as two subsea cables and pipelines will have to be commissioned via the island of Baltrum in 2029, an extension of the construction window is likely to be required to carry out the necessary work. After commissioning of these five grid connection systems, the line corridor via Baltrum will be exhausted and all further grid connection systems via the N-III gate will be routed via Langeoog. The use of the Langeoog corridor with commissioning from 2029 would be positive here.

To the North Sea territorial waters of Schleswig-Holstein, gate N-V is specified south-west of area N-4. The state of Schleswig-Holstein has stated that, compared to the SDP 2020, seven further grid connection systems could probably be routed via the so-called Büsum corridor and thus via the N-V gate. However, an essential prerequisite for this is the possibility of laying cables in parallel in waterways and thus not having to cross them by the shortest route. In order to clarify this issue, a consultation with the authorities involved was initiated. Furthermore, Schleswig-Holstein has formulated the requirement for the Büsum corridor that the other grid connection systems be laid in parallel to the south of the existing cables. At the N-V gate, however, the further grid connection systems according to NOR-7-2 will be located to the north of this corridor, so that crossings of the systems in the territorial sea will be necessary for the requirement of the southern parallel position. A temporal restriction of the maximum grid connection systems per year via N-V comparable to N-II is not known.

Baltic Sea

In the area of the gate O-I, two additional grid connecting cables and two interconnectors are planned within the framework of this plan in addition to the existing systems (see Chapter 2.3).

Gate O-II is not a corridor for grid connection of OWFs through the territorial sea to the GCP in the sense of this plan. This corridor serves exclusively for grid connection of the wind farm "ARCADIS OST I" (area O-4) approved in the territorial sea.

Gate O-III is specified by the existing systems to the wind farm "EnBW Windpark Baltic 2". Three interconnectors are planned for this corridor within the framework of the SDP (see Chapter 2.3).

Gates O-IV, O-V, and O-XIII are also used exclusively for the routing of interconnectors within the framework of this plan (see Chapter 2.3).

2.2 Grid connection systems

Compared to the previous expansion target of 20 GW by 2030 and the corresponding provisions of the SDP 2020, the increase to at least 30 GW by 2030 requires the timely commissioning of additional grid connection systems. Particularly due to the long planning and implementation times, this has turned out to be one of the main challenges for achieving the expansion target.

In this context, the gates to the territorial sea and the GCP on land are again the key factors whose clarification or definition should enable the timely commissioning of the grid connection systems.

Since the publication of the preliminary draft of the SDP, a coordination process has taken place between the BNetzA and the BSH as well as the affected coastal federal states of Lower Saxony and Schleswig-Holstein and the responsible TSOs to identify suitable GCPs.

The aim of the coordination was to achieve a temporal and spatial planning of the grid connec-

tion systems that takes into account as many restrictions as possible and achieves the expansion target of at least 30 GW by 2030.

With regard to any local or temporal restrictions with reference to the GCP as well as the possibly required onshore grid expansion measures, kindly refer to the comments of the TSOs as well as those of the BNetzA.

One of the central points in the definition of the grid connection systems required by 2031 is the routing of further grid connection systems via the N-V gate to the GCP Heide West in Schleswig-Holstein. In their comment of 5 May 2022, the TSOs point out that the routing of a second system to Heide West has various advantages over the routing via gate N-III to Lower Saxony. For example, the island crossing, which is not necessary, and the relatively short onshore route would make better use of scarce market capacities and shorten the planning and implementation period. In its comment dated 06.04.2022, the BNetzA points out that due to the bottlenecks in the landside network in the Heide area, a further grid connection system to this GCP should be dispensed with for the time being. Such a second connection would lead to the risk that more than half of the total annual energy of the two grid connection systems would have to be curtailed until the commissioning of the onshore NEP measures DC 25 and DC 31. The consultation and coordination process has shown that island crossings and long onshore routes of grid connection systems entail high delay risks. Therefore, as a result of the consideration process, two grid connection systems with GCP Heide/West will be defined in 2030 with NOR-11-1 and NOR-12-2.

In addition, further boundary conditions or principles must be taken into consideration in the planning of the grid connections and their chronological order, such as minimising crossings both in the EEZ and in the territorial sea and land areas.

In their comment dated 05.05.2020, the TSOs propose to apply the DC grid connection concept with a transmission capacity of 2,000 MW also for the OST-2-4 grid connection system. It should be noted that according to the current state of affairs, site O-2.2 has an expected installed capacity of up to 1,000 MW to be installed. Further potential sites are not identifiable in the short to medium term in this area due to other uses. Specifying a transmission capacity of 2,000 MW to connect a site with a capacity of 1,000 MW to be installed would lead to vacancies on the grid connection and thus not comply with the legal requirement under Sec. 4 para. 2 no. 3 WindSeeG-E.

In the extended preliminary draft of the SDP of 14.04.2022, it was initially proposed to position the converter platforms at the edge of the site, starting with the NOR-9-1 system. However, the comments received on the extended preliminary draft show that there are various reasons for positioning them within the sites. One of the main reasons is the routing of the cables within the park to the converter platform. Particularly in the case of large sites, the length of the required cables necessitates reactive power compensation, which, according to the TSOs, cannot be carried out on the converter platform. Also, with increasing length of the cables inside the park, the losses would increase and cables with larger diameters might be necessary. It was also suggested that the voltage level of the cables inside the park be increased from 66 kV to, for example, 132 kV. Please refer to the consultation question on this.

As a result, the converter platforms will be primarily located centrally in the site. In this way, the length of the in-park cables can be minimised. When routing the lines for the corresponding grid connecting cables, the aim is to minimise site usage, so that they are generally routed at right angles from the edge of the site to the converter platform.

The further routing of the grid connecting cables is always through the reservation areas for subsea cables and pipelines defined in the ROP 2021. The routing should avoid crossings both in the EEZ and in the further course in the territorial sea. For this reason, for example, the grid connection systems for areas N-13, N-16 and N-18, which lie to the east in the North Sea EEZ, are routed to the N-V gate leading to Schleswig-Holstein.

The allocation of the defined grid connection systems to the gates is carried out in accordance with the requirement to avoid crossings, taking into consideration the restrictions relating to the gates and the land-based GCP. The latter applies in particular to the grid connection systems with a commissioning date up to and including 2031.

2.3 Interconnectors

The SDP is intended to spatially secure routes or route corridors for possible interconnectors in order to be able to ensure in future that the existing and planned interconnectors are spatially integrated into a coordinated overall system, i.e. in particular with regard to the grid connecting cables for OWFs.

North Sea

The SDP identifies seven additional interconnectors in the North Sea EEZ. Of these, two connections are planned with a landfall in Germany. One connection starts at gate N-III in Lower Saxony, the remaining connection is only defined up to a bundling point, so that the question of landfall can be clarified at a later date. In this way, a further route on the limited gates to the territorial sea can initially be kept open for grid connection systems. Starting from the bundling point, the subsea cable system runs parallel to "Europipe 2", to shipping route SN4 to shipping route SN10 and from there along the border of areas N-12 and N-13 to gate N-VI.

The other interconnector landing in Germany is the approved NeuConnect system routed to the UK. It starts at gate N-III and runs parallel to "Europipe 2" in a northerly direction to the southern edge of shipping route SN2. From there, it continues north of areas N-1, N-2 and N-3 westwards to gate N-XV. NeuConnect is routed across the N-III gate, but not across an island. For this reason, NeuConnect is not relevant for the limited capacity of 13 grid connection systems via gate N-III.

An interconnector is planned to connect the converter platform in area N-1 with neighbouring OWFs in the Netherlands. This leads from the converter platform in area N-1 westwards through connecting gate N-XV.

In addition, four other interconnectors are planned which will only cross the German EEZ and are intended to connect the Netherlands with Denmark or Norway. Three routes run on both sides of the SN10 shipping route and connect the gates N-VI and N-XIV as well as N-VII and N-XIII. One system is planned to run parallel to the "Viking Link".

Baltic Sea

In the Baltic Sea EEZ, eight routes for interconnectors will be specified, connecting the German territorial sea with the Danish and Swedish EEZs. One system each is planned in the area of the Fehmarn Belt crossing (O-V to O-VI) and parallel to "Kontek" (O-IV to O-VII). Another system to Denmark leads from connecting gate O-III to connecting gate O-VIII. Likewise, two systems start at connecting gate O-III, and travel towards Sweden, running towards connecting gate O-IX parallel to the "EnBW Windpark Baltic 2" wind farm. These are planned in the area of the "EnBW Windpark Baltic 2" wind farm with a reduced distance of 350 m and 450 m respectively to the wind farm, in order to affect the overlaying submarine diving area as little as possible. From connecting gate O-I, two interconnectors are also planned in the direction of Bornholm, which

will run parallel to the existing grid connecting cables to connecting gates O-X and O-XI. With regard to connecting gate O-X, it is pointed out that it is located on the edge of a submarine diving area and that, for reasons of military security, a route must also be followed in the Danish area that is outside this NATO exercise area.

A further system is planned parallel to "Nord-Stream 1" or between "NordStream 1" and "Nord-Stream 2" and connects the connecting gates O-XII and O-XIII.

A route from Poland to Denmark does not seem possible at the moment due to existing restrictions within the German EEZ.

The TSOs proposed in their comment of 05.05.2022 that further route corridors for interconnectors in the Baltic Sea EEZ should be defined. Different variants for such connections are available both to Sweden and Denmark.

2.4 Cross connections between installations

The spatial requirements for cross connections shall be ensured for new grid connections from zone 3 onwards, starting with grid connection NOR-9-1. Please refer to Chapter 5.11 of the SDP 2020 for the justification of the waiver of cross connections in Zones 1 and 2. With a view to possible subsequent uses in these zones, connections to these platforms may also be resumed in the future.

Contrary to the previous stipulations in the SDP 2020, it is now assumed that cross connections will be implemented using direct current technology in the future. Current platform concepts of the TSOs provide for these possibilities; in addition, so-called multi-terminal converters are to be increasingly used, which allow a connection to further converters. Since one route is sufficient for DC connections, the required route site for cross connections is reduced. The cross connections on the converter platforms are drawn in accordingly on the DC side of the platform. When determining the route corridors for cross connections, the adverse effect on site should be as low as possible.

North Sea

In the North Sea, starting with the NOR-9-1 grid connection system in Zone 3, all platforms should in principle have the option of up to two cross connections. As a result, the intended specifications can create the prerequisite that all platforms in Zone 3 of the North Sea can be connected. In addition, cross connections are also envisaged in zones 4 and 5, although a connection between the zones has not yet been spatially defined.

In their joint statement of 05.05.2022, the TSOs propose to make the cross connection more flexible and to provide for additional train route sites. This cannot be complied with, as any spatial designation restricts other uses and in particular the sites to be connected. The aim should therefore be to identify and overcome any obstacles to connections due to different platform concepts at an early stage. Connections only between platforms of the same TSO do not seem appropriate.

Baltic Sea

For the additional grid connection system OST-2-4 in the Baltic Sea, no connection to another platform is planned. Since all neighbouring platforms in the area are implemented using AC grid connection concept, a connection to the platform OST-2-4, which is planned as a direct current system, can only be realised with a high technical effort.

3 Specifications for the territorial sea

Pursuant to Sec. 4 para. 1 sentence 2 of WindSeeG-E, the SDP may also make sectoral planning specifications for areas, sites, the chronological order of the tendering of sites, the calendar years of commissioning and the expected installed capacity, as well as for testing grounds and areas for other forms of energy generation for the territorial sea. According to an administrative agreement[6] between the Federal Government, represented by the BSH, and the competent state, the individual designations for the territorial waters are determined in more detail.

Pursuant to Sec. 4 para. 1 sentence 4 WindSeeG-E, the federal state shall provide the BSH with the information and documents required in each case, including those required for the strategic environmental assessment.

Pursuant to the Administrative Agreement, determinations for the territorial sea shall not include

- the locations for converter platforms, collector platforms and transformer stations,
- routes or route corridors for offshore grid connecting cables, for interconnectors or for possible cross connections between the installations, routes and route corridors, as well as
- determinations of locations where the offshore grid connecting cables cross the boundary between the exclusive economic zone and the territorial sea and
- standard technical principles and planning principles pursuant to Sec. 5 para. 1 nos. 6 to 11 WindSeeG-E.

The corresponding technical and spatial requirements are the subject of the planning and individual project approval procedures within the jurisdiction of the Land.

An administrative agreement was already concluded between the federal government, represented by the BSH, and the state of Mecklenburg-Western Pomerania as part of the process of preparing the SDP 2019.

For the states of Lower Saxony and Schleswig-Holstein, an administrative agreement is currently out of the question. Therefore, no designations are made in the territorial sea of these federal states.

Areas and sites for the construction and operation of offshore wind turbines

The marine priority areas for wind turbines designated by the Land of M-V in the Mecklenburg-Western Pomerania spatial development programme (LEP M-V) of 09.06.2016 are adopted as areas in the SDP.

The marine reservation area for wind turbines is adopted with the status "under review" due to a required maritime spatial planning procedure.

Within the areas, due to the lack of actual availability of site, which includes freedom of rights, no sites are designated for the construction and operation of offshore wind turbines connected to the grid (Sec. 5 para. 1 no. 2 WindSeeG-E).

Testing ground and testing ground grid connection

Pursuant to Sec. 5 para. 2 sentence 1 no. 1 lit. a of WindSeeG-E, the SDP may define coastal testing grounds outside areas for a total of up to 40 square kilometres.

According to Sec. 3 no. 9 of WindSeeG-E, testing grounds are areas in the EEZ and in the territorial sea in which pilot offshore wind turbines

[6] Available at: https://www.bsh.de/DE/THEMEN/Offshore/Meeresfachplanung/Flaechenentwicklungsplan/_Anlagen/Downloads/FEP/Flaechenentwicklungsplan_Verwaltungsvereinbarung_BSH_Mecklenburg_Vorpommern.html?nn=1653366

connected to the grid are to be erected in a spatial context exclusively and which are to be connected jointly via a testing ground grid connection.

Pursuant to Sec. 3 no. 10 WindSeeG-E, a "testing ground-grid connection" is a testing ground grid connection within the meaning of Sec. 12b para. 1 sentence 4 no. 7 EnWG. According to this, the NEP also contains measures that are required for a grid connection of testing grounds. Furthermore, pursuant to Sec. 5 subsection 2 sentence 1 no. 1b WindSeeG-E, the NEP may specify the calendar years in which pilot offshore wind turbines and the corresponding testing ground grid connection are to be commissioned for the first time on the specified testing ground and, pursuant to Sec. 5 subsection 2 sentence 1 no. 1c WindSeeG-E, the capacity of the corresponding testing ground grid connection.

Pursuant to Sec. 118 para. 26 EnWG, the NDP pursuant to Sec. 12b EnWG shall require a maximum of one testing ground grid connection with a connection capacity of a maximum of 300 MW by 31 December 2023.

Pursuant to Sec. 5 subsection no. 2 sentence 2 nos. 1 to 3 WindSeeG-E, the SDP may also specify, inter alia, the following:

- Spatial legal requirements for the construction of pilot offshore wind turbines in areas and in testing grounds,
- technical conditions of the testing ground grid connection.

According to information from the state of Mecklenburg-Western Pomerania dated 26.07 2021, a spatially modified testing ground compared to the LEP M-V 2016 is designated in the territorial sea northwest of Warnemünde.

The questions raised by consultation participants during the preparation of the SDP 2020 on the issue of shipping at that time were resolved by means of a compromise within the framework of the procedure of the state of Mecklenburg-Western Pomerania there.

The state of Mecklenburg-Western Pomerania submitted the modified layout for the testing ground to the BSH. The state of Mecklenburg-Western Pomerania proposed 2026 as the year of commissioning for the testing ground and the testing ground grid connection. The expected installed capacity is stated to be 180 MW.

On the basis of the letter from the state of Mecklenburg-Western Pomerania, the BSH initiated a procedure for amending the SDP 2020 in a notice dated 17 September 2021.

In the amendment procedure, it was not possible to clarify the outstanding issue of the commissioning year in particular. Rather, in the comments received, doubts were expressed by various parties regarding the use of the testing ground under the current legal framework conditions and regarding the commissioning year 2026.

The testing ground and the required testing ground grid connection therefore remain in the "under review" status due to open questions. The procedure for amending the SDP 2020 with regard to the testing ground in the territorial sea of the State of M-V was combined with the present procedure for amendment and revision of the SDP, which was announced on 17 December 2021 (cf. Public notification of the BSH on the combination of the amendment procedure with the revision procedure of the SDP of 1 July 2022).

[The remaining open points are to be clarified as far as possible in the present procedure. Please refer to the consultation questions on the testing ground and the testing ground grid connection in the territorial sea of Mecklenburg-Western Pomerania].

