DEUTSCHE WINDGUARD

Status of Offshore Wind Energy Development in Germany

First Half of 2025

On behalf of

BWE Bundesverband WindEnergie

BWO Bundesverband Windenergie Offshore e.V.

FOUNDATION OFFSHORE WIND ENERGY

VDMA Power Systems

wab It's only possible with wind

20 Jahre WindEnergy Network

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Notes

The data was obtained through surveys with industry representatives as well as through additional research. Retroactive adjustments to the data are done based on corrected notifications if required.
The installed capacity of offshore wind energy projects may be less or higher than the assigned grid connection capacity.
Future offshore wind energy projects are assigned with their total capacity to the respective expected year of full commissioning of the project.
The information provided within the text and figures partially includes rounded values. Thus, when added, there is a possibility of deviations from the overall values.

Photo on Title Page

Ørsted OWP Borkum Riffgrund 3
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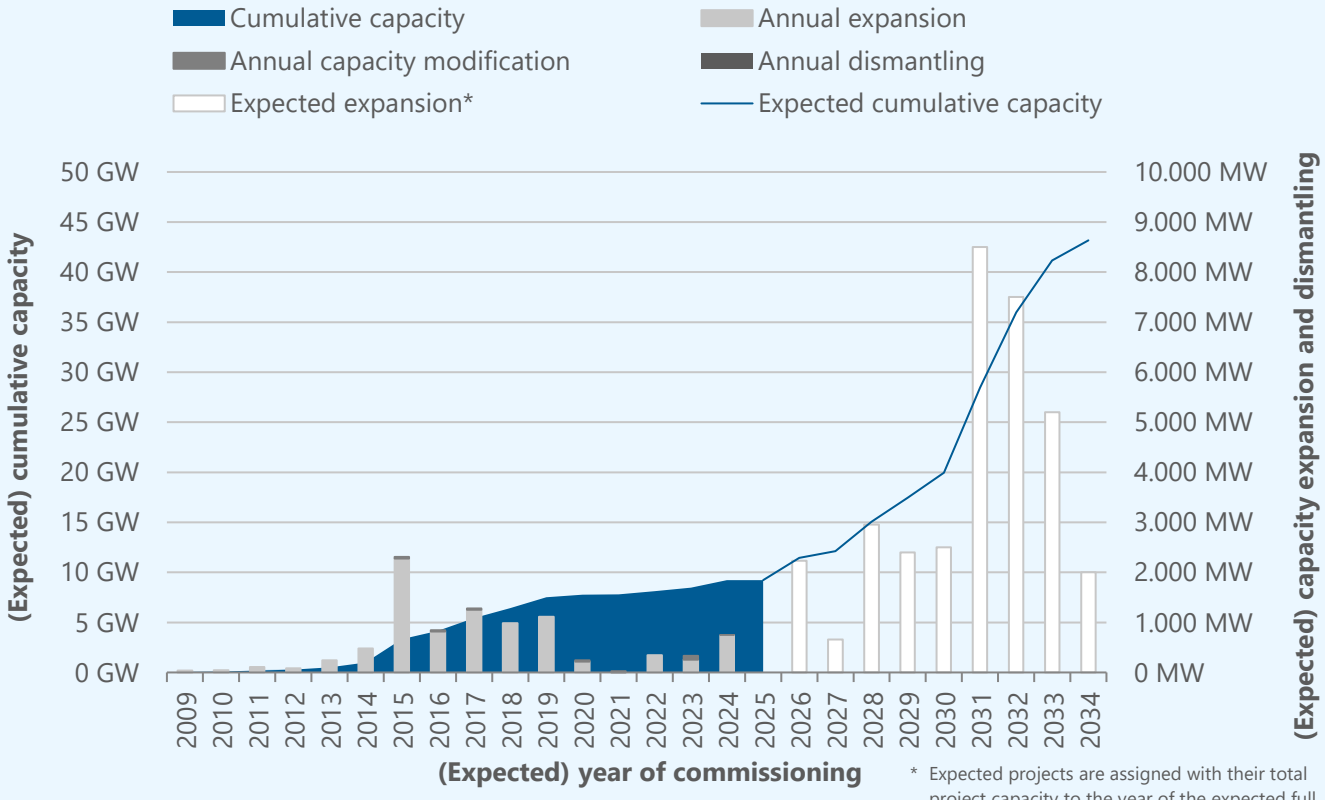
Offshore Wind Energy Development

As of June 30, 2025, 1,639 offshore wind turbines (OWT) with a total capacity of around 9.2 GW are in operation in Germany. Over the course of the first half of 2025, no offshore wind turbines fed into the electricity grid for the first time. However, new offshore wind turbines were installed on existing foundations. Thus, there is a total of 1,730 offshore wind turbines located off the German coast by mid-2025, with 91 of these offshore wind turbines awaiting first feed-in. In addition, 56 foundations are installed in the seabed, which are to be fitted with offshore wind turbines in the coming months.