4 Calendar years of tendering and commissioning

Sec. 5 para. 4 WindSeeG-E specifies the criteria to be applied in determining the sites in the SDP and the chronological order in which they are put out to tender. The overall objective of the specifications is to ensure that the expansion of offshore wind turbines and the associated grid connection systems on these sites is carried out in parallel and that the existing grid connections are used efficiently and at full capacity. This will ensure that all offshore wind turbines are connected in time and unused capacity on the grid connections is avoided. In this way, the development of the use of wind energy will be carried out as cost-efficiently as possible. When applying the criteria listed in Sec. 5 para. 4 sentence 2 WindSeeG-E, this objective as well as the general objective of the Act to ensure a steady and cost-efficient development of the use of offshore wind energy shall always be taken into account. The list in Sec. 5 para. 4 sentence 2 WindSeeG-E is not exhaustive.

For a detailed description of the criteria and their application, please refer to segment 4.8 of the SDP 2020.

Between the calendar year of the invitation to tender for a site and the calendar year of commissioning of the offshore wind turbines awarded on this site, there must be at least as many months as necessary to ensure that the implementation deadlines pursuant to Sec. 81 WindSeeG-E can be met.

The basis for determining the chronological order of the sites and grid connections is firstly the achievement of the expansion targets pursuant to Sec. 1 subsection 2 sentence 1 WindSeeG-E. In addition, Sec. 2a para. 1 WindSeeG-E stipulates how high the tender volume should be in the individual calendar years.

With the specified chronological order of tendering and commissioning, the expansion target of 30 GW by 2030 can be achieved. The chronological order of the specifications with commissioning from 2031 is based on the specified tender volumes in Sec. 2a para. 1 WindSeeG-E, which means that the expansion target of 40 GW by 2035 is significantly exceeded. The chronological order of sites and grid connections is determined up to and including the year of commissioning in 2038. The achievement of the long-term expansion target of 70 GW by 2045 cannot therefore be guaranteed with the defined sites. This requires the identification of further areas and sites for the development of offshore wind energy.

In accordance with Sec. 5 para. 1 no. 3 of WindSeeG-E, the SDP must also determine whether the respective site is to be centrally pre-surveyed and tendered in accordance with Part 3 section 4 WindSeeG-E or whether a tendering procedure is to be carried out for sites not centrally pre-investigated in accordance with Part 3 segment 5 WindSeeG-E. Pursuant to Sec. 2a para. 2 WindSeeG-E, the tender volume is to be divided equally between centrally pre-surveyed and non-centrally pre-investigated sites. For the additional sites required to achieve the increased expansion target of 30 GW by 2030, the proportion of non-pre-investigated sites is higher.

The calendar years of commissioning for grid connection systems and sites are determined on the basis of the BNetzA's statement on the preliminary draft of the SDP of 6 April 2022. This statement shows the possible calendar years of commissioning for the grid connection systems with commissioning until 2031. Compared to the presentation in the extended preliminary draft of the SDP of 14.04.2022, there are updates in the allocation of the GCP, but not in the definition of the calendar years of commissioning.

For the grid connection systems from the year of commissioning 2032 onwards, there is not yet any reliable information available for probable GCPs. Corresponding findings from the ongoing

grid development plan procedure may thus have an impact on the chronological order of the sites and grid connection systems.

Pursuant to Sec. 5 para. 1 no. 4 WindSeeG-E, the SDP shall determine the calendar years, including the quarter in the respective calendar year, in which the offshore wind turbines at the sea and the corresponding grid connection are to be commissioned on the specified sites, as well as the quarters in the respective calendar year in which the cables of the interarray cabling of the sited offshore wind turbines are to be connected to the converter or the transformer platform. In addition, the SDP may specify essential intermediate steps for the joint implementation schedule pursuant to Sec. 17d para. 2 EnWG.

As part of the consultation of SDP 2020, the interaction of the commissioning of the grid connection and the commissioning of the offshore wind turbines was consulted on. Against this background, if two sites are connected to a grid connection, the first or second quarter is usually determined. If only one site is connected to the converter platform, the period for cable installation is generally set to the first and second quarter of the respective calendar year. In the case of the NOR-3-3 grid connection system, the offshore wind turbines for which a bid has been submitted are not connected directly to the converter platform, but via a transformer platform of the future OWF project developer. Accordingly, no quarter is specified for the installation of the interarray cabling for the corresponding sites. The different definition of the third quarter for the NOR-7-2 grid connection system results from the advanced planning status for the grid connection system, which envisages installation of the converter platform up to and including the second quarter of 2027. Consequently, the installation of the interarray cabling can only take place in the third quarter of 2027.

Pursuant to Sec. 5 para. 1 no. 4 WindSeeG-E, the SDP specifies the respective quarter in the calendar year for sites and grid connection systems in addition to the calendar year of commissioning. The question of which quarter of the respective calendar year the grid connection can be commissioned as early as possible was discussed extensively during the consultation on the draft SDP 2020. Against this background, the third quarter of the respective calendar year is generally determined for the commissioning of the offshore grid connection. Pursuant to Sec. 17 d para. 2 sentence 1 EnWG, the TSO with connection obligations commissions the offshore grid connection in good time so that the completion dates fall within the calendar years specified in the SDP for this purpose, including the quarter in the respective calendar year.

In deviation from this, the quarter of commissioning for the NOR-7-2 grid connection system is set for the fourth quarter of the corresponding calendar year. This is due to the advanced planning stage of this grid connection system.

Based on the comments of the TSOs in their joint statement of 5 May 2022, the commissioning of the grid connection systems in the years 2028 to 2030 is divided between the third and fourth quarters if a TSO commissions more than one grid connection system in a year. Beginning with the year of commissioning 2031, the third quarter shall in principle be determined for commissioning.

5 Standard technical principles

The strategic planning of the expansion of offshore wind energy and the associated grid topology for the transmission of electricity is of enormous importance for the supply of renewable energy. With the increase in different uses in the German EEZ, the space available for future uses and infrastructure is becoming increasingly scarce.

In the interests of systematic and efficient planning, the BSH was given the statutory mandate to designate areas and sites for offshore wind energy, as well as corresponding routes and locations for the necessary network topology. As a result of this coordinated process, the measures in the German EEZ are defined in a spatially and temporally binding manner.

Due to the temporally different planning and realisation progress of the offshore grid connection and the OWF or the site that is put out to tender, a deviation from the standard technical principles is generally not possible. Otherwise, major impacts, for example on the interfaces between the TSO and the OWF developer, could only result at a very late stage, for example after the site has been put out to tender.

5.1 Standard concept - DC system

In principle, the route length for connecting a site or area to the onshore GCP appears to be decisive for the selection of the appropriate transmission technology for the grid connection of OWFs. For route lengths of more than 100 km, additional devices for power factor correction must regularly be provided for AC connections. The transmission losses also increase with the length of the cable system. With HVDC transmission, these losses are significantly lower. For the EEZ, route lengths of more than 100 km are required, and with increasing distance from the coast, significantly more.

Compared to a grid connection using AC technology, HVDC requires a significantly smaller number of cable systems for the same transmission capacity and thus reduces the area required for the cable systems.

5.2 Interface between TSO and OWF project developer

It is foreseeable that with the 66 kV direct connection concept there is an increased need for coordination in the preparation and implementation of the respective individual project approval procedures. Due to the joint use of the converter platform as a result of the interface between the TSO and the OWF project developer at the entrance to the 66 kV subsea cables, there is a need for close coordination and clear responsibility for tasks in the planning, construction, operation, servicing and maintenance, possible repair and deconstruction between the TSO and the OWF project developer and, if necessary, between different OWF project developers who connect their offshore wind turbines to the same converter platform. For the parties involved, there is an absolute need for cooperative collaboration. This applies in particular to the exchange of information on project deadlines, the mutual transfer of necessary information and details on the platform and the components to be installed on it. Please refer to the implementation schedule pursuant to Sec. 17d para. 2 EnWG.

It is pointed out that the joint use of the converter platform by the OWF project developer only includes the joint use necessary due to the technical interface on the converter platform. Accordingly, the OWF project developer must be in a position to carry out the measures required for the grid connection on the converter platform in good time. On the other hand, the TSO must coordinate and carry out the measures necessary for preparing the grid connection with the OWF project developer in good time. A separate platform of the OWF project developer for housing and maintenance purposes might be required due to this.

5.3 Self-commutated technology

This variant was already defined as standard in the spatial offshore grid plan for North Sea (BFO-N) and can be described as established.

In contrast to the classic, grid-guided technology, self-commutated HVDC can reconstruct a grid without having to provide reactive power from the connected alternating system. This feature is necessary to rebuild the transmission independently after a grid fault, to control it during normal operation and to stabilise the surrounding alternating grid. Please refer to segment 5.1.2.2 of the BFO-N 16/17 for further justification on the definition of self-guided technology.

5.4 Transmission voltage +/- 525 kV

The definition of a uniform voltage level for DC systems (consisting of the converter on the converter platform, the DC subsea cable system and the converter on shore) serves to create a standard for the grid connection systems, specifically also for the converter platform. Based on the definition of framework parameters, manufacturers and grid operators can develop standardised solutions and, in the long term, advance planning at an early stage - if necessary also independently of location. The aim is to achieve a certain degree of standardisation in the planning of the plants through standardising legal requirements and thus to accelerate the planning process, achieve planning security for grid and wind farm operators as well as suppliers and reduce costs. A uniform voltage level also prepares for a possible cross connections of offshore grid connections to each other.

In order to enable the most spatially compatible planning and implementation of cross connections between the offshore grid connections, the aim is to achieve the highest possible output from the DC system and therefore also the highest possible system voltage. So far, a manufacturer-independent transmission voltage standard of +/- 320 kV has developed on the market. Limitations of the power result mainly from the available cable technology as well as the space requirements of the converter platform.

Due to the possibility of increasing the power to be transmitted with a higher voltage level and thus making grid connection systems more efficient, it is necessary to reduce the number of systems as far as possible and to maximise their respective transmission capacity in view of the large contiguous sites in Zone 3 of the North Sea EEZ and the strong spatial restrictions on the routing of grid connecting cables.

In the consultations on the preparation procedure of the SDP 2019, the issue of technology availability of offshore grid connection systems with a transmission voltage of +/- 525 kV was addressed. In summary, the comments received indicated that the technology is expected to be available from around 2030. The 3rd interim report of the research commission accompanying the SDP until the end of 2020 also came to a comparable conclusion. The TSOs initially pointed out in their joint comment on the second draft of the SDP 2019 that a realisation in 2029 was "not feasible" and a realisation in 2030 was "critical". However, in the context of the confirmation of the NEP 2019-2030, it has become clear that this is possible and necessary to achieve the previous expansion target of 20 GW by 2030. In an agreement signed between the federal government, the coastal federal states and the transmission system operators 50Hertz, Amprion and TenneT to implement 20 GW of offshore wind energy by 2030, it was also considered necessary to commission the first offshore grid connection system with a transmission voltage of +/- 525 kV in 2029 (Bundesministerium für Wirtschaft und Energie, 2020).

5.5 Standard capacity 2,000 MW

The definition of a standardised transmission capacity of the direct current grid connection systems formed the central basis for spatial planning in the BFO-N. Based on a standard capacity

of 900 MW, the spatial requirements for the transmission of the installed wind power capacity were determined.

A standard capacity is also defined in the SDP. In view of the areas and sites in Zone 3, it seems sensible to specify the highest possible standard capacity in order to minimise the number of, and thus the site required for, converter platforms and routes for dissipating the wind energy capacity.

In the preparation procedure for the SDP 2019, the TSOs indicated that the transmission capacity of +/- 525 kV HVDC grid connection systems is limited to less than 2,000 MW if the maximum permissible sediment heating (2 K criterion, cf. planning principle 4.4.4.8 of the SDP 2020) is observed. A corresponding review with heating calculations was carried out as part of an accompanying scientific research commission by the BSH. According to this, the transmission of 2,000 MW with cable cross-sections already in use today in the EEZ appears to be possible in compliance with the 2 K criterion. Due to increased nature conservation requirements in the territorial waters of the North Sea, further measures may be necessary in these areas to comply with the 2 K criterion (Federal Ministry for Economic Affairs and Energy, 2020). However, a transmission of 2,000 MW in compliance with the 2 K criterion is also possible in territorial sea areas. Please refer to the aforementioned agreement of 11 May 2020 in this regard. (Bundesministerium für Wirtschaft und Energie, 2020).

Based on current knowledge, it is assumed that the DC connection concept with a transmission capacity of 2,000 MW will be applied in the long term. There are also numerous other projects with this grid connection concept outside the German EEZ. Although a further increase in transmission capacity seems conceivable, according to the TSOs there are currently no concrete efforts to do so. In addition, the possibility of connecting converter platforms on the DC side only makes sense if the same voltage level is used - in this case +/- 525 kV. Nevertheless, the possibility of increasing the transmission capacity is still being examined by the BSH, also with a view to the potential for easing spatial bottlenecks in this respect.

5.6 Version with metallic return conductor

With the help of this design, in the event of failure or unavailability of one pole, the system can be operated with the remaining pole as a monopole, which allows at least a transmission of a maximum of 50% of the transmission power. With the design as a bipole with metallic return conductor, in contrast to the DC grid connection systems laid in the North Sea EEZ to date, an additional cable is required, so that three cable systems have to be laid in a bundle.

If the design with metallic return conductor is no longer planned within the framework of technical developments, this can be introduced within the framework of a revision of the Site Development Plan.

5.7 Connection on the converter platform / switch bays to be provided

For the connection of OWFs to a converter platform, the responsible TSO shall provide switchgear panels and J-Tubes. The number of cubicles and J-Tubes is determined depending on the connected load. Based on 14 switchgear panels and J-Tubes per 1,000 MW connected load, there are e.g. 7 switchgear panels and J-Tubes for 500 MW or 28 switchgear panels and J-Tubes for a connected load of 2,000 MW, which serve to connect OWFs. Accordingly, the number of switchgear panels and J-Tubes is determined in the event of a deviation from the standard concept depending on the connected load.

For the grid connection systems already specified in the SDP 2020 up to and including NOR-6-3, kindly refer to the specifications there.

The number of J-tubes and switchgear panels available for the connection of OWFs to a converter platform are often the subject of coordination between the OWF project developer and the responsible TSO. For the purpose of long-term standardisation and equal treatment, it is advisable to define the J-tubes and cubicles available for a specific connected load in the SDP at an early stage.

Deviations from the specifications can be made by agreement between the responsible TSO and the project developer of the respective OWF, taking into consideration the grid connection rules. If the OWP project developer does not fully utilise the specified number, another OWF project developer whose site or awarded WT will be connected to the same platform may use these unused cubicles or J-tubes for connection in agreement with the responsible TSO.

5.8 Requirements for cross connection / switchgear panels to be provided

The SDP makes spatial designations for connections between converter platforms, kindly refer to Chapter 2.4.

Cross connections can contribute to ensuring system reliability. In principle, the grid connecting cables can be connected by alternating or direct current systems. For the first time, cross connections are defined in this SDP under the assumption of a DC connection. According to the TSOs, the converter platforms from zone 3 onwards should fulfil the technical requirements for such connections.

In order to be able to use these connections and pull in associated submarine cables on the converter platform, the corresponding technical prerequisites are to be created (in particular sufficient J-tubes).

5.9 66 kV direct connection concept

By defining the direct connection concept, the transformer platform and the 155 kV or 220 kV intermediate voltage level between the transformer and converter platform are no longer required. From the converter platform, a grid connection to the onshore GCP is made by means of DC transmission. However, despite the possible omission of a transformer platform, a separate platform may be required for maintenance and accommodation purposes of the OWF.

The suitable transmission technology for the connections between the converter platform and the OWF basically depends on the route length between the converter platform and the WTs to be connected. For the EEZ, route lengths of around 20 km have frequently been observed to date. The losses and the need for reactive power compensation increase with greater distances and the resulting longer cable lengths. In addition, the space requirement increases with the length of the cable system due to the possible need for reactive power compensation. In connection with the cost differences between DC and AC cable systems indicated in the NEP 2019-2030, a central location of the converter platform with the shortest possible three-phase lines should therefore be aimed for.

In the long term, it seems conceivable to increase the voltage level of the direct connection concept, for example to 132 kV. Particularly in the case of large contiguous sites in combination with the standard transmission capacity of 2,000 MW and future wind turbines with a correspondingly higher nominal capacity, a reduction in the required subsea cables would appear to be expedient. However, the direct connection of wind turbines with a voltage greater than 66 kV required for this would have to be examined. Please refer to the relevant consultation question and the recently published report by the Carbon Trust. (Carbon Trust, 2022).