The expected expansion in the coming years will lead to a significant increase in total installed offshore wind energy capacity in Germany by the end of the decade. A higher level of annual expansion is expected in the years after 2030.

Status of the offshore wind energy development

		Capacity	Number
Development H1 2025	OWT (feeding in)	0 MW	0 OWT
	Capacity modifications of existing OWT	0 MW	0 OWT
	Installed OWT (no feed-in)	143 MW	10 OWT
	Foundations w/o OWT		No Foundations
Cumulative 2025-06-30	OWT (feeding in)	9,222 MW	1,639 OWT
	Installed OWT (no feed-in)	1,079 MW	91 OWT
	Foundations w/o OWT		56 Foundations



(Expected) development of the offshore wind energy capacity in Germany
(Database: own surveys, MaStR, FEP 2025)

* Expected projects are assigned with their total project capacity to the year of the expected full commissioning. The actual commissioning of partial project sections may differ.

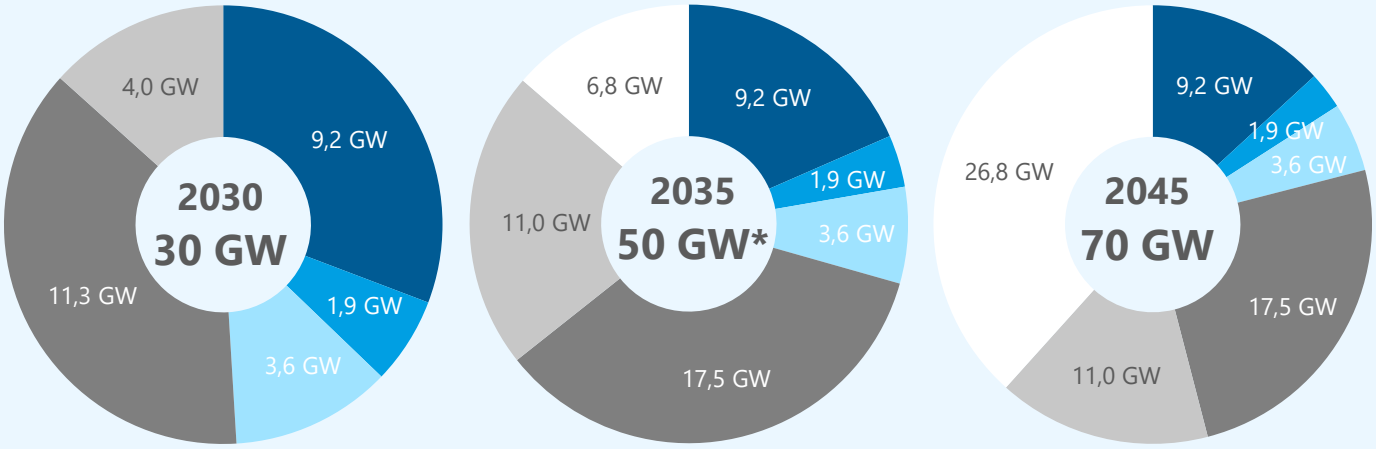
Expansion Targets Offshore Wind Energy

The expansion targets for offshore wind energy are defined in the German Offshore Wind Energy Act (German: Windenergie-auf-See-Gesetz or WindSeeG). It specifies that the installed capacity of offshore wind turbines connected to the grid is to be increased to at least 30 GW by 2030, to at least 40 GW by 2035 and to at least 70 GW by 2045. According to the Offshore Realisation Agreement from November 2022 the legally specified minimum target of 40 GW by 2035 is set to be exceeded, with 50 GW to be installed by 2035.

In order to achieve the expansion targets for offshore wind energy, the Federal Maritime and Hydrographic Agency (German: Bundesamt für Seeschifffahrt und Hydrographie or BSH) is constantly designating new sites for future expansion in the Site Development Plan (German: Flächenentwicklungsplan or FEP). The FEP 2025, which was published by the BSH in January 2025, provides for specifications for wind energy sites and grid connection systems up to the year 2034. Further specifications will follow in an update of the FEP 2025. The initiation of the update process is planned for 2025.

The legally defined expansion target of 30 GW for 2030 is expected to be achieved with a slight delay in the course of 2032. The WindSeeG target for 2035 of 40 GW can already be achieved in 2034 according to the plans of the FEP 2025, provided that all sites planned for this are tendered, awarded and realised as planned.

In order to achieve the increased expansion target of 50 GW in 2035, further specifications are required. This also applies to achieving the long-term legally defined expansion target of at least 70 GW offshore wind energy capacity by the end of 2045.



Development status (2025-06-30)

- In operation
- Under construction
- Final investment decision
- Awarded/grid connection claim
- Tenders scheduled
- Additional specifications required

* According to the WindSeeG, the installed capacity is to be increased to at least 40 GW by 2035. The Offshore Realisation Agreement from November 2022 between the federal government, the federal states of Hanseatic City of Bremen, Hanseatic City of Hamburg, Mecklenburg-Western Pomerania, Lower Saxony, North Rhine-Westphalia and Schleswig-Holstein and the transmission system operators 50Hertz, Amprion and TenneT aims to exceed the WindSeeG expansion target and install 50 GW by 2035.

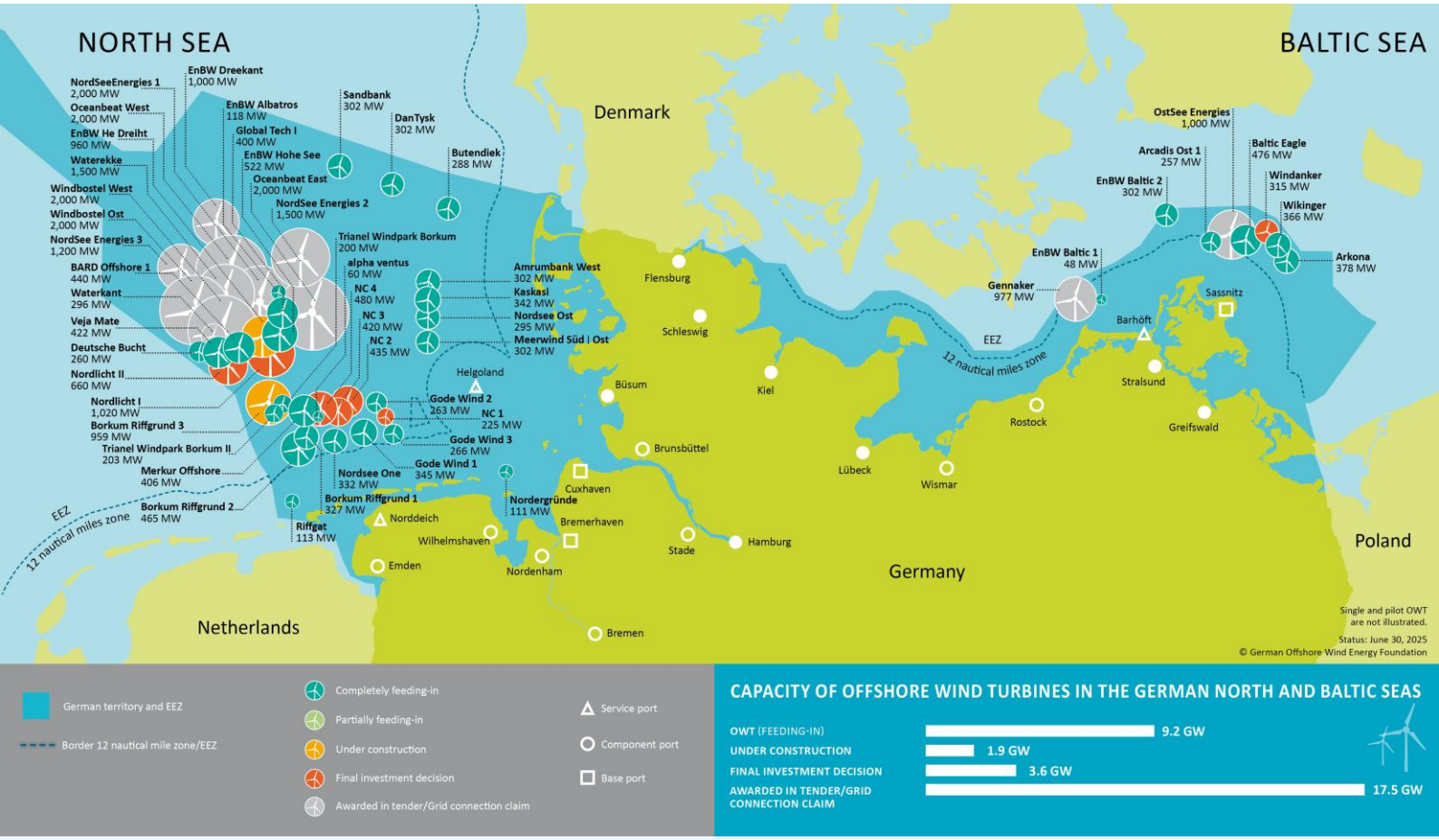
Development status of offshore wind energy capacity with expansion targets by 2030, 2035 and 2045 (Database: own surveys, MaStR, FEP 2025)

Activities in Offshore Wind Energy Projects

By the middle of 2025, 31 offshore wind energy projects (OWP) are fully operational in Germany. In the Borkum Riffgrund 3 OWP, the foundation installations were already completed in 2024, and the installation of the turbines was finalised at the beginning of 2025. At the OWP EnBW He Dreiht, all foundations were installed in 2024, and the erection of the offshore wind turbines has started in April 2025. The final investment decisions (FID) for the two projects Nordlicht I and Nordlicht II were made in spring 2025. For Nordlicht II, the final investment decision is still subject to the necessary approval being granted. Furthermore, for the first German OWP alpha ventus, which was fully commissioned in the year 2010, it was announced in May 2025 that the development of a decommissioning concept has begun.