As the concept is 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 further technical connection requirements, please refer to the VDE offshore grid connection rules (VDE-AR-N 4131).

5.10 Interconnectors: Bundled subsea cable system

Due to the significantly lower losses and the elimination of the need for reactive power compensation compared to the AC subsea cable system, all known projects for interconnectors through the German EEZ are already planned as DC links.

By bundling the supply and return conductors, a magnetic flux density can generally be achieved that is significantly below the average strength of the earth's magnetic field and excludes significant impacts on protected assets. Due to the development of offshore wind energy, in addition to "classic" interconnectors connecting terrestrial grids, hybrid cross-border connections including OWFs such as the "Kriegers Flak Combined Grid Solution" are now also being constructed. These connections can be implemented as AC connections due to the shorter route length and the need for a matching grid connection concept, and are therefore not covered by this legal requirement.

5.11 Interconnectors: Consideration of overall system

For interconnectors, it must be explained in the approval procedure how they can be included in grid planning without adversely affecting the expansion targets for offshore wind energy. From this perspective, it makes sense to examine on a case-by-case basis whether and to what extent interconnectors can connect OWFs. Therefore, the technology used in particular must be examined and its compatibility with the overall grid weighed against other advantages (such as higher transmission capacity).

In the course of the further revision of the SDP, the development of an international offshore grid including both the interconnectors and the grid connection for offshore wind energy will be further accompanied. Before any integration of the interconnectors into a meshed offshore grid, technical and regulatory issues would have to be clarified in addition to the question of economic viability.

6 Planning principles

The planning principles are based on the objectives and principles of the ROP for the North Sea and Baltic Sea EEZs. Within the framework of the ROP, an overall consideration of the various uses has already been carried out. The designations made within this framework will be observed and taken into account in the revision of the SDP. The relevant objectives and principles at the level of maritime spatial planning are predominantly adopted as planning principles in the SDP and are checked, concretised and weighted among themselves in their significance with regard to their applicability to the regulatory issues addressed in the SDP on the basis of the concerns and rights presented.

The definition of standardised technical principles and planning principles is already based on a consideration of potentially affected public concerns and legal positions, so that the determination of standard technical principles and planning principles also already includes a "preliminary examination" of possible alternatives.

6.1 General principles

The following are the justifications for the planning principles for offshore wind turbines, platforms, subsea cables and plants for other forms of energy generation.

6.1.1 Overall time coordination of the construction and installation work

The specification corresponds to the legal requirements for overall timing coordination in principle 2.2.3 (8) of the ROP 2021.

For the installation work of cable systems that are spatially close to each other, an overall temporal coordination should be aimed for. In this way, the number of interventions can be reduced and possible cumulative impacts can be avoided or mitigated.

In order to reduce the impact on the marine environment, the construction of wind turbines, platforms, subsea cables and plants for other forms of energy generation in close proximity to each other should also be coordinated in terms of time (cf. also the planning principle 6.1.9 on noise mitigation).

This also includes the reduction of shipping traffic for construction and operation and the associated acoustic and visual adverse effects to a minimum through optimal construction and time planning.

6.1.2 No adverse effect of the safety and efficiency of shipping

This stipulation is derived from the maritime spatial planning principle 2.2.1 (3), according to which economic uses should affect the safety and ease of traffic as little as possible.

A common safety zone is regularly established around wind turbines and platforms. The effect of this safety zone is, on the one hand, that commercial shipping does not take place in these areas and, on the other hand, that proper shipping operated in accordance with the rules of good seamanship continues to be generally possible without danger. Please refer to the responsibility of the GDWS in this respect for the device of safety zones and for the device of any navigation regulations.

In the case of cable systems, the specified depth (cf. 6.4.7) and crossing angles (cf. 6.4.4) are not expected to have any adverse effect on shipping.

Please refer to the planning principles 6.1.6 and 6.1.11.

6.1.3 No adverse effect on the safety and ease of air traffic

Offshore structures or parts thereof may pose a risk to air traffic (collision risk). In order to minimise the potential danger, such structures must therefore be marked as aviation obstacles. Since the regulations applicable to this on the territory do not extend to the German EEZ, the BMDV

has already created corresponding regulations for the EEZ in Part 5 of the SOLF.

Sec. 9 para. 8 EEG specifies the sites in the German EEZ whose night-time marking must be demand-controlled.

The GGBL-WBF also apply to the device, marking and operation of wind farm sites on wind turbines in the EEZ (cf. No. 1.1 GGBL-WBF) and must therefore be observed until new legal requirements (SOLF) are established.

In the absence of relevant national legal requirements, the regulations of the International Civil Aviation Organisation (ICAO) apply in principle in the EEZ (international airspace) in the context of air traffic. With regard to wind farm sites on platforms, the regulations for wind farm sites on ships may also be applied accordingly to platforms in accordance with the competent authority (BMDV) (cf. Nos. 4.2.25 to 4.2.29 ICAO Appendix 14 Volume II in conjunction with No. 7.1 ICAO document 9261). This is the case until the entry into force of the BMDV Standard (SOLF). The latter will contain corresponding regulations for this type of wind farm sites.

Adequate obstacle protection is an essential criterion for safe flight operations on a helicopter landing deck. The dimensioning and orientation of the sites to be provided for this purpose are derived from the relevant regulations. These are, in particular, Appendix 14 Volume II to the Convention on International Civil Aviation and, after its introduction, the SOLF as well as, in the case of commercial flight operations, under certain circumstances additionally the regulations on obstacle assessment in accordance with ordinance (EU) No. 965/2012, in the respective applicable versions.

Obstacles in the approach and departure areas of helicopter landing decks pose a high collision risk. Therefore, they may not be erected there or, in individual cases, only under strict conditions. Otherwise, the helicopter landing deck would no longer be usable or at least no longer usable for its intended purpose. The principle is derived from the relevant provisions of ICAO Appendix 14 Volume II (cf. especially No. 4) and applies until the entry into force of the SOLF, which will contain regulations in this respect.

Tower illumination increases the visibility of obstacles, facilitates the orientation of helicopter crews and gives a spatial impression of the surroundings. In this way, the approach to such obstacles can be better assessed, as the lateral limit of the approach and departure paths is marked. Concrete regulations for implementation are contained in TF11; after the SOLF comes into force, the requirements for tower radiation will be regulated via this standard.

By not establishing approach and departure sites of helicopter landing decks beyond the boundaries of the German EEZ, it is prevented that they become unusable due to the increase of obstacles outside the German EEZ. As a rule, there is no or only very little influence outside the German EEZ boundaries on any construction projects planned there, so that otherwise reliable planning could not be ensured in principle.

6.1.4 No adverse effect on the security of military

The stipulations comply with Sec. 5 subsection 3 sentence 2 no. 4 WindSeeG-E as well as objective 2.2.2 (5.1) and principle 2.2.2 (5.2) of ROP 2021.

The designation of areas, sites, platforms and plants for other forms of energy generation within military training areas for floating units or flight training areas that begin at sea level is to be avoided. To the extent that specific exercise procedures are not restricted by the designation, designation in these areas is not precluded in individual cases. Routing of subsea cables shall be sought outside military training areas for floating units.

The provisions c) and d) correspond to the maritime spatial planning objective 2.2.2. (5.1) and

principle 2.2.2 (5.2) of ROP 2021 and serve to ensure effective military defence. For further justification, please refer to ROP 2021.

During exercises for the purpose of military, the installation of sonar transponders is intended to avoid sources of danger from collisions of submarines with structural installations by means of acoustic signals.

6.1.5 Deconstruction obligation and security deposit

The SDP pursues the objective of a complete deconstruction as far as possible in order to enable the highest possible subsequent usability of the sites and routes. The determination corresponds to Sec. 80 para. 1 WindSeeG-E, according to which devices must be removed with the aim of ensuring full subsequent use and restoration of the site's performance and functionality. Furthermore, the provisions implement the maritime spatial planning objective 2.2.1 (2) of the ROP 2021, according to which fixed installations must be deconstructed after the end of their use.

Whether a complete removal of the foundations has to take place must be checked at the time of deconstruction. The state of the art in science and technology applicable at the time must be taken into account and, in particular, the extent to which removal is necessary or advisable for reasons of efficient subsequent use. However, as a rule, the deconstruction must be carried out at least to such an extent that the upper edge of the remaining foundation is permanently below the movable lower edge of the sediment and below the area of interference by fishing gear. This is to be checked for an appropriate time depending on the location so that it is ensured that there is no obstacle to shipping and fishing.

The exact designations for deconstruction are reserved for the individual procedure in order to adapt the requirements to the respective location, among other things.

The security deposit serves to secure the deconstruction obligation pursuant to section 80 WindSeeG-E. The requirements for the security deposits are set out in the Appendix to the WindSeeG-E (on Sec. 80 para. 3 WindSeeG-E).

6.1.6 Consideration of all existing, approved and established uses.

This planning principle also corresponds to the assessments in the ROP 2021, including in requirements 2.2.1 (3), 2.2.2 (3), 2.2.2 (4), 2.2.2 (5.1) and 2.2.2 (5.2).

In the course of minimising conflicts, the selection of sites for offshore wind turbines and platforms and the routing of subsea cables and plants for other forms of energy generation should take into account the concerns of shipping (cf. planning principle 6.1.2), national defence and alliance obligations (cf. planning principle 6.1.4) and existing and approved uses / rights of use (including OWFs) as early as possible. A route outside these areas should be sought if the laying of the subsea cables is expected to have a negative impact on the aforementioned uses. The concerns of fisheries should also be taken into account at an early stage. The construction of aquaculture facilities should take place in close proximity to or in combination with other facilities already in existence or under construction. Maintenance and operation of the facilities should be affected as little as possible by the construction and operation of aquaculture facilities. Please refer to Principle 2.2.5 para. 2 in the ROP 2021. Fishing over subsea cables outside the safety zones is generally made possible by a sufficient depth of the cables and corresponding conditions in the individual procedures; kindly refer to the legal requirements of the principle 6.4.7. Regulations within OWF sites in accordance with principle 2.2.2 (4) and principle 2.2.5 (2) of ROP 2021 must be clarified in individual cases.

In order to reduce the risk of damage to existing pipelines and not to affect the possibilities of repair, due consideration shall be given to existing structures when choosing the routing of new subsea cables and a distance of 500 m shall be maintained in these areas, unless the subsoil conditions require greater distances. Existing submarine cables shall also be taken into account during planning and laying. In accordance with the legal requirements in principle 6.4.2, a distance of 100 m or 200 m alternately is to be provided between submarine cables. This also applies to distances from data cables and existing interconnectors. With this distance, a smaller distance is specified for the shallower water depths of up to 45 m in the planned area compared to corresponding internationally agreed industry guidelines, which apply for water depths of up to 75 m, for example.

In order to reduce the risk of damage during the construction and operation phases of the platforms and in order not to affect the possibilities of the necessary maintenance and servicing work, due consideration must be given to existing and approved structures in the case of platforms planned for the future. The distance to be observed depends, among other things, on the position of the platform in area, in relation to building structures on site, the subsoil conditions and the water depth.

In the area of the substation or converter platform, it must be ensured that there is sufficient site for the routing of the DC and AC subsea cables of the TSO due to the installation of a large number of cable systems. Therefore, in the area where the subsea cables are routed to the transformer or converter platform, a distance of at least 1000 m must be maintained between the platform and the nearest wind turbines.

In addition, interference-free operation of existing installations (e.g. radio or radar installations) must be ensured.

The distance of 500 m between subsea cables and wind turbines is necessary so that work can be carried out on the subsea cables while the OWF is in operation. Even in the event that work on cable systems and the wind farm is carried out simultaneously, sufficient area must be available for the construction vessel, the wind turbine and the laying vessel. The international guidelines also require a minimum distance of 500 m to wind turbines and point out that larger distances are needed for laying and repair. Reducing this distance would limit the repair possibilities to certain types of vessels and thus possibly delay them. In addition, the repairs would not be possible while the wind farms are in operation. Due to the high importance of the grid connection systems for Germany's electricity supply, a fundamental reduction of the distances is not appropriate.

In any case, if the distances fall below the minimum distances in the planning phase, an approximation agreement must be submitted in the approval procedure, which also includes the bearing of additional costs caused by distances of less than 500 metres.

Due to the spatial proximity between the OWF project and the grid connections including the platforms of the TSO, there is a high need for coordination between the OWF project developer and the TSO. Accordingly, it is imperative that close coordination between the TSO and the OWF project developer takes place at a very early stage of the project. For the wind farm project developer and the TSO, there is an unrestricted need for cooperative collaboration on both sides. This applies in particular to the exchange of information on project deadlines, the mutual transfer of necessary information and details on planning, construction and commissioning of the platform and the subsea cables, but also during operation, any repair and maintenance work and during deconstruction. In particular, the construction is to be coordinated and

optimised in good neighbourly cooperation at an early stage.

With regard to the distances between sites and in relation to sites and wind turbines, please refer to the planning principle 6.2.1.

6.1.7 Observance of environmental and nature conservation framework conditions

This planning principle serves as a clarifying reference to the applicable environmental and nature conservation legal requirements. These include the following aspects in particular - The list is not exhaustive.

Significant adverse effect of legally protected biotopes within the meaning of Sec. 30 para. 2 sentence 1 of the Federal Nature Conservation Act (BNatSchG) should be avoided as far as possible when constructing wind turbines and plants for other forms of energy generation.

Areas, sites and areas for other forms of energy generation must be compatible with the conservation objective of a Protected Area Ordinance issued pursuant to Sec. 57 of the Federal Nature Conservation Act; designations are permissible if, pursuant to Sec. 34 subsection 2 of the Federal Nature Conservation Act, they cannot lead to significant adverse effect of the components of the area relevant to the conservation objective of the respective Protected Area Ordinance, or if they meet the requirements of Sec. 34 subsections 3 to 5 of the BNatSchG.

Please refer to Sec. 45a of the Federal Water Act[7] (WHG). Best environmental practice in accordance with the Helsinki and OSPAR-Conventions and the respective state of the art shall be taken into account and specified in the individual procedure.

In accordance with Sec. 2, paragraph 2, No. 6 ROG, the area is to be developed, safeguarded or, where necessary, possible, and appropriate, restored in terms of its importance for the functional capacity of soils, the water balance, fauna and flora, and the climate, including the respective interrelationships. The significance of the area for the functionality of the soils, the water balance, the fauna and flora, and the climate, including the respective interrelationships with the requirements of the biotope network system, must be preserved. This should ensure that the dispersal processes and long-range ecological interactions of species and their habitats are taken into account.

When laying subsea cables, possible adverse effects on the marine environment should be minimised. To this end, the subsea cables should be laid outside nature conservation areas wherever possible.

Known occurrences of legally protected biotopes pursuant to Sec. 30 BNatSchG are to be avoided when laying subsea cables.

Project-specific avoidance and mitigation measures may be required in the planning and construction of wind turbines and other offshore energy generation systems in the vicinity of nature conservation areas in order to ensure compliance with site protection legal requirements. These measures, e.g. noise mitigation measures to protect noise-sensitive marine mammals, are determined on a project-specific basis at project level, taking into consideration the special features of the project area and the circumstances of the individual case.

Depending on the location and foundation design of the offshore wind turbine and other energy generation facility, as well as the conservation objective of the nature conservation area,

[7] The Water Resources Management Act of 31 July 2009 (BGBl. I p. 2585) last amended by Art. 2 G for the Implementation of Legal requirements of Directive (EU) 2018/2001 for Approval Procedures under the Federal Immission Control Act, the Federal Water Act and the Federal Waterways Act of 18.8.2021 (BGBl. I p. 3901)

additional or specific protection measures may be required in individual cases.

If occurrences of structures listed in Sec. 30 BNatSchG are found during closer investigations in the specific approval procedure, these must be analysed and taken into account in the decision-making process. However, at this point in time, no concrete spatial allocation of the structures mentioned is possible.

These regulations refer to the justification of principle 2.2.1 (4.1) of the ROP 2021. According to this principle, the adverse effect of occurrences of legally protected biotopes according to Sec. 30 BNatSchG should be avoided during the planning, construction and operation of installations for energy generation and subsea cables and pipelines. To avoid negative impacts on sensitive habitats, subsea cables and pipelines should be planned and laid outside nature conservation areas wherever possible. Hereby, more extensive technical and nature conservation stipulations remain unaffected.

The laying of submarine cables in sensitive habitats and the adverse impact on the marine environment of their laying, operation, maintenance and possible retention after abandonment or deconstruction should be avoided.