Overview of future offshore wind energy projects

OWP	Status	Expected commissioning	Expected capacity
Borkum Riffgrund 3	Under Construction	2026	959 MW
EnBW He Dreiht	Under Construction	2026	960 MW
Windanker (O-1.3)	FID	2026	315 MW
NC 1 (N-3.7)	FID	2027	225 MW
NC 2 (N-3.8)	FID	2027	435 MW
Nordlicht I (N-7.2)	FID	2028	1,020 MW
Nordlicht II (N-6.6)	FID	2028	660 MW
Gennaker	Grid Connection Claim	2028	977 MW
Waterkant (N-6.7)	Awarded	2028	296 MW
NC 3 (N-3.5)	FID	2029	420 MW
NC 4 (N-3.6)	FID	2029	480 MW
Waterekke (N-9.3)	Awarded	2029	1,500 MW
Oceanbeat West (N-12.2)	Awarded	2030	2,000 MW
NordSee Energies 1 (N-12.1)	Awarded	2031	2,000 MW
Windbostel Ost (N-9.1)	Awarded	2031	2,000 MW
OstSee Energies (O-2.2)	Awarded	2031	1,000 MW
NordSee Energies 2 (N-11.2)	Awarded	2032	1,500 MW
Windbostel West (N-9.2)	Awarded	2032	2,000 MW
Oceanbeat East (N-11.1)	Awarded	2032	2,000 MW
EnBW Dreekant (N-12.3)	Awarded	2033	1,000 MW
Nordsee Energies 3 (N-9.4)	Awarded	2033	1,200 MW



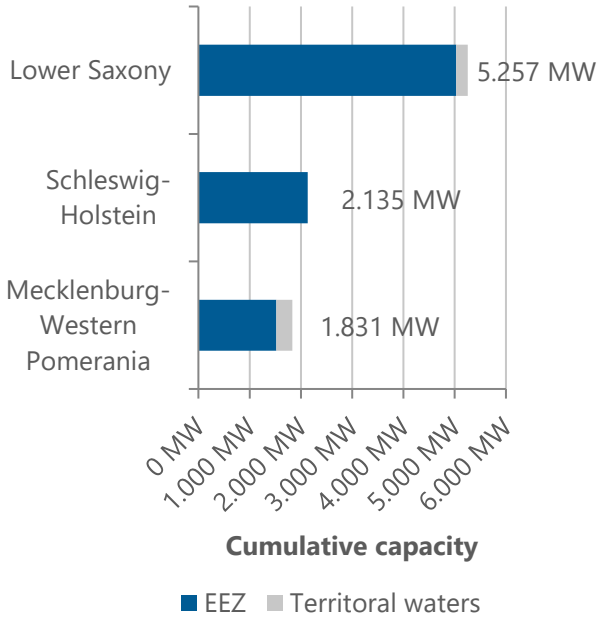
Overview map of offshore wind energy in Germany (© German Offshore Wind Energy Foundation)

Distribution across Federal States and North and Baltic Sea

The expansion of offshore wind energy in Germany is primarily focussed on the Exclusive Economic Zone (EEZ) of the North Sea. Accordingly, as of 30 June 2025, the installed capacity of German offshore wind turbines with grid feed-in is largely located in the North Sea (7.4 GW). The Baltic Sea accounts for significantly less capacity (1.8 GW).

The distribution between the EEZ and the territorial sea also clearly shows that most of the offshore wind turbines in the North Sea and Baltic Sea are installed in the EEZ (8.7 GW), with only a few turbines installed in the territorial waters (0.5 GW).

The capacity installed at sea can be allocated to the federal states based on the location of the respective grid connection point. Lower Saxony accounts for around 5.3 GW of the installed capacity in the North Sea and Schleswig-Holstein for 2.1 GW. The installed capacity of 1.8 GW in the Baltic Sea is fully connected in Mecklenburg-Western Pomerania.



Distribution of cumulative capacity of OWT (feeding in) across the federal states and maritime areas