The installation of subsea cables, as well as their operation, maintenance and possible fate after abandonment or deconstruction, can lead to adverse effect on sensitive habitats. In order to limit potential negative impacts on sensitive habitats and to safeguard the conservation objectives of nature conservation areas, subsea cables within the EEZ should primarily be routed outside of nature conservation areas. If this is not possible, impacts on the protection and conservation objectives of the nature conservation areas must be assessed in the individual project approval procedure.

6.1.8 Consideration of cultural assets

This stipulation is in line with the values of principle 2.2.1 (3) of the ROP 2021, according to which adverse effects of cultural heritage by economic uses are to be minimised.

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

A large number of such shipwrecks are known and listed in the BSH underwater database. The information available at the competent authorities should be taken into account when selecting sites for the construction of wind turbines and platforms or the specific routing of subsea cables. For consideration within the framework of spatial planning, all known wrecks located within these reservation areas were communicated to the monument offices with the request for examination and assessment of the required distances when defining the reservation areas for subsea cables and pipelines in the ROP 2021. These assessments of the case-by-case examination are used for the spatial planning in the SDP. There are no known wrecks in the immediate vicinity of the defined converter sites that are relevant for monument protection. However, it cannot be ruled out that previously unknown cultural assets will be found during the closer investigation of planned sites or a suitable route or during construction. In order not to damage these, suitable securing measures must be carried out in this case in consultation with the specialist authorities responsible for monument preservation and archaeology. The finds must be scientifically examined and documented. It should be possible to preserve and conserve objects of an archaeological or historical nature either in situ or by salvage. The legal requirement

to preserve cultural heritage falls under other public law provisions that must be complied with.

6.1.9 Noise mitigation

The legal requirements for noise mitigation are intended to avoid hazards to the marine environment from noise emissions. The planning principle also corresponds to the assessment of requirement 2.2.2 (6) of the ROP 2021.

During pile driving for the foundations of WT, platforms, and separate energy generation installations , the use of effective technical noise mitigation systems shall be provided for in order to safeguard species and habitat protection concerns. In the individual project approval procedures, a maximum sound exposure level (LE) of 160 dB re 1µPa² s and a peak sound pressure level (Lpeak-peak) of 190 dB re 1µPa at a distance of 750 m from the pile driving site are regularly specified, irrespective of the pile diameter. Noise abatement measures, which include technical noise mitigation, deterrence and monitoring of effectiveness, are specified on a site-specific basis and in relation to the foundation design used in each individual case. This is done on a project-specific basis as part of the approval procedure. The best available method or a combination of the best available methods according to the state of the art in science and technology for reducing the input of underwater noise to comply with applicable noise emission values during the installation of foundation pillars, such as large bubble curtain, cladding tube, hydro-silencer, limitation of pile driving energy or optimised pile driving method with real-time monitoring, shall be used. 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 further extensive sound protection measures and monitoring measures, in particular by recording the underwater noise input as well as the activity of the harbour porpoise during the installation of foundations, is required.

Limiting the duration of individual pile driving operations is intended to minimise the impact and serves to avoid a violation of the species protection prohibition of disturbance, Sec. 44 para. 1 no. 2 BNatSchG.

The Strategic Environmental Assessment comes to the conclusion that, according to the current state of knowledge, only compliance with applicable noise emission values and implementation of the legal requirements of the noise mitigation concept of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) (2013) can ensure with the necessary certainty that the requirements for species protection will be met and that nature conservation areas will not be significantly impaired in their components relevant to the conservation objectives or the purpose of protection.

The order of an overall temporal and spatial coordination of the pile driving work within the framework of the subordinate approval procedure can be applied on the basis of both species protection law and habitat protection law requirements.

In order to comply with the requirements under species protection law within the meaning of Sec. 44 para. 1 no. 2 of the BNatSchG in conjunction with noise mitigation concept of the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) (2013), suitable overall coordination may be required so that no more than 10% of the site of the EEZ is exposed to disturbance-triggering impulse noise at any time. In order to comply with the species protection requirements under Sec. 44 of the BNatSchG, it is necessary to ensure that there are permanently sufficient escape routes for harbour porpoises in the German EEZ of the North Sea and that significant disturbance of the local population can be ruled out with the necessary degree of certainty. Appropriate spatial and temporal coordination of parallel construction sites can prevent significant disturb-

ance even in the years with the highest construction rates, 2028 to 2030 (cf. explanations in Chapter 4.12.3 North Sea Environmental Report).

For the particularly sensitive breeding period (May to August), the noise mitigation concept also requires that the Natura 2000 site "Sylter Außenriff" (corresponding to Area I of the nature conservation area "Sylter Außenriff- Östliche Deutsche Bucht") and the main concentration area of harbour porpoises be kept free of sound-intensive construction measures that cumulatively affect more than 1% of the site area within the disturbance radius. This is intended to meet the requirements of site protection law under Sec. 34 of the BNatSchG by ensuring that there are sufficient permanent escape routes for harbour porpoises and that any adverse effect of the conservation objectives and the purpose of protection of the nature conservation area can be ruled out with the necessary degree of certainty.

If compliance with the above-mentioned 1% criterion (habitat protection in the sensitive phase in the Natura 2000 site"Sylter Außenriff") or the 10% criterion (species protection) cannot be technically ensured in the individual procedures, spatial and temporal coordination of parallel construction sites could be considered - as already implemented in the years 2013 to 2018. This means that, if necessary, orders regarding the permitted period for pile driving work for individual wind farm projects can be issued at the downstream approval level. For individual projects, it may not be possible for sound-intensive work to take place at certain times.

Blasting is generally not permitted due to harmful impact on the marine environment, in particular harmful sound pressures. If blasting is unavoidable to remove ammunition that cannot be transported, a noise mitigation concept must be submitted to the approval authority in good time beforehand. The legal requirement of a noise mitigation concept is necessary in order to avoid threats to the marine environment from noise emissions even in the exceptional case of detonation of ammunition that cannot be transported, as regulated here.

6.1.10 Minimisation of scour and cable protection measures

In certain areas, measures to prevent scour are necessary to ensure the long-term stability and positional safety of structures on the seabed.

For any scour and cable protection measures, the project developer shall limit the placement of hard substrate to the minimum necessary to provide protection in order to minimise the impact on the marine environment.

Only fill made of natural stones or inert and natural materials are to be used as scour protection. The use of alternatives based on plastic or plastic-like materials (e.g. geotextile sand containers, (recycled) plastic nets filled with natural stones, concrete mats covered with plastic) shall be avoided.

As a rule, fillings made of natural stones or inert and natural materials are to be used as cable protection. The use of cable protection systems containing plastic is only permissible in exceptional cases and, if technically possible, must be kept to a minimum.

6.1.11 Consideration of official standards, legal requirements or concepts

The planning principle stipulates that official standards, legal requirements and concepts, as amended from time to time, must be taken into account in the planning, construction and operation of wind turbines, platforms, subsea cables and plants for other forms of energy generation. Their consideration serves to ensure a speedy approval procedure and the safe and proper construction and operation of the installations. In particular, the following shall be taken into account

- the Standard Investigation of the Impact of Offshore Wind Turbines on the Marine Environment (StUK),
- the Standard Subsoil Investigation, Minimum Requirements for Subsoil Exploration and Investigation for Offshore Wind Turbines, Offshore Stations and Power Cables,
- the Standard Design, Minimum Requirements for the Design of Offshore Structures in the EEZ,
- the "Standard Offshore for the German Exclusive Economic Zone" (SOLF), Part 5 [*Should the SOLF be issued before the entry into force of the updated SDP, the restriction to Part 5 will be deleted*].
- the "WSV Framework Guidelines Marking Offshore Installations",
- the Implementing Directive on Maritime Spatial Observation of the BMDV,
- the guideline "Offshore Installations to Ensure the Safety and Efficiency Of Shipping Traffic",
- Recommendations O-139 and A-126 of the International Association of Marine Aids to Navigation and Lighthouse Authorities,
- the Offshore Wind Energy Safety Framework Concept,
- the framework concept for waste and operating materials for OWF and their grid connection systems in the German EEZ,
- the German stipulations on occupational health and safety,
- the concept for the protection of harbour porpoises from noise pollution during the construction of OWF in the German North Sea and
- the BfN mapping guidelines for legally protected biotopes.

6.1.12 Emission reduction

The avoidance and reduction requirement ensures that the construction and operation of offshore installations does not lead to "pollution of the marine environment" within the meaning of Art. 1 para. 1 no. 4 of the Convention on the Law of the Sea and a threat to the marine environment pursuant to Secs. 5 para. 3 Sentence 2 no. 2 and 69 para. 3 Sentence 1 no. 1 WindSeeG-E. In addition, the legal requirements of the Ordinance on the Environmentally Sound Conduct of Maritime Shipping must be complied with.

In this context, "emissions" are substances or energy directly or indirectly added to the marine environment, such as heat, sound, vibration, light, electrical or electromagnetic radiation.

In order to prevent pollution and threats to the marine environment, no substances may be discharged into the sea during the construction, operation, maintenance and deconstruction of installations. If the discharge of such plant-specific emissions into the marine environment is unavoidable for technical reasons, e.g. due to safety-relevant legal requirements of shipping or air traffic, this shall be presented and justified to the planning approval authority within the framework of the planning approval procedure, together with an environmental assessment. Installation-specific examination of reasonable alternatives (EIA Directive) must be performed and documented.

The minimisation requirement for material discharges applies. This also applies to the vehicles used during construction, operation and deconstruction. The legal requirements of the Ordinance on Environmentally Sound Practices in Maritime Shipping shall be complied with.

Lighting during operation of the wind turbines and converter platforms that is as compatible with nature as possible must be provided to reduce attraction effects as far as possible, taking

into consideration the requirements of safe shipping and air traffic and occupational safety, such as switching obstruction lighting on and off as needed, selecting suitable light intensities and spectra or lighting intervals.

The preparation of an emissions study to record the emissions arising from the respective design and equipment variant or their avoidance is mandatory. A preliminary study on this is already to be submitted as part of the application documents. In the preliminary study, the project developer shall address emissions that are as concrete and project-related as possible, the possible and applied avoidance and reduction measures, and the cumulative effects of the installation(s). The emission study, which is substantiated in the enforcement procedure, shall form the basis for the waste and process material concept to be prepared within the framework of the protection and safety concept. For the preparation of the waste and operating materials concept, the minimum legal requirements of the "Waste and Operating Materials Framework Concept for OWF and their Grid Connection Systems in the German EEZ" published by the BSH in its currently valid version shall be taken into consideration. Emergency plans shall be drawn up, inter alia, for accidents involving substances hazardous to water during the construction and operation phases and other unexpected events giving rise to concerns about pollution of the marine environment.

The minimisation requirement also includes that environmentally compatible operating materials (e.g. oils, greases) are to be used as far as possible for the operation of the installation and that biodegradable operating materials are to be preferred, if available. The environmental compatibility of the operating materials used in the plants must be ensured by examination of reasonable alternatives (EIA Directive).

If grouting methods are to be used, the grout material must be as free of pollutants as possible. Appropriate techniques and devices for the grouting process (installation phase) shall be used to prevent the discharge of grout material into the marine environment as far as possible.

Constructional and operational precautions and safety measures

All technical installations and infrastructure used on the facilities shall be secured by structural safety systems and measures in accordance with the state of the art and shall be monitored such that pollutant accidents and environmental discharges are prevented (e.g. enclosures, double-walled enclosures, room/door enclosures, catch basins, drainage systems, collection tanks, leakage and remote monitoring) and that in the event of damage it is ensured that the project-executing agency can intervene immediately at any time. This applies in particular to installations that contain or carry large quantities of operating materials and/or substances hazardous to water (e.g. diesel tanks, pipelines, transformers). False activations of the fire protection systems on helicopter landing decks must be avoided at all costs.

Since in the offshore area there is an increased threat potential from changes of operating materials and refuelling measures, special organisational and technical precautionary measures must be taken for these activities (e.g. preparation of method statements, precautionary measures during crane work, self-sealing breakaway couplings (emergency breakaway couplings), dry couplings, catch basins, overfill safeguarding devices, spill kits) in order to avoid pollutant accidents and environmental discharges.

Waste

The dumping and discharge of waste into the marine environment is prohibited unless exceptionally permitted in this planning policy. Waste must be taken ashore and disposed of there according to the applicable waste disposal regulations. Exceptions may include the discharge of properly treated sewage water, which is permitted on a case-by-case basis, or the discharge of sewage water with a maximum oil content of 5 milligrams per litre (see below).

Corrosion protection

The corrosion protection used must be as pollution-free and low-emission as possible.

Wherever possible, external current systems shall be used as cathodic corrosion protection on foundation structures. If the use of galvanic anodes (sacrificial anodes), typically consisting of aluminium-zinc-indium alloys, is unavoidable, this is only permissible in combination with a suitable coating of the foundation structures (cf. BSH standard construction). The content of minor components of the anode alloys, in particular zinc, cadmium, lead, copper and mercury, shall be reduced as far as possible. The zinc content required for the functionality of the anodes must also be limited to a technically necessary minimum.

The cathodic corrosion protection system must be dimensioned such that the use of galvanic anodes is limited to a technically necessary minimum. The use of zinc anodes (in the sense of zinc being the main component of the anodes) is prohibited. Where necessary, external current systems should be used as a cathodic corrosion protection system in the internal areas of the foundation structures.

The minimum requirements for the corrosion protection in the construction standard must be observed. The VGB/BAW Standard Corrosion Protection has been introduced as a technical supplement to the BSH Standard Construction with regard to Parts 1-3 and must be taken into account in enforcement. The use of biocides such as tributyltin (TBT) or other anti-fouling agents to protect the technical surfaces from the undesired settlement of organisms is prohibited. The (underwater) construction shall be provided with an oil-repellent coating in the splash water zone; regular removal of marine fouling is not required in this context. The solvent-free nature of coating materials should be strived for.

The exterior coating shall be as glare-free as possible without prejudice to the regulation on air and navigation marking.

Installation cooling

A closed cooling system shall be used for plant cooling (e.g. for the cooling of transformers on platforms), in which there are no discharges of cooling water and/or other substances (anti-fouling agents or biocides) into the marine environment. Seawater cooling systems with discharges during regular operation are only permissible in justified exceptional cases, for example if the required cooling capacity cannot be demonstrably achieved with closed systems or system variants and no suitable alternative systems are available. The use of antifouling agents or biocides in seawater cooling systems to ensure continuous operation must be kept to a minimum, e.g. by seasonal use or reduction of the concentration of active substances, and requires a comprehensive environmental assessment in advance.

Sewage water

The sewage water referred to in e) must not be discharged untreated into the marine environment. Since the discharge of treated sewage water is still associated with material discharges to a certain extent, the sewage water must always be collected professionally, transported to land and disposed of there in accordance with the applicable waste management regulations.

Sewage water treatment plants on platforms are generally not permitted. On unmanned platforms or platforms manned only during maintenance

work, sewage water is generated only for a limited period of time. However, sewage water treatment systems are only effective to a limited extent in discontinuous operation, so that inadequately treated sewage water can lead to emissions into the marine environment that exceed avoidable levels. On unmanned platforms or platforms that are only manned during maintenance work, it is therefore necessary to resort to solutions that do not lead to an introduction. For example, sufficiently dimensioned collection tanks must be provided for the professional collection of sewage water and the limited quantities of sewage water must be transported ashore, or other solutions must be used (such as "incineration toilets").

Exceptions may apply in individual cases for permanently manned platforms. Proof that a sewage water treatment plant is required on a permanently manned platform must be provided by the project developer as part of the planning approval procedure. The justification for this could be, in particular, that the negative impacts on the marine environment associated with the transfer of the volume of sewage water produced - for example, due to the required number of ship transports - exceed the impacts associated with the discharge of the treated sewage water.

The sewage water treatment system must correspond to the state of the art. This includes, inter alia, that only such sewage water treatment plant is permitted which reduces nitrogen and phosphorus compounds at least in accordance with the legal requirements of MARPOL Resolution MEPC.227(64) "2012 GUIDELINES ON IMPLEMENTATION OF EFFLUENT STANDARDS AND PER-FORMANCE TESTS FOR SEWAGE TREATMENT PLANTS" Appendix 22 para. no. 2.7 (MARPOL, 2012) provided that such sewage water treatment plant is available for the quantity of sewage water expected to be generated in each case.

If sewage water treatment plants are permissible in individual cases, they shall treat all sewage water arising on the platform.

The chlorination of sewage water is not permissible, since chlorination processes produce halogenated secondary compounds that are harmful to the environment. Other techniques must be used that are demonstrably more environmentally friendly, such as UV systems or ultrafiltration.

To ensure proper operation and to check the purification performance and the discharge values in the operating phase, the sewage water must be sampled regularly. At sewage water treatment systems, suitable sampling points shall be provided at the inlet and outlet for this purpose. This is to enable sampling and subsequent analysis of the sewage water.