Distribution across the North and Baltic Sea

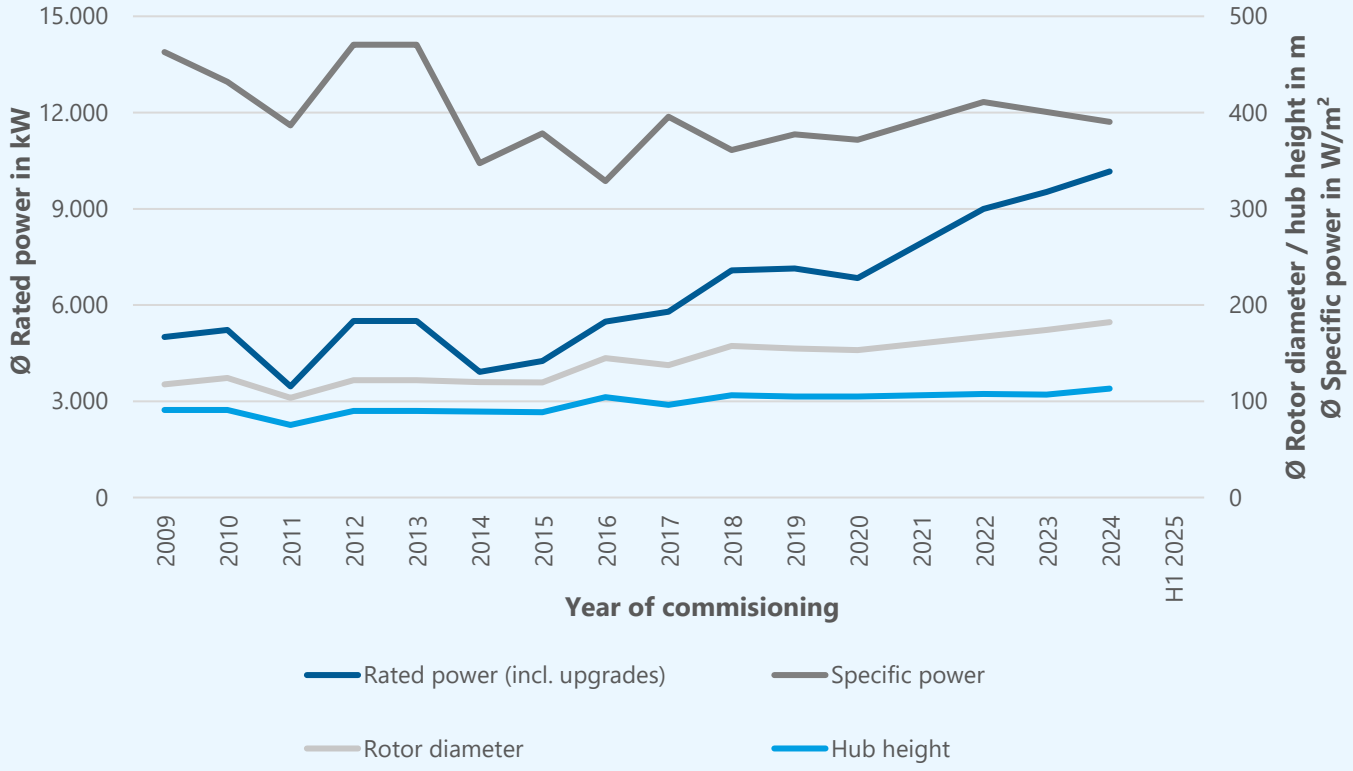
		North Sea		Baltic Sea	
		Capacity	Number	Capacity	Number
Development H1 2025	OWT (feeding in)	0 MW	0 OWT	0 MW	0 OWT
	Capacity modifications of existing OWT	0 MW	0 OWT	0 MW	0 OWT
	Installed OWT (no feed-in)	143 MW	10 OWT	0 MW	0 OWT
	Foundations w/o OWT		0 Foundations		0 Foundations
Cumulative 2025-06-30	OWT (feeding in)	7,391 MW	1,330 OWT	1,831 MW	309 OWT
	Installed OWT (no feed-in)	1,079 MW	91 OWT	0 MW	0 OWT
	Foundations w/o OWT		66 Foundations		0 Foundations

Turbine Configuration

With the expansion of offshore wind energy in Germany, the technology of OWT has developed steadily. The offshore wind turbines in operation in the German North Sea and Baltic Sea as of 30 June 2025 have an average turbine capacity of 5.6 MW. The first turbine with a capacity of 11 MW was installed and commissioned in 2024. This was followed in spring 2025 by the first erection of an offshore wind energy turbine with a capacity of 15 MW, which had not yet been commissioned by the middle of the year. Accordingly, the turbines currently under construction have significantly higher capacities than those that have been commissioned in the past. This also applies to the rotor diameter and hub height. The existing turbines have an average rotor diameter of 136 metres and a hub height of 96 metres. The turbines under construction in mid-2025, on the other hand, have significantly higher values: an average rotor diameter of 216 metres and a hub height of 144 metres.

Average offshore wind turbine configuration

Average Configuration	Cumulative 2025-06-30	Under construction H1 2025
Rated power (incl. upgrades)	5,627 kW	13,052 kW
Rotor diameter	136 m	216 m
Hub height	96 m	144 m
Specific power	378 W/m²	357 W/m²