Drainage systems and oil separators

Insofar as a light liquid separator is used instead of a closed system for the collection of drainage water and subsequent disposal on land, the oil content shall not exceed 5 milligrams per litre at discharge in order to mitigate the discharge of oil contained in the drainage water into the marine environment. The setting of the maximum oil content at 5 milligrams per litre is based on the current state of implementation in existing OWFs and the technical availability of these systems (DIN EN 858-1).

In order to monitor compliance with the maximum oil content when discharging into the marine environment, the oil content in the drainage water shall be continuously monitored by means of sensors after passing the light liquid separator in the discharge. If the threshold value of 5 milligrams per litre is exceeded, the use of appropriate valves shall automatically ensure that the drainage water is not discharged into the marine environment, e.g. via collection tanks or recirculation).

Firefighting foams on helicopter landing decks

Per- and polyfluorinated chemicals (PFAS) are of ecotoxicological concern and have been shown to have negative impacts on the marine environment. Therefore, foam agents that do not contain PFAS should be chosen.

At the same time, it must be ensured that the foam agent is resistant to alcohol and frost and that the other requirements of fire protection and aviation are met (including minimum performance level ICAO B). Firefighting exercises are to be performed with water only.

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

The legal requirements of ordinance (EU) 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases shall be complied with. According to Art. 3 of ordinance (EU) 517/2014, these measures are basically the avoidance and limitation of emissions of fluorinated greenhouse gases. In addition, the legal requirements regarding leakage checks of technical installations, if necessary by means of leakage detection systems, must be observed, carried out or documented by the operator (Art. 4-6 ordinance (EU) 517/2014).

The operating materials used must be assessed for their climate impact. Fuels should be used that have the lowest possible greenhouse gas potential. In particular, sulphur hexafluoride (SF_6) is a highly climate-impacting gas. Its use should therefore be avoided for reasons of climate protection. It must be examined whether SF6 can be replaced by a less climate-impacting product. The substitution test and its result shall be presented and justified in the planning approval procedure documents.

Diesel generators

Diesel generators must be certified according to the MARPOL standards mentioned above. Diesel generators certified to alternative emission standards may be used if these standards comply with the emission standards defined in MARPOL Appendix VI, Regulation 13, paragraph 5.1.1. This shall be demonstrated.

This legal requirement ensures that the level of protection is consistent while a choice can be made between different suitable certifications.

For wind turbine installations, the use of diesel generators for emergency power supply is to be avoided. The use of diesel generators leads to air emissions. In addition, the operation of diesel generators requires extensive refuelling and fuel storage, which can result in risks of environmental hazards from oil spills. Therefore, alternative systems are to be used for the temporary supply of the wind turbines, if possible, within the framework of ensuring general operational safety.

In order to reduce sulphur dioxide emissions to a minimum, the lowest possible sulphur fuel must be used, taking into consideration the storage capacity of the respective product (such as low-sulphur heating oil according to DIN 51603-1 or diesel according to DIN EN 590 (so-called "land diesel")). This applies to temporary generators during installation work on WT and platforms as well as to permanent diesel generators (grid backup systems) on platforms. When selecting the appropriate diesel generators, ensure suitability for the respective fuel type in good time.

6.1.13 Consideration of sites where explosive ordnance has been found

In 2011, a federal-state working group published a basic report on the munitions contamination of German marine waters, which is updated annually. According to current knowledge, the explosive ordnance load in the German Baltic Sea is estimated at up to 0.3 million tonnes and in the German North Sea at up to 1.3 million tonnes. The overall data availability is insufficient. It can thus be assumed that explosive ordnance deposits are also to be expected in the area of the German EEZ (e.g. remnants of mine barriers and

combat operations). The location of known munitions dumping areas can be found on the official nautical charts and in the above-mentioned 2011 report (which also includes suspected areas for munitions-contaminated areas) (Böttcher, et al., 2011). The reports of the Federal-state Working Group are available at www.munition-im-meer.de.

It is recommended that the project developer carry out a detailed historical search for the possible presence of explosive ordnance as part of the concrete planning of a project.

According to DIN 4020, the developer is responsible for ensuring that the site is free of explosive ordnance.

The respective project developer is responsible for the identification and exploration of explosive ordnance as well as for all resulting protective measures. Within this framework, the project developer is also responsible for any necessary salvage or removal. The responsibility of the project developer also includes its duty to bear the costs for the identification, exploration and resulting protective measures as well as for the recovery or removal of found munitions.

If munitions are found, this must be documented immediately and reported to the planning approval authority. Findings of munitions and the further handling thereof must also be reported to the Maritime Safety Centre Cuxhaven (Joint Control Centre of the Water Police of the Coastal States, Central Reporting Centre for Ammunition in the Sea).

If there are no instructions of specific relevance, the Quality Guide for Offshore Ordnance Disposal of the University of Leipzig can be referred to.

Blasting of found munitions is generally not permitted. If blasting to remove non-transportable munitions is unavoidable, a noise mitigation concept must be submitted to the licensing authority in good time beforehand and implemented in order to avoid any threat to the marine environment, see also Planning Principle 6.1.9.
Transportable munitions found must not be dumped again after recovery, but must be disposed of properly on land in consultation with the responsible explosive ordinance disposal team of the States.

The relevant details of any protective measures that may become necessary are regulated in the individual procedure.

6.2 Sites and offshore wind turbines at sea as well as areas for other forms of energy generation and installations

The following are planning principles for sites, primarily for the construction and operation of offshore wind turbines and areas for other forms of energy generation and facilities. Please refer to Chapter 6.3, which defines planning principles for platforms, as well as for transformer and residential platforms. The planning principle 6.2.2 is not applicable to areas for other forms of energy generation.

6.2.1 Distances between sites relative to each other and to wind turbines

The determination serves to limit shadowing effects and to ensure the stability of wind turbines. Against the background of the technical development of wind turbines, the minimum distance for designations from 2030 onwards is increased from 750 m to 1,000 m.

The minimum distance to wind turbines of the neighbouring OWF project is five times the rotor diameter of the new turbine to be erected and is measured between the centres of the turbines, based on the largest rotor diameter. The legal requirements for minimum distances only apply to turbines of neighbouring OWFs. This planning principle does not apply to the distances between WTs within a site. The same also applies

to the case of the same project developer in the case of two adjacent sites.

In the case of two adjacent sites which are put out to tender by the BNetzA in the same year and therefore the planning by the respective project developers takes place in the same period, close coordination between the project developers is required at an early stage with regard to the turbine locations and distances, taking rotor diameters into consideration, in good neighbourly cooperation. Therefore, the submission of proof of coordination is stipulated as a prerequisite for the respective individual project approval procedure.

In the event that a site is located next to a site that has already been tendered but not yet approved, it is not possible for the project that is already in the approval procedure to take into account the planning of the site that was tendered at a later date due to the different progress in planning. The basic prerequisite for the preparation of the planning approval documents for the later site is therefore the transmission of the plans for the site that was put out to tender earlier, especially with regard to turbine locations and distances, taking into consideration the rotor diameters, as well as immediate information in the event of any updates.

6.2.2 Deviation of the actually installed capacity from the allocated grid connection capacity

According to the explanatory memorandum to Sec. 24 para. 1 No. 2 WindSeeG, the bidder who is awarded the contract has the option of installing additional wind turbines in excess of the bid quantity, provided that this is permitted by the planning approval decision. However, excess feed-in over and above the allocated grid connection capacity is not permitted at any time.

When submitting the application, the awarded bidder must state whether and to what extent additional systems are to be installed beyond the allocated grid connection capacity.

The increase in installed capacity beyond the allocated grid connection capacity serves to compensate for electrical losses and the unavailability of individual WTs. When demonstrating compliance with the 2 K criterion by the responsible TSO, the non-availability of individual WTs, the grid connection or measures through feed-in management as well as the electrical losses of the interarray cabling are generally not taken into consideration. Due to the conservative approach of the verification procedure, measures to increase the installed capacity beyond the allocated grid connection capacity are thus covered within a certain framework. Provided that the scope of the increase in installed capacity does not exceed a share of 10% of the allocated grid connection capacity, no additional proof of compliance with the 2C criterion in the area of the entire grid connection system is required from the awarded bidder.

Compliance with the 2 C criterion in the ongoing operation of the grid connection system shall be verified by the TSO using model-based procedures (e.g. TCM II), in particular in the event of an increase in the actually installed capacity beyond the allocated grid connection capacity.

6.3 Platforms

6.3.1 Planning and public display of platforms

During the planning, construction, operation and deconstruction of the platform, particular attention shall be paid to structural safety, supply and disposal including the provision of drinking water, sewage water treatment and occupational health and safety concerns including escape routes and means of rescue. Please refer to the requirements of the planning principle 6.1.11 to take into consideration official standards, legal requirements or concepts and the planning principle 6.1.12 (emission reduction) with regard to supply and disposal as well as sewage water treatment.

The implementation of the planning principle is to be presented in a concept for the various areas mentioned in the individual project approval procedure.

Major challenges are regularly associated with the subsequent installation of residential units to accommodate personnel. Therefore, these are to be avoided and accommodations are to be provided as far as necessary already during the planning of the platform.

Depending on the escape and rescue concept, at least two regular access points should be provided. Each installation should be equipped with a device (e.g. boat landing) which, in the event of an emergency, enables rescue workers mooring at the installation with a ship without wave-compensated access systems to ascend and enable persons who have gone overboard to ascend to the transition piece. On platforms, a helicopter landing deck is regularly set up in addition to the regular access by boat landing. It should be possible to use two different transport systems so that, for example, if access by boat is restricted due to weather conditions, the helicopter landing deck is available as an alternative access option. On a platform, it is possible to set up wind farm sites only as a rescue area in case of emergency. Use of the wind farm sites on a platform beyond emergencies is permissible by way of exception if, in the event of a technical incident, the hazard potential must be reduced within a short period of time in order to prevent the occurrence of an emergency, intervention from shore is not possible or countermeasures initiated have remained unsuccessful and no more suitable means of access to the platform are temporarily available.

6.4 Subsea cables

The following are the justifications for planning principles for subsea cables, which for the purposes of this Plan means power cable systems such as offshore grid connecting cables, cross-border subsea cables, interconnectors and subsea cables for plants for other forms of energy generation.

6.4.1 Bundling

This determination implements principle 2.2.3 (5) of the ROP 2021.

The bundling principle is intended to minimise impacts on other uses and the need for coordination with each other and with other uses. In addition, it should create as few constraints as possible for future uses. Bundling in the sense of parallel laying also reduces undesirable fragmentation effects, which can also be reduced by the above-mentioned determination.

6.4.2 Distance for parallel laying

There are various international recommendations for determining appropriate distances between subsea cables, such as those of the International Cable Protection Committee (ICPC) and the European Subsea Cables Association (ESCA). In the "Recommendation No. 2" of the ICPC of 3 November 2015, at least three times the water depth is required as a distance for parallel installation. If this is not possible, taking into consideration all circumstances, the distance can be reduced to two times the water depth using modern navigation equipment and installation/repair procedures (International Cable Protection Committee (ICPC), 2015). A study updated by DNV GL in 2018 on minimum distances for submarine cables determined the minimum distances that are technically possible and the corresponding threat potential for the cable systems. It describes under which conditions (e.g. ships, weather conditions, water depths) these values can be achieved (DNV GL, 2018).

The recommendations of ICPC mainly refer to the subsoil conditions of the North Sea, which are very different from the subsoil conditions in the Baltic Sea. As there are hardly any empirical values for the laying and repair of subsea cables in the subsoil conditions that occur in particular

in the territory of area O-2, it is not possible at the moment to assess whether the distances specified here are sufficient. If necessary, these distances must be adapted to the subsoil conditions.

When determining the required distances in the context of this plan, the exclusion of mutual thermal influence, safe installation and a sufficient safety distance in the event of repair measures are important.

Due to the large number of subsea cables required and the already very tight spatial conditions in the North Sea EEZ, especially in the area between the traffic separation zones, a spacing of at least 100 m between the cable systems is specified in this plan for water depths of up to 45 m. In particular for repair measures, a distance of 200 m is to be provided after every second cable system.

The distances between the subsea cables result, among other things, from the water depth, the subsoil conditions and the distances technically required for laying and repair.

The technically required distances also depend on the type of vessel used for laying and repair. It is likely that these distances are sufficient for all vessels currently available on the market (self-positioning vessels, but also anchor barges) under appropriate weather conditions.

With regard to the distances between each other, it should be borne in mind, especially in the case of a large bund, that the omega loops required for repairs also depend on the water depth, the subsoil conditions and the length of the damaged area. Accordingly, a greater distance of 200 m is required after every second subsea cable system. If necessary, these distances are to be adapted to the geological conditions.

In addition, in accordance with the planning scale of 1:400,000, the SDP does not define the actual submarine cable routes, but only corridors. The exact planning of the submarine cable route ("fine routing") is reserved for the respective approval or enforcement procedure. The routing and associated arrangement of the cable systems must take into account the implementation of the planning principles as early as possible. This principle can reduce the amount of space required and the impacts on the environment during laying and deconstruction.

6.4.3 Routing through gates

This stipulation ensures that subsea cables are routed through specified gates. This concentrates the subsea cables and pipelines at these points as far as possible and bundles them for further discharge towards land. This definition implements Objective 2.2.3 (3) and Principle 2.2.3 (4) of ROP 2021 with modifications. The definition was made in close consultation with the coastal federal states.

Gates were defined at the external borders of the EEZ with neighbouring states, from which a route within the German EEZ appears possible. In some cases, these corridors make use of existing infrastructure, such as subsea cables or pipelines that have already been laid. The designation was made in consultation with the neighbouring countries.

Due to the limited number of available routes in the territorial sea, subsea cables that do not land in Germany should not be routed through the N-I to N-V gates.

6.4.4 Crossing of shipping lanes

This specification is in line with the requirements 2.2.3 (5) of the ROP 2021.

In order to minimise mutual adverse effect between shipping and network infrastructure, it is necessary for the cable routes to cross the traffic separation zones, their continuations and the Kiel-Baltic Sea Route by the shortest possible route, insofar as parallel routing to existing structures and built facilities is not possible. Due to

the large number of cable systems to be expected, this applies in particular to the subsea cables for grid connection of OWFs, but also to all other subsea cables. By routing them parallel to existing structures, the area use and - to the benefit of shipping - the devaluation of the manoeuvring site as an anchorage ground can be reduced. In addition, conflicts can be minimised by laying the subsea cables sufficiently deep. Please refer to planning principle 6.4.7.

6.4.5 Crossings

This stipulation is also in line with the values of principle 2.2.3 (5) of the ROP 2021.

The purpose of the legal requirement is to avoid damage to third-party submarine cables and pipelines as well as other third-party devices that have already been laid, established or approved by the SDP. In addition, crossings of submarine cables are to be avoided wherever possible to prevent interference with the marine environment through the placement of hard substrate. Recommendations for the crossing construction structures are set out, for example, in the ESCA and ICPC recommendations.

The two crossing cable systems must usually be mechanically separated from each other. This is usually done by constructing a crossing construction. When building crossings, a technical structure is usually erected on the ground using hard substrate.

By laying the cables without crossing constructions, it is not necessary to cover the upper cable system with a cover or stone packing. This minimises the interference, especially in the case of expected large crossing constructions.

If crossing constructions cannot be avoided, the crossing should be designed as right-angled as possible according to the respective state of the art. If this is not technically possible, the crossing angle must not be less than 45°. This principle reduces the size of the crossing construction. Within the crossing construction, the two crossing subsea cables are usually separated from each other by concrete mats. These extend approx. 30 m on each side beyond the submarine cable to be crossed. The narrower the crossing angle, the longer the required crossing construction. Within the crossing construction, it is not possible to repair the lower cable system due to these structural measures. If there are faults in the lower cable system, a new crossing construction may be required.

When planning a crossing construction, the subsoil conditions must be taken into account. In addition, it must be taken into account that in the area of the crossing construction, the overburden required for compliance with the 2 K criterion cannot be maintained. It can be expected that the upper cable system will have to be additionally covered over a length of at least 100 m. The possibly required overlap of the crossing construction should remain easy to overfish.

In addition, the bending radii of the submarine cable must be taken into account, especially at crossings. In the case of crossings of existing cables, it must be ensured that the bending radii of the newly crossing subsea cables do not lie in the area of the crossing construction, so as not to enlarge it.

The routes for the TSO's subsea cables shall be provided without any crossings within the sites, and the interarray cabling of the OWF shall be designed accordingly.

6.4.6 Minimally disruptive cable laying procedure

The specification corresponds to the values of principle 2.2.3 (6) of the ROP 2021.