Turbine configuration over course of time

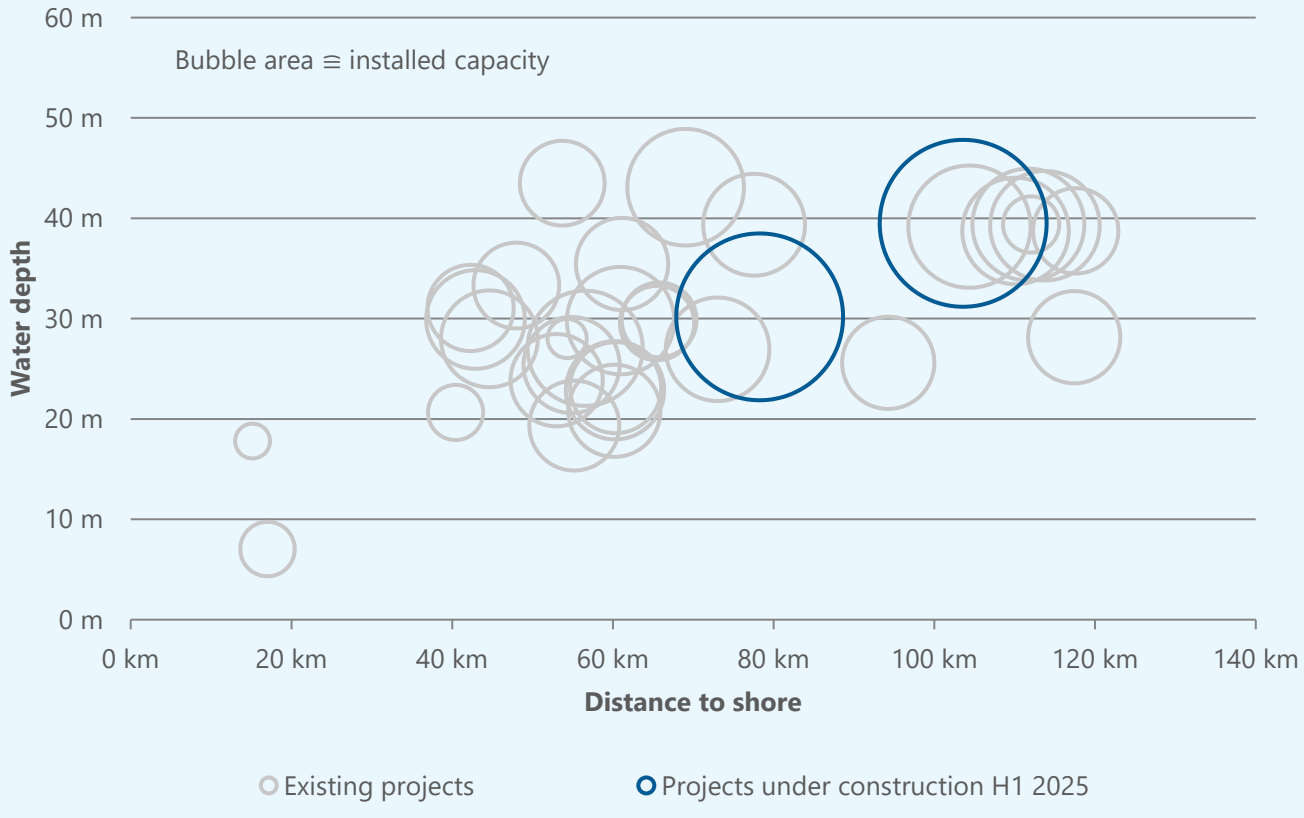
Water Depth and Distance to Shore

The majority of offshore wind energy projects off the German coast are located at least 40 km from the shore in water depths of 20 m or more; only a few projects are located in shallow waters close to the coast. Some of the projects are installed at locations up to 120 km from the shore and in water depths of over 40 m. On average, the existing projects have a water depth of approx. 31 m and a distance from the coast of approx. 73 km. The two projects under construction by mid-2025 have a greater average water depth and are also located further from the shore than the existing projects. In the long term, the expansion of offshore wind energy will increasingly shift to offshore areas in the German EEZ far away from the shore.

In terms of foundation type, the monopile foundation has been established as the most commonly used type in Germany. No other foundation type has been installed since the year 2019. Accordingly, the projects under construction in mid-2025 also used this type of foundation. In parallel with the growing dimensions of offshore wind turbines, the dimensions of monopile foundations are also steadily increasing.

Average water depth and distance to shore

Average location	Existing projects	Projects under construction H1 2025
Water depth	31 m	35 m
Distance to shore	73 km	91 km



Water depth and distance to shore of existing projects and projects under construction

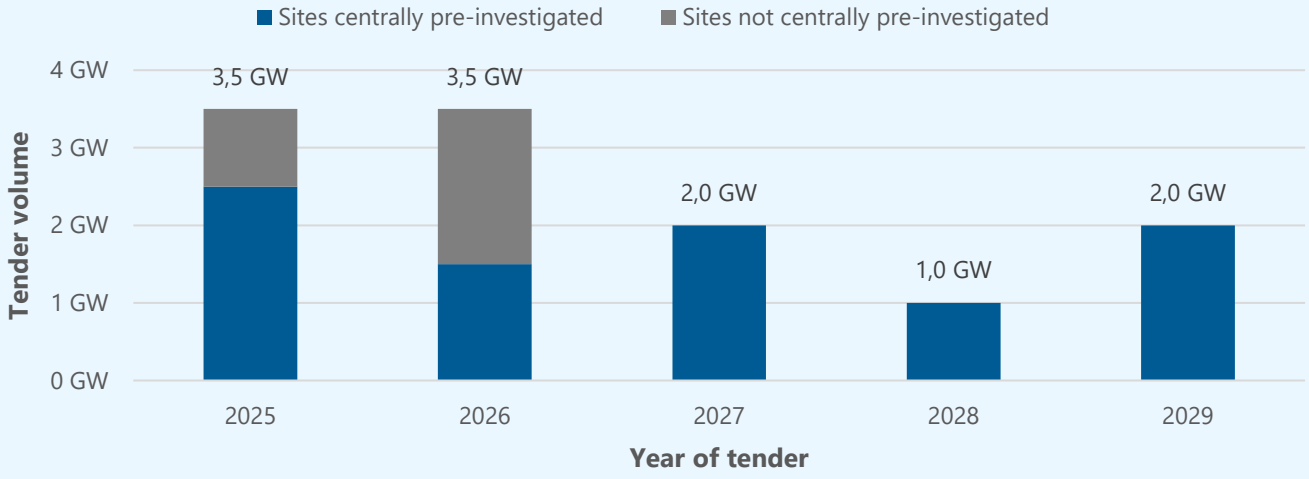
Tenders for Offshore Wind Energy

Since the year 2023, the Federal Network Agency (German: Bundesnetzagentur or BNetzA) conducts two tender rounds per year. A distinction is made between tenders for sites that have not been centrally pre-investigated and tenders for sites that have been centrally pre-investigated by the BSH. The tendering procedure differs depending on the type of site.

In June 2025, the tender round for a site not centrally pre-investigated took place. Site N-9.4 with 1 GW was put out to tender. The FEP 2025 states for this site that the actual installed capacity should exceed the allocated grid connection capacity by 20%. Two bidders submitted 0-cent-bids, which means that they do not receive funding, and a dynamic bidding procedure had to be carried out. The bidder with the highest willingness to pay was awarded. TotalEnergies was able to secure the award for the N-9.4 site for a bid value of €180,000/MW. Most of the payments offered are to be paid during the operating period of the offshore wind energy project.

In August 2025, the tender round for two centrally pre-investigated sites (N-10.1 and N-10.2) with a total volume of 2.5 GW will take place. These two sites will be awarded on the basis of a bidding process with additional qualitative criteria (including contribution to decarbonisation, foundation technology and securing skilled workers).

Further sites for future tender rounds with a volume of 8.5 GW have already been scheduled in the FEP 2025. These sites will be put out to tender in the years 2026 to 2029.



Site name (planned commissioning and capacity)	2025	2026	2027	2028	2029
Not centrally pre-investigated (■)	N-9.4 (2032, 1 GW)	N-12.4 (2033, 1 GW)			
		N-12.5 (2033, 1 GW)			
Centrally pre-investigated (■)	N-10.1 (2031, 2 GW)	N-13.1 (2031, 0.5 GW)	N-6.8 (2032, 2 GW)	N-9.5 (2033, 1 GW)	N-12.6 (2034, 2 GW)
	N-10.2 (2030, 0.5 GW)	N-13.2 (2031, 1 GW)			

Offshore sites for tenders 2025 to 2029 (Database: FEP 2025)

Overview of Grid Connection Capacities

In Germany, a total of 21 grid connection systems with a total capacity of ca. 9.8 GW are in operation as of mid-2025. Of the grid connection systems realised to date, 13 are in the North Sea and 8 in the Baltic Sea. Further grid connection systems are under construction by mid-2025. The first commissioning of a grid connection system in accordance with the new 2 GW standard is planned for 2029.

Installed and planned grid connections (to converter station or bundling point) in the North and Baltic Seas (Database: Confirmation of Grid Development Plan Electricity 2037/2045, FEP 2025, TSOs, additional research)