In order to minimise possible negative impacts on the marine environment from the laying of subsea cables, a cable laying procedure should be selected in the individual procedure, in particular depending on the geological conditions, which is expected to have the least interference

with and impact on the marine environment, but at the same time safely achieve the specified overburden.

6.4.7 Covering

This planning principle is also found in and clarifies principle 2.2.3 (5) of the ROP 2021. According to BFO-N 16/17, a depth of at least 1.5 m was required for the cable system to be laid in the North Sea. Please refer to the justification for this in planning principle 5.3.2.7 of BFO-N 16/17.

The covering to be created in the Baltic Sea was determined on the basis of planning principle 5.4.2.7 of the spatial offshore grid plan for the Baltic Sea (BFO-O) 16/17 in the individual project approval procedure and in the enforcement procedure on the basis of a comprehensive study.

6.4.8 Increase of sediment temperature

The determination on increase of sediment temperature is based on the justification of principle 2.2.3 (6) of the ROP 2021.

During the operation of the subsea cables, there is significant warming of the surrounding sediment radially around the cable systems. The heat emission results from the thermal losses of the cable during energy transmission. The conductor temperature can be a maximum of 70°C for DC conductors and 90°C for AC conductors.

The “2 K criterion” (i.e. a maximum temperature increase of 2 degrees (Kelvin) 20 cm below the seabed surface) has become established as a precautionary value for nature conservation in current official approval practice for all subsea cables laid in the EEZ area. The 2 K criterion represents a precautionary value which, according to the assessment of the Federal Agency for Nature Conservation (BfN), ensures with sufficient probability, based on the current state of knowledge, that significant negative impacts of cable warming on the marine environment or the benthic community will be avoided. Increased warming of the uppermost sediment layer of the seabed may lead to changes in the benthic communities in the area of the submarine cable route. In the process, coldestothermic species, which are bound to a low temperature range and are sensitive to temperature fluctuations, can be displaced from the area of the cable routes, especially in lower areas. In addition, there is the possibility that new, non-native species could become established as a result of increase of sediment temperature. Furthermore, an increase in soil temperature could change the physico-chemical properties of the sediment, which in turn could result in a change in oxygen or nutrient profiles.

In addition to the ambient temperature in the area of the subsea cables and the thermal resistance of the sediment, the type of cable and the transmission power have a significant influence on the extent of increase of sediment temperature. Compliance with the 2 K criterion must therefore be ensured when dimensioning the cable systems. For the temperature development in the near-surface sediment layer, the depth position or overburden of the cable systems is also decisive.

For further justification and discussion of this planning principle during the revision procedure for the SDP 2020, please refer to the explanations in Chapter 4.4.4.8 of the SDP 2020.

7 Pilot offshore wind turbines

Pursuant to Sec. 5 para. 2 no. 2 WindSeeG-E, the SDP may designate available grid connection capacities for areas in the EEZ and in the territorial sea on existing offshore grid connections or on offshore grid connections to be completed in the following years, which may be allocated to pilot offshore wind turbines pursuant to Sec. 95 para. 2 WindSeeG-E. In this context, the SDP identifies those grid connection capacities which are not sufficient for the efficient, economic operation of a larger number of WECs at sea in the spatial context and which are therefore not to be included in the tenders, but which are sufficient for the grid connection of pilot offshore wind turbines at sea. This is intended to increase the efficient use and utilisation of offshore grid connections.

The SDP can make spatial legal requirements for the construction of pilot offshore wind turbines in areas and designate the technical conditions of the offshore grid connections and the resulting technical requirements for the grid connection of pilot offshore wind turbines. A preliminary investigation of sites for pilot offshore wind turbines does not take place.

It should be noted that the SDP, by identifying available grid connection capacities, does not make any statement as to whether free sites for the construction and operation of pilot offshore wind turbines are available in an area. Furthermore, the SDP makes no statement as to whether pilot offshore wind turbines can be connected to the offshore connection on which grid connection capacity is available. Whether and where exactly the construction and operation of pilot offshore wind turbines at sea are permissible will be decided solely by the approval procedure for pilot offshore wind turbines at sea to be carried out later.

The available grid connection capacities were confirmed by the TSOs during the consultation of the SDP 2019. For a detailed preparation of the notes, please refer to the SDP 2019 or 2020.

In the SDP 2020, a free grid connection capacity of 5 MW was already identified on the OST-1-3 grid connection system. The available grid connection capacity on the OST-1-3 grid connection system has now increased by 10 MW to 15 MW. The background to this is the withdrawal of the award for the Wikinger Süd wind farm by the BNetzA.

8 Areas for other forms of energy generation

Pursuant to Sec. 5 para. 2a WindSeeG-E, the SDP may designate areas for other forms of energy generation outside of areas.

According to Sec. 3 No. 8 WindSeeG-E, an areas for other forms of energy generation is an area outside areas on which offshore wind turbines and plants for other forms of energy generation, each of which is not connected to the grid, can be erected in spatial coherence and which is subject to the approval procedure. According to Sec. 4, para. 3 WindSeeG, the objective of the designation is to enable the practical testing and implementation of innovative concepts for energy generation not connected to the grid in a spatially ordered and site-saving manner.

Sec. 5 para. 2a WindSeeG-E now does not contain a limit on the total site of areas for other forms of energy generation. For areas for other forms of energy generation, the SDP may stipulate spatial and technical legal requirements for wind energy installations and plants for other forms of energy generation, for subsea cables and pipelines or cables carrying energy or energy sources away from them, and for their ancillary installations (Sec. 5 para. 2a sentence 1 WindSeeG-E). The designation of corresponding subsea cables and pipelines or cables in routes or route corridors for offshore grid connecting cables is not permissible (Sec. 5 para. 2a sentence 2 WindSeeG-E).

In the territorial sea, areas for other forms of energy generation can only be designated if the competent federal state has identified areas for other forms of energy generation as a possible subject of the SDP. Please refer to the administrative agreement between the BSH and the federal state of Mecklenburg-Western Pomerania on determinations in the territorial sea[8]. No such determination has been made in the territorial sea.

Within the areas for other forms of energy generation in the EEZ defined in the SDP, the BSH determines the person entitled to apply for the respective areas by invitation to tender in accordance with Sec. 92 WindSeeG-E in conjunction with the legal requirements of the Ordinance on the Allocation of Areas for other Forms of Energy Generation in the Exclusive Economic Zone[9]

Areas for other forms of energy generation

In the EEZ of the North Sea, the areas for other forms of energy generation SEN-1 is defined. The area SEN-1 borders the OWFs "EnBW Hohe See", "Albatros" and "Global Tech 1" to the north-east. The interconnector "NorNed" runs through the centre of the area. To the west, north and east, the area is bordered by shipping routes. The approach and departure corridor of the "Albatros" wind farm runs along the eastern corner of the south-western area and must be taken into account (cf. planning principle 6.1.3). No spatial adjustment was made compared to the determination in the SDP 2020.

The areas for other forms of energy generation SEO-1 defined in the 2020 RDP is omitted. The ROP 2021 has defined a priority area for offshore wind energy for this sea area. Site O-2.2, the designation of which is being examined, also includes the former SEO-1 area (cf. Chapter 1).

[8] Available at: https://www.bsh.de/DE/THEMEN/Offshore/Meeresfachplanung/Flaechenentwicklungsplan/_Anlagen/Downloads/FEP/Flaechenentwicklungsplan_Verwaltungsvereinbarung_BSH_Mecklenburg_Vorpommern.html?nn=1653366

[9] Ordinance on the Allocation of Areas for Other Forms of Energy Generation in the Exclusive Economic Zone of 21 September 2021 (BGBl. I p. 4328).

No areas for other forms of energy generation are identified. In the ROP 2021, extensive priority and reservation areas for offshore wind energy have been designated. In all priority areas and, except in individual cases, also in all reservation areas, the present plan designates sites for the construction of offshore wind turbines for grid connection to the electricity grid. As a result, a capacity of approx. 60 GW can be erected with the sites thus designated for offshore wind turbines. In order to achieve the target of a total installed capacity of at least 70 GW of offshore wind turbines connected to the grid in 2045, additional sites are therefore needed beyond those specified in the ROP. Other uses regularly have claims on potential areas. The identification of additional areas for other forms of energy generation would further exacerbate the need to identify additional potential sites and the associated competing uses. This also applies to sites in Zones 4 and 5, which have so far been explicitly earmarked for grid connection to the onshore electricity grid. Due to the legal objectives for the expansion of offshore wind turbines connected to the grid, this use is prioritised over the identification of areas for other forms of energy generation.

Subsea cables and pipelines

The construction of subsea cables and pipelines or cables carrying energy or energy sources from the area for other forms of energy generation SEN-1 through the territorial sea is no longer excluded. Pursuant to Sec. 5 para. 2a sentence 1 WindSeeG-E, the SDP may lay down spatial and technical legal requirements for these subsea cables and pipelines or cables.

The legal requirement that the subsea cables and pipelines or cables for grid connection to SEN-1 should be routed within the reservation areas for subsea cables and pipelines wherever possible is based on principle 2.2.3 (2) of ROP 2021.

Pursuant to Sec. 5 para. 2a sentence 2 WindSeeG-E, the designation of subsea cables and pipelines or cables to connect areas for other forms of energy generation in routes or route corridors for offshore grid connecting cables is not permissible. For this reason, the routing of subsea cables and pipelines or cables for grid connection to SEN-1 via the gates N-I to N-V defined in the SDP is excluded. In order to achieve the medium- and long-term expansion targets for offshore wind energy, the available route corridors, particularly in the North Sea, should be reserved for pipelined wind energy.

In the case of the construction of a pipeline to grid connection SEN-1, the minimum capacity should be 2 GW (in relation to the energy carrier hydrogen). This legal requirement is intended to enable the grid connection of further areas for other forms of energy generation to the pipeline in the event of a designation in spatial connection with SEN-1. In this case, the pipeline operator must ensure that other market participants are granted access to the pipeline for the grid connection of further areas for other forms of energy generation. The comments received during the consultation on the extended preliminary draft of the SDP showed that the construction of a collection pipeline for the possible grid connection of further areas for other forms of energy generation is considered reasonable, even though there are still numerous open questions regarding the regulatory aspects of a hydrogen pipeline and the access possibilities for third parties. A capacity of 2 GW was initially mentioned as a reasonable size for a gathering pipeline. The construction of a pipeline with a lower throughput capacity, which only serves for grid connection to SEN-1, represents an inefficient connection option from a spatial point of view and is therefore excluded.

The construction of a cable that only serves for grid connection of SEN-1 through the territorial sea to land, e.g. to an onshore electrolysis plant,

also represents a spatially inefficient connection option and is therefore also excluded.

A grid connection of the SEN-1 area to the existing pipeline Europipe I is not excluded. The open questions regarding the access possibilities of third parties to an existing pipeline would have to be clarified exclusively by the respective project promoters. BSH does not assess the feasibility of such a grid connection in the SDP. There is no spatial designation of the pipeline required for grid connection to the SEN-1 area. The SEN-1 area is directly adjacent to the Europipe 1 pipeline. If the grid connection is planned along the shortest possible route, avoiding crossings with the pipeline's own cables and those of third parties, such as the NorNed interconnector, and is routed within SEN-1 as far as the south-western corner, which is directly adjacent to the pipeline, no impacts are apparent that would necessitate a spatial designation and the associated restriction of the future developer of the project in the implementation of the project.

III. Conformity of the specifications with private and public concerns

[will be executed after consultation]

IV. Summary environmental declaration and monitoring measures

[will be executed after consultation]

V. Bibliography

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Appendix

1 Map section

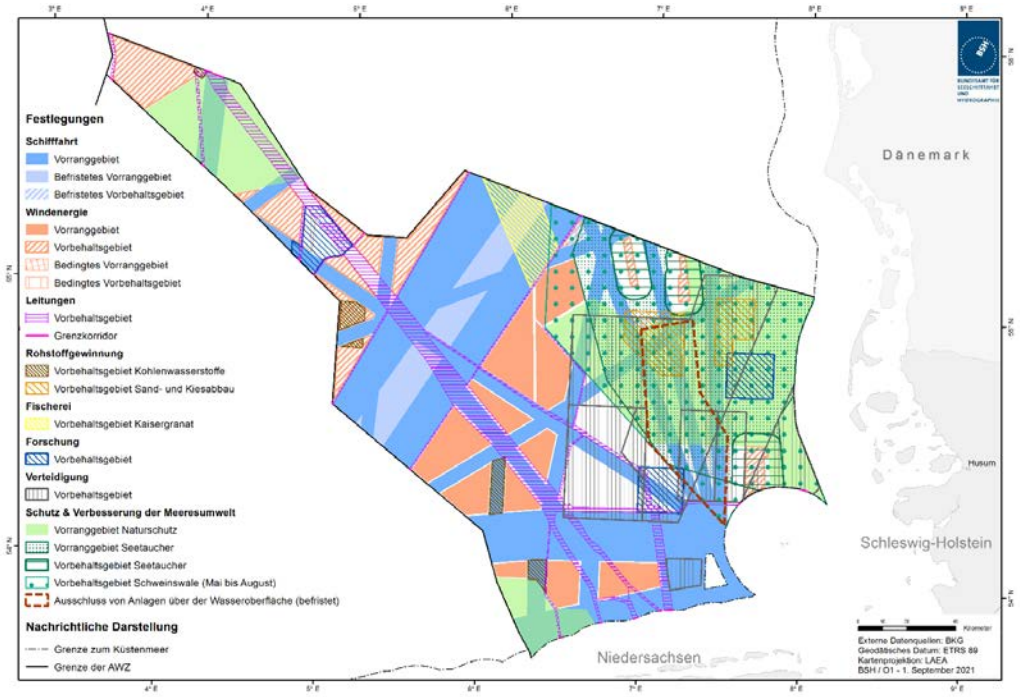

Figure 10: Maritime spatial plan for the German exclusive economic zone in the North Sea and the Baltic Sea - map section North Sea

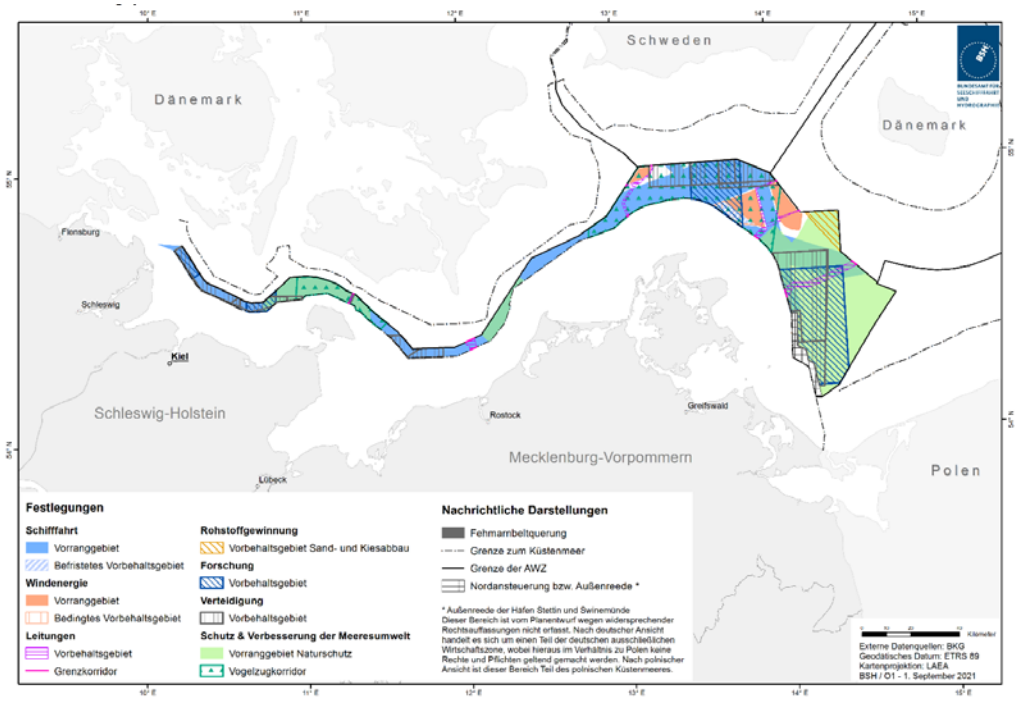

Figure 11: Maritime spatial plan for the German exclusive economic zone in the North Sea and the Baltic Sea - map section Baltic Sea

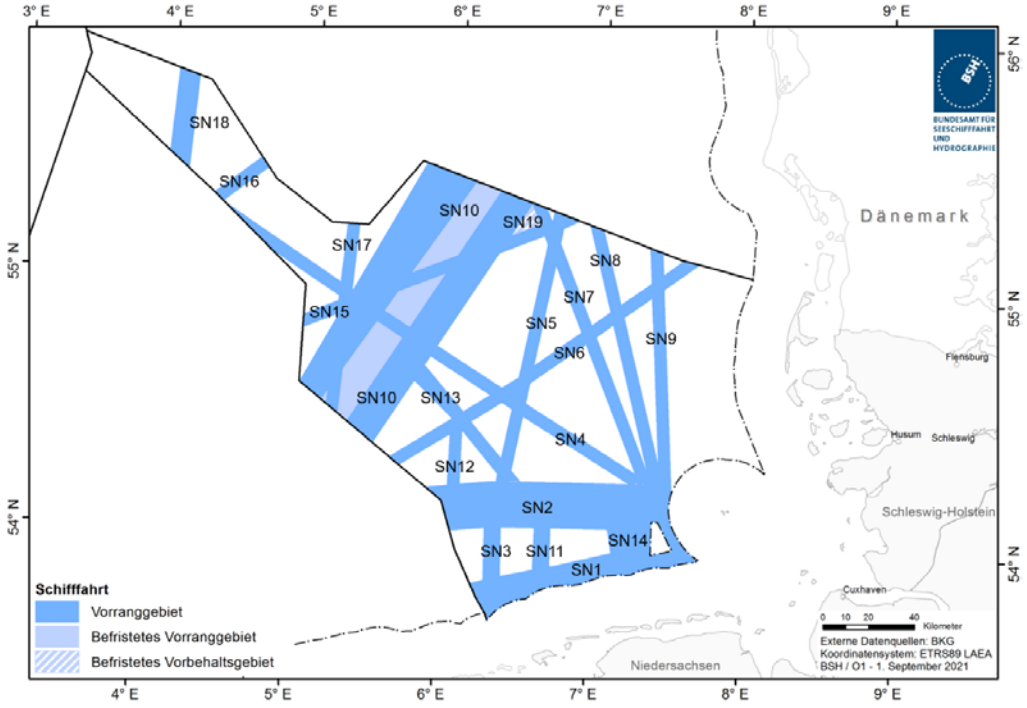

Figure 12: Maritime spatial plan for the German exclusive economic zone in the North Sea and the Baltic Sea - Priority and reservation areas for shipping in the North Sea.

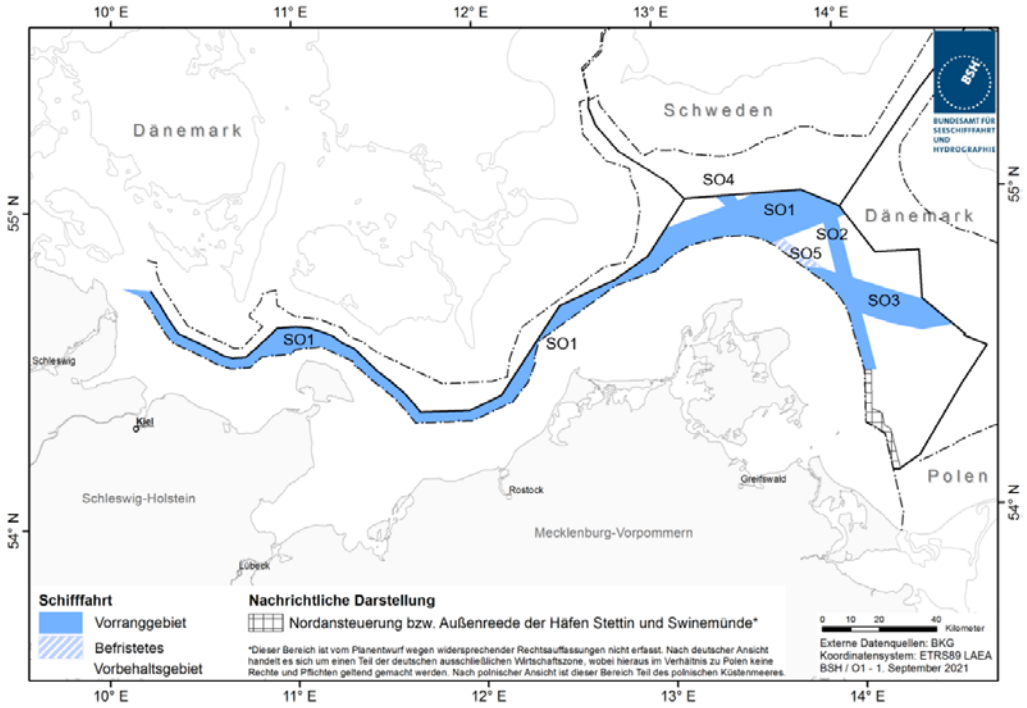

Figure 13: Maritime spatial plan for the German exclusive economic zone in the North Sea and the Baltic Sea - Priority and reservation areas for shipping in the Baltic Sea

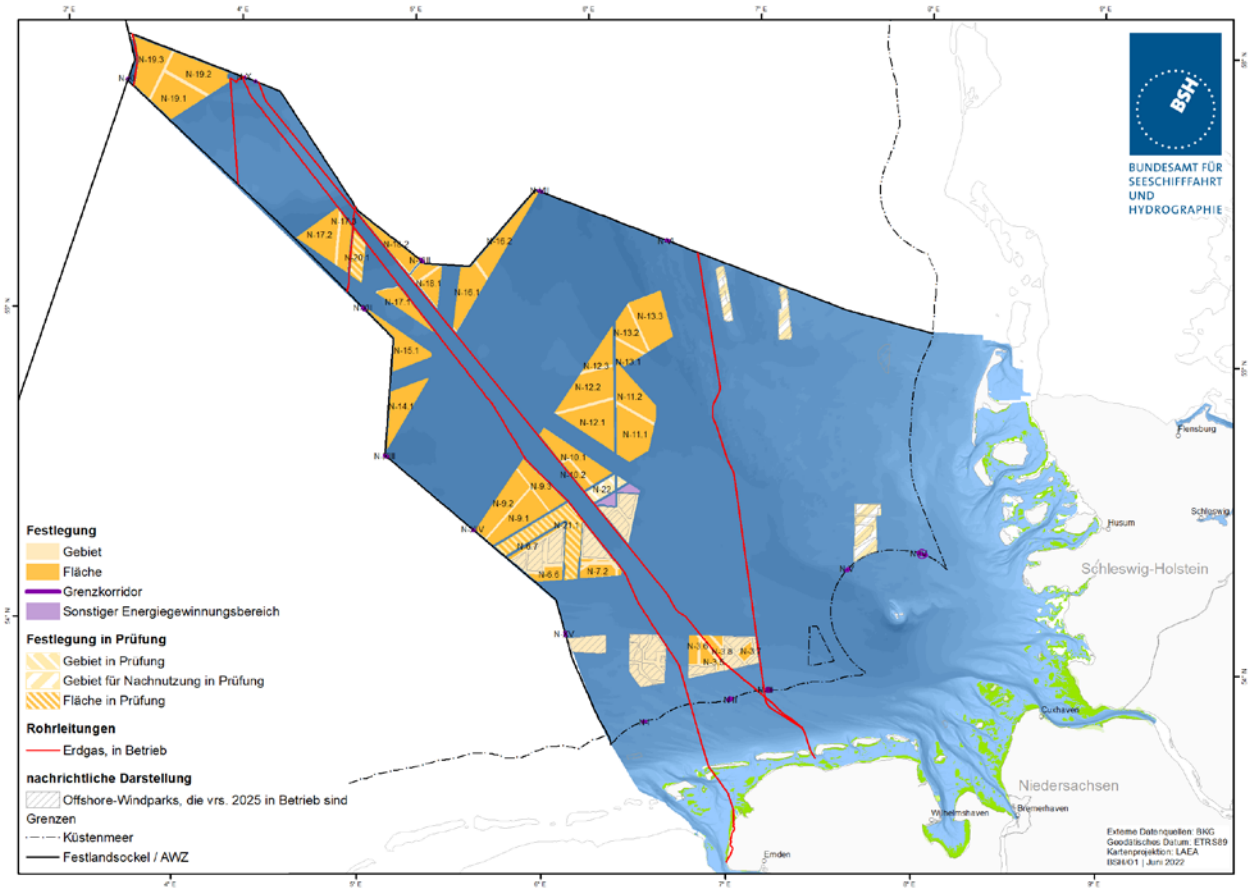

Figure 14: Determinations concerning areas and sites in the EEZ of the North Sea and pipelines

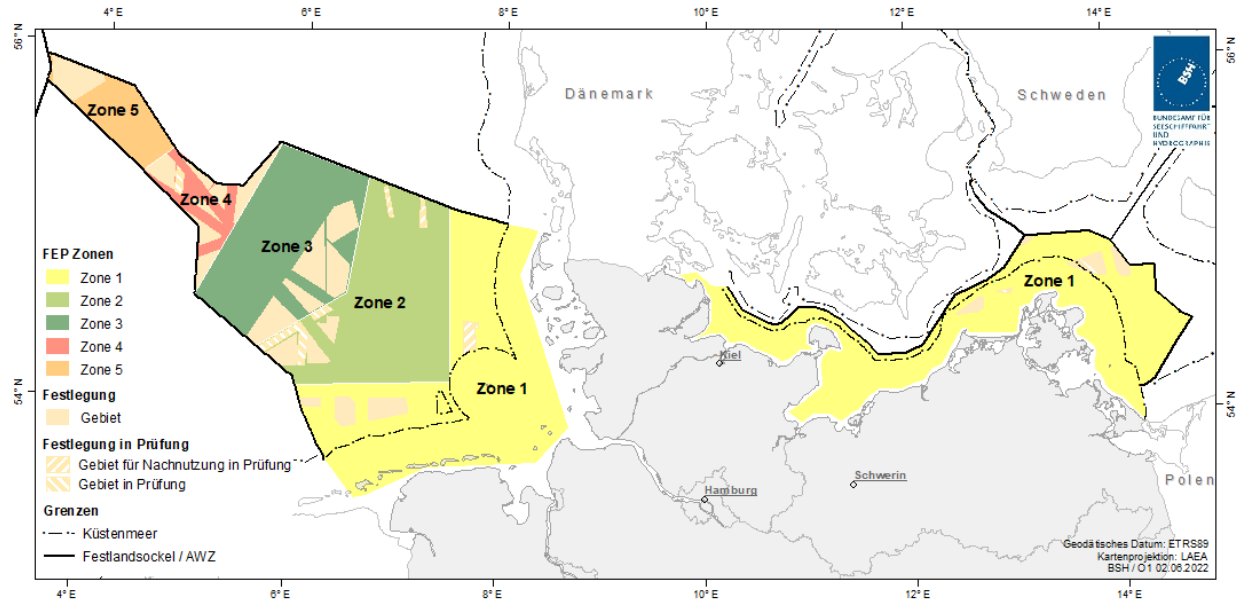

Figure 15: SDP zones (new layout)

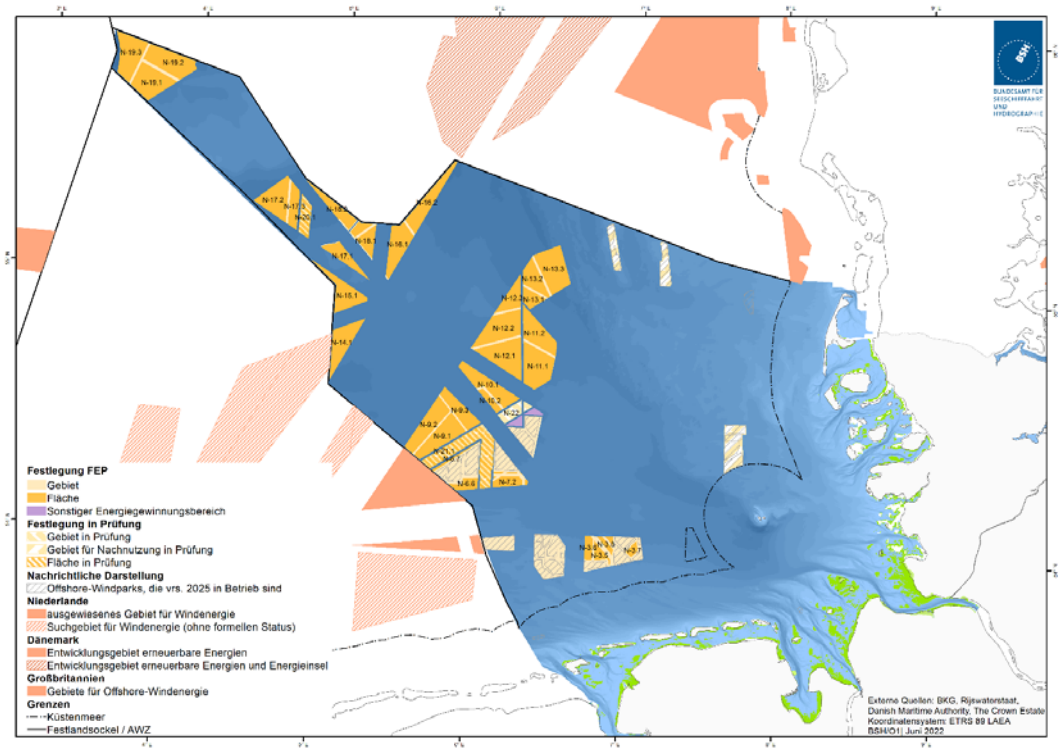

Figure 16: Designations for areas and sites and indicative presentation of planning statuses for offshore wind energy in the neighbouring EEZs of the North Sea

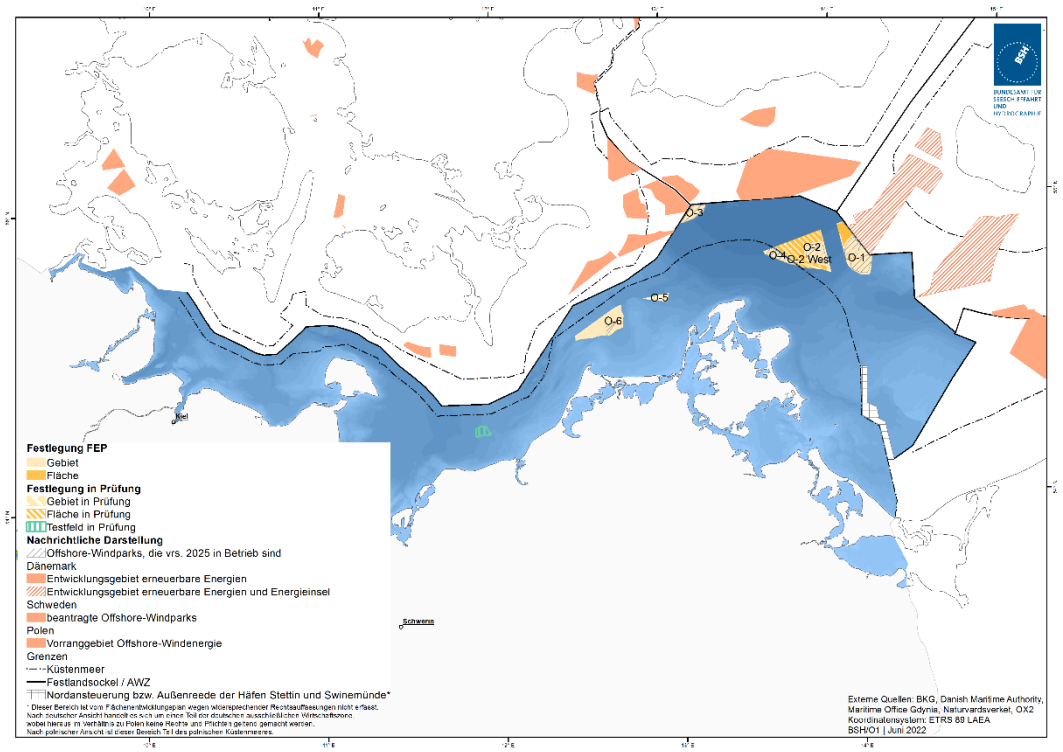

Figure 17: Designations of areas and sites and indicative presentation of planning statuses for offshore wind energy in the neighbouring Baltic Sea EEZs

2 Overview table

Table 10: Overview table of specifications for site and grid connection systems

Commissioning calendar year	Site designation	Tender calendar year	Calendar year / quarter commissioning	Expected to be installed Capacity [MW]	Commissioning per calendar year [MW]	Designation of grid connection system	Calendar year / quarter Commissioning	Transmission capacity [MW]	Gate to the territorial sea
2026	N-3.7	2021	2026 (QIII)	225	958	NOR-3-3	n/a	900	N-II
	N-3.8	2021	2026 (QIII)	433					
	O-1.3	2021	2026 (QIII)	300		OST-1-4	2026 (QIII)	300	O-I
2027	N-7.2	2022	2027 (QIV)	980	980	NOR-7-2	2027 (QIV)	980	N-V
2028	N-3.5	2023	2028 (QIII)	420	1,800	NOR-3-2	2028 (QIII)	900	N-II
	N-3.6	2023	2028 (QIII)	480					
	N-6.6	2023	2028 (QIII)	630		NOR-6-3	2028 (QIII)	900	N-II
	N-6.7	2023	2028 (QIII)	270					
2029	N-9.1	2024	2029 (QIII)	2,000	5,500	NOR-9-1	2029 (QIII)	2,000	N-II
	N-9.2	2024	2029 (QIV)	2,000		NOR-9-2	2029 (QIV)	2,000	N-III
	N-9.3	2024	2029 (QIV)	1,500		NOR-9-3	2029 (QIV)	2,000	N-III
2030	N-10.2	2025	2030 (QIV)	500	9,500				
	N-12.1	2023*	2030 (QIV)	2,000		NOR-12-1	2030 (QIV)	2,000	N-III
	N-12.2	2023*	2030 (QIV)	2,000		NOR-12-2	2030 (QIV)	2,000	N-V
	O-2.2**	2023*	2030 (QIII)	1,000		OST-2-4	2030 (QIII)	1,000	O-I
	N-10.1	2025	2030 (QIV)	2,000		NOR-10-1	2030 (QIV)	2,000	N-II
	N-11.1	2023*	2030 (QIV)	2,000		NOR-11-1	2030 (QIV)	2,000	N-V
2031	N-11.2	2024*	2031 (QIII)	1,500	4,000	NOR-11-2	2031 (QIII)	2,000	N-III
	N-13.1	2026	2031 (QIII)	500					
	N-12.3	2024*	2031 (QIV)	1,000		NOR-13-1	2031 (QIV)	2,000	N-III

Commissioning calendar year	Site designation	Tender calendar year	Calendar year / quarter commissioning	Expected to be installed Capacity [MW]	Commissioning per calendar year [MW]	Designation of grid connection system	Calendar year / quarter Commissioning	Transmission capacity [MW]	Gate to the territorial sea
	N-13.2	2026	2031 (QIV)	1,000					
2032	N-14.1	2025*	2032 (QIII)	2,000	4,000	NOR-14-1	2032 (QIII)	2,000	N-III
	N-13.3	2027	2032 (QIV)	2,000		NOR-13-2	2032 (QIV)	2,000	N-V
2033	N-15.1	2026*	2033 (QIII)	2,000	4,000	NOR-15-1	2033 (QIII)	2,000	N-III
	N-21.1**	2028	2033 (QIV)	2,000		NOR-21-1	2033 (QIV)	2,000	N-II
2034	N-17.1	2027*	2034 (QIV)	1,000	4,000	NOR-17-1	2034 (QIV)	2,000	N-III
	N-18.1	2027*	2034 (QIV)	1,000					
	N-16.1	2029	2034 (QIII)	2,000		NOR-16-1	2034 (QIII)	2,000	N-V
2035	N-18.2	2028*	2035 (QIV)	2,000	4,000	NOR-18-1	2035 (QIV)	2,000	N-V
	N-16.2	2030	2035 (QIII)	2,000		NOR-16-2	2035 (QIII)	2,000	N-V
2036	N-17.2	2029*	2036 (QIV)	2,000	4,000	NOR-17-2	2036 (QIV)	2,000	N-III
	N-19.1	2031	2036 (QIII)	2,000		NOR-19-1	2036 (QIII)	2,000	N-III
2037	N-17.3	2030*	2037 (QIV)	1,000	4,000	NOR-20-1	2037 (QIV)	2,000	N-III
	N-20.1**	2030*	2037 (QIV)	1,000					
	N-19.2	2032	2037 (QIII)	2,000		NOR-19-2	2037 (QIII)	2,000	N-III
2038	N-19.3	2033	2038 (QIII)	2,000	2,000	NOR-19-3	2038 (QIII)	2,000	N-III
Total SDP specifications					48,738				
Projected park 2025					10,800				
Additional potential of the territorial sea					1,000				
Projected park 2038					60,538				

* These tenders are expected to be issued as tenders for sites that have not been centrally pre-investigated. The period between tendering and commissioning is extended accordingly.

** Site under review

3 Subsequent use of sites

The first OWFs in the German EEZ were commissioned from 2009 onwards. By 2045, a significant number of wind turbines are expected to have reached the end of their service life and to have been deconstructed. In order to reliably achieve the statutory expansion targets, suitable assumptions must be made about the extent of the expected deconstruction.

According to the current state of knowledge, it can be assumed that no electricity can be produced on the sites between decommissioning and subsequent use for a certain period of time, so that the decommissioned capacity must be compensated for by the determination of additional sites in order to achieve the statutory targets. The amount of site required for this depends largely on how orderly and coordinated deconstruction and subsequent use of site can be. The issue of deconstruction and subsequent use was comprehensively consulted for the first time in the preliminary draft of the SDP dated 17 December 2021.

Pursuant to Sec. 69 para. 7 WindSeeG-E, the planning approval decision or the planning permission is issued for a limited period of 25 years; an extension of the time limit by 5 years is possible once, provided that the SDP does not provide for immediate subsequent use. Sec. 69 para. 7 sentence 4 WindSeeG-E even provides for a one-time extension by a maximum of ten years.

In order to reduce the period of vacancy of sites and grid connection systems as far as possible and at the same time ensure efficient planning and re-tendering of sites for subsequent use, the SDP will specify at which point in time subsequent use is planned on the respective site. Another measure to reduce vacant sites is to interleave the phases of deconstruction, tendering, approval and new construction as much as possible. Against this background, a period of two years between the completion of the deconstruction of the old wind farm and the commissioning of the new wind farm is considered sufficient.

The scope of the extension of the approval of existing wind farms is decided within the framework of the individual approval procedure. However, the intended determination of the subsequent use of the sites specifies the maximum period up to which the operation of the existing wind farms can be extended.

The aim of determining sites for subsequent use is to designate the largest possible contiguous sites that enable efficient operation and grid connection.

Areas N-4 and N-5 are currently under review with regard to subsequent use. Accordingly, no subsequent use is currently planned for these areas.

These intended specifications are initially only presented as an informative addendum within the framework of this draft. The presentation is initially limited to possible designations in Zones 1 and 2 of the North Sea and Baltic Sea and to those areas in which wind farms are expected to be in operation up to and including 2028. The intended determinations for subsequent use are shown in the Table 11.

A corresponding extension of the operating period of the existing wind farms requires the possibility of continued operation of the corresponding grid connection system. The maximum required operating time of the corresponding grid connection systems in the North Sea, assuming a maximum extension of the operating time in accordance with the intended specifications in Table 11, is shown in the following Table 12.

Table 11: Intended determinations for the subsequent use of sites in zones 1 and 2 of the North Sea and Baltic Sea.

Name of the site for subsequent use	Site for subsequent use [km²]	Expected installable capacity [MW]	Corr. Power density for subsequent use [MW/km²]	Commissioning for subsequent use	Completion of deconstruction until
N-1.2	79	1000	9.4	2056	2054
N-2.6	223	2000	7.6	2047	2045
N-3.9	130	1000	6.1	2053	2051
N-3.10	165	2000	9.8	2055	2053
N-6.8	249	2000	6.7	2055	2053
N-7.3	163	2000	9.7	2057	2055
N-8.4	124	1000	6.1	2047	2045
O-1.5	129	1000	6.0	2053	2051
O-3.2	28	300	6.4	2047	2045

Table 12: Maximum required operating time of the grid connection systems in the North Sea with maximum extension of the operating time of the existing wind farms in accordance with Table 11

Grid connection system	Commissioning	Expiry of approval	Decommissioning at max. extension of operation of OWF	Max. total operating time in years
NOR-1-1	2024	2049	2054	30
NOR-2-1	2009	2035	2035	26
NOR-2-2	2015	2045	2045	30
NOR-2-3	2018	2044	2045	27
NOR-3-1	2016	2042	2051	35
NOR-3-2	2028	2053	2053	25
NOR-3-3	2028	2051	2053	25
NOR-6-1	2010	2038	2048	38
NOR-6-2	2015	2045	2052	37
NOR-6-3	2028	2053	2053	25
NOR-7-1	2025	2050	2055	30
NOR-7-2	2027	2052	2055	28
NOR-8-1	2019	2044	2045	26
NOR-8-2	2019	2044	2045	26

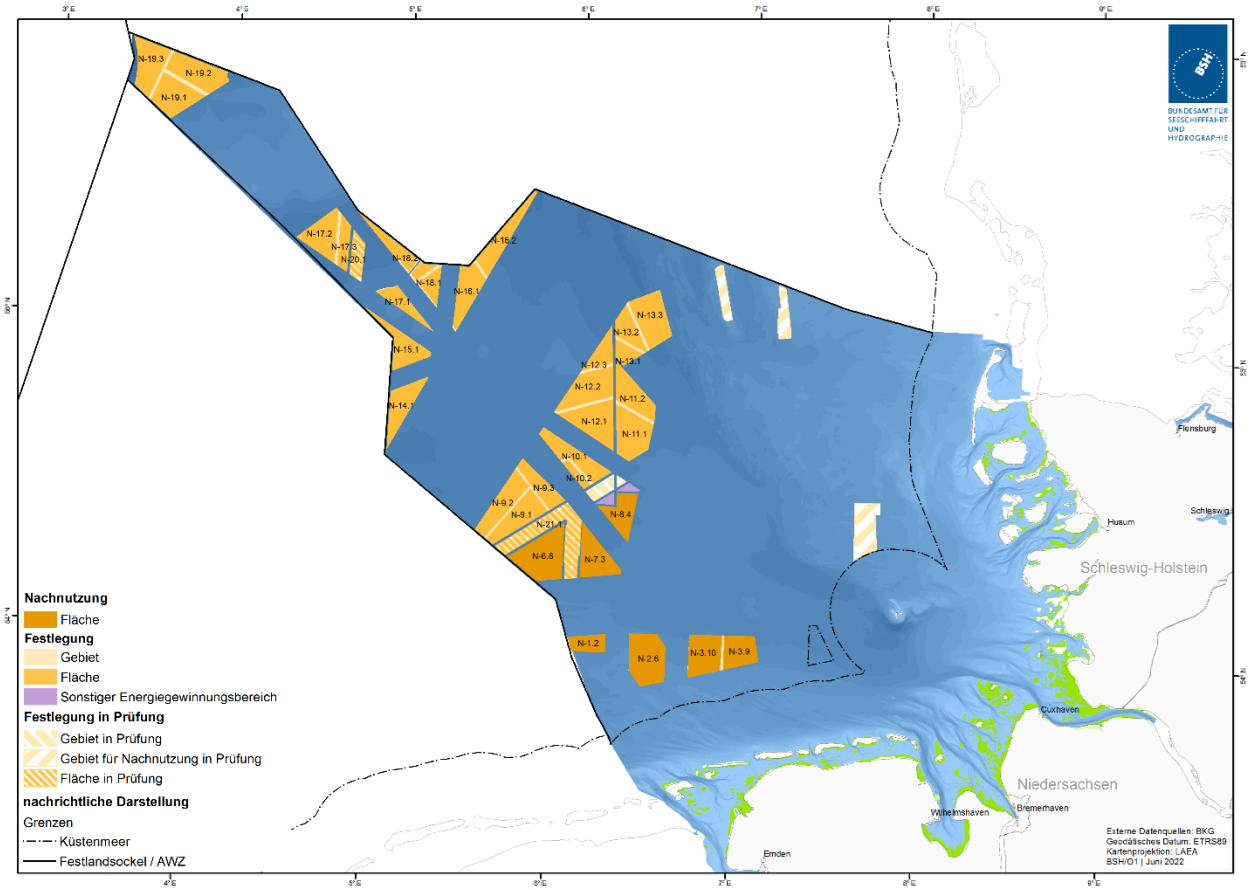

Figure 18: Intended determinations for subsequent use of areas in zones 1 and 2 of the North Sea (only areas in which wind farms are in operation up to and including the year 2028).

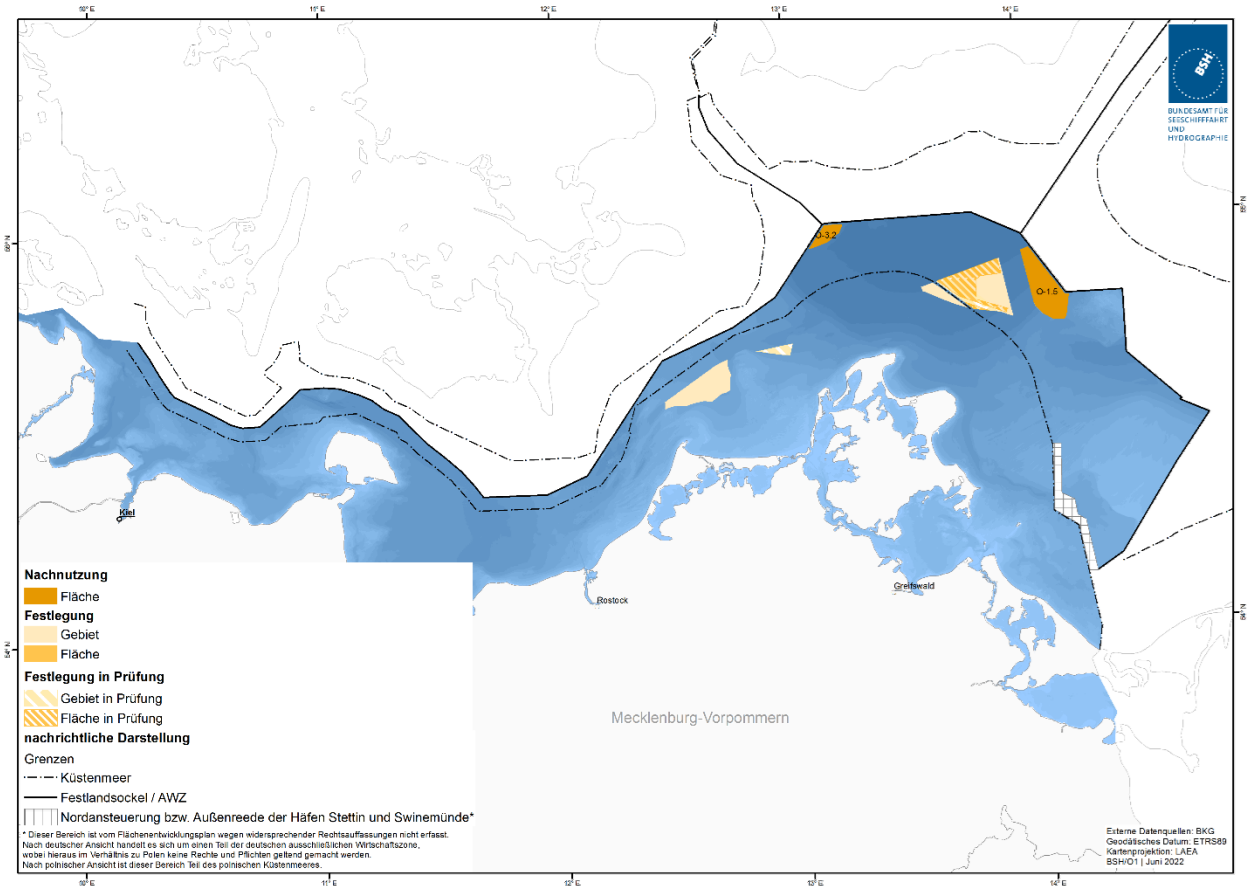

Figure 19: Intended determinations for subsequent use of areas in the Baltic Sea (only areas where wind farms will be operational up to and including 2028).

Questions for consultation

Subsequent use

F.13 Some of the intended determinations for the subsequent use of sites assume a significant increase in the corrected power density. Considering the technical development, do we think this is realistic?

F.14 The basis for determining the period of a maximum extension of the operating period of the existing wind farms is a time lag of 2 years between the completion of the deconstruction work and the commissioning of the new wind farm. Do you consider this period to be sufficient?

F.15 The intended determinations for the subsequent use of site assume in part a significant extension of the operating period of the wind farms and grid connection systems of 25 years. Is this realistic, taking into consideration the possibilities of adapting maintenance concepts and/or replacement investments?

F.16 Under what circumstances do you consider it possible to carry out the work on deconstructing the old wind farms and constructing the new wind farm in parallel? To what extent could

this reduce the assumed period of 2 years between completion of the deconstruction work and commissioning of the new wind farm?