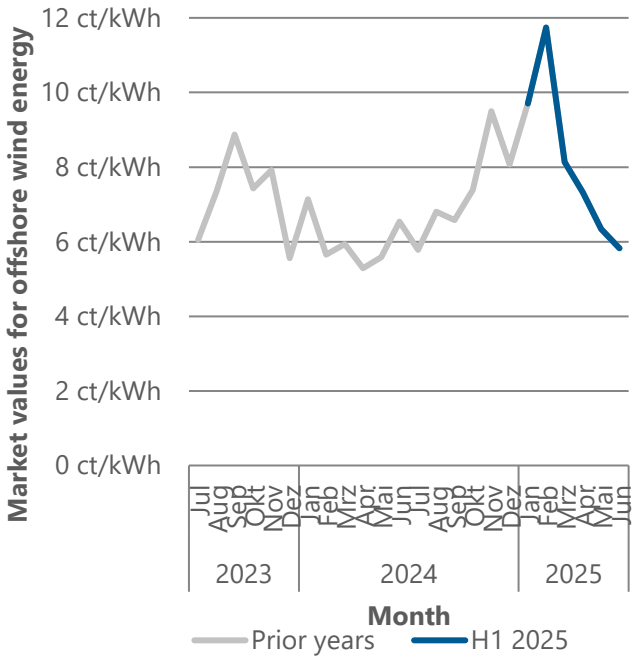
Grid connection system	Status	(Excpected) commissioning	(Expected) capacity	(Preliminary) assigned offshore wind energy projects and sites
North Sea				
NOR-2-1 (alpha ventus)	In operation	2009	62 MW	alpha ventus
NOR-6-1 (BorWin1)	In operation	2010	400 MW	BARD Offshore 1
NOR-0-1 (Riffgat)	In operation	2014	113 MW	Riffgat
NOR-2-2 (DolWin1)	In operation	2015	800 MW	Borkum Riffgrund 1, Trianel Windpark Borkum, Trianel Windpark Borkum II
NOR-4-1 (HelWin1)	In operation	2015	576 MW	Meerwind Süd | Ost, Nordsee Ost
NOR-4-2 (HelWin2)	In operation	2015	690 MW	Amrumbank West, Kaskasi
NOR-5-1 (SylWin1)	In operation	2015	864 MW	Butendiek, DanTysk, Sandbank
NOR-6-2 (BorWin2)	In operation	2015	800 MW	Deutsche Bucht, EnBW Albatros, Veja Mate
NOR-3-1 (DolWin2)	In operation	2016	916 MW	Gode Wind 1, Gode Wind 2, Nordsee One
NOR-0-2 (Nordergründe)	In operation	2017	111 MW	Nordergründe
NOR-2-3 (DolWin3)	In operation	2018	900 MW	Borkum Riffgrund 2, Merkur Offshore
NOR-8-1 (BorWin3)	In operation	2019	900 MW	EnBW Hohe See, Global Tech I
NOR-3-3 (DolWin6)	In operation	2023	900 MW	Gode Wind 3, NC 1, NC 2
NOR-1-1 (DolWin5)	Under construction	2025	900 MW	Borkum Riffgrund 3
NOR-7-1 (BorWin5)	Under construction	2025	900 MW	EnBW He Dreiht
NOR-7-2 (BorWin6)	Under construction	2027	980 MW	Nordlicht I
NOR-3-2 (DolWin4)	Under construction	2028	900 MW	NC 3, NC 4
NOR-6-3 (BorWin4)	Under construction	2028	900 MW	Nordlicht II, Waterkant
NOR-9-3 (BalWin4)	Under construction	2029	2,000 MW	Waterekke, N-10.2
NOR-9-1 (BalWin1)	Under construction	2030	2,000 MW	Windbostel Ost
NOR-12-1 (LanWin1)*	Under construction	2030	2,000 MW	NordSee Energies 1
NOR-12-2 (LanWin2)*	Planned	2030	2,000 MW	Oceanbeat West
NOR-9-2 (BalWin3)	Under construction	2031	2,000 MW	Windbostel West
NOR-10-1 (BalWin2)	Under construction	2031	2,000 MW	N-10.1
NOR-11-2 (LanWin4)*	Under construction	2031	2,000 MW	NordSee Energies 2, N-13.1
NOR-13-1 (LanWin5)*	Planned	2031	2,000 MW	EnBW Dreekant, N-13.2
NOR-6-4 (BorWin7)	Planned	2032	2,000 MW	N-6.8
NOR-9-4 (BalWin5)	Planned	2032	2,000 MW	NordSee Energies 3, N-9.5
NOR-11-1 (LanWin3)*	Planned	2032	2,000 MW	Oceanbeat East
NOR-12-3 (LanWin6)	Planned	2034	2,000 MW	N-12.4, N-12.5
NOR-12-4 (LanWin7)	Planned	2034	2,000 MW	N-12.6
Baltic Sea				
OST-3-1 (Baltic 1)	In operation	2011	50,6 MW	EnBW Baltic 1
OST-3-2 (Baltic 2)	In operation	2015	288 MW	EnBW Baltic 2
OST-1-1 (Ostwind 1)	In operation	2018	250 MW	Wikinger
OST-1-2 (Ostwind 1)	In operation	2019	250 MW	Arkona
OST-1-3 (Ostwind 1)	In operation	2019	250 MW	Arkona, Wikinger
OST-2-1 (Ostwind 2)	In operation	2023	250 MW	Arcadis Ost 1
OST-2-2 (Ostwind 2)	In operation	2024	250 MW	Baltic Eagle
OST-2-3 (Ostwind 2)	In operation	2024	250 MW	Baltic Eagle
OST-1-4 (Ostwind 3)	Under construction	2026	300 MW	Windanker
OST-6-1 (Gennaker)	Under construction	2028	927 MW	Gennaker
OST-2-4 (Ostwind 4)	Planned	2031	2,000 MW	OstSee Energies

* According to the decision on the cable routing of the BSH from May 2025, there may be delays in commissioning.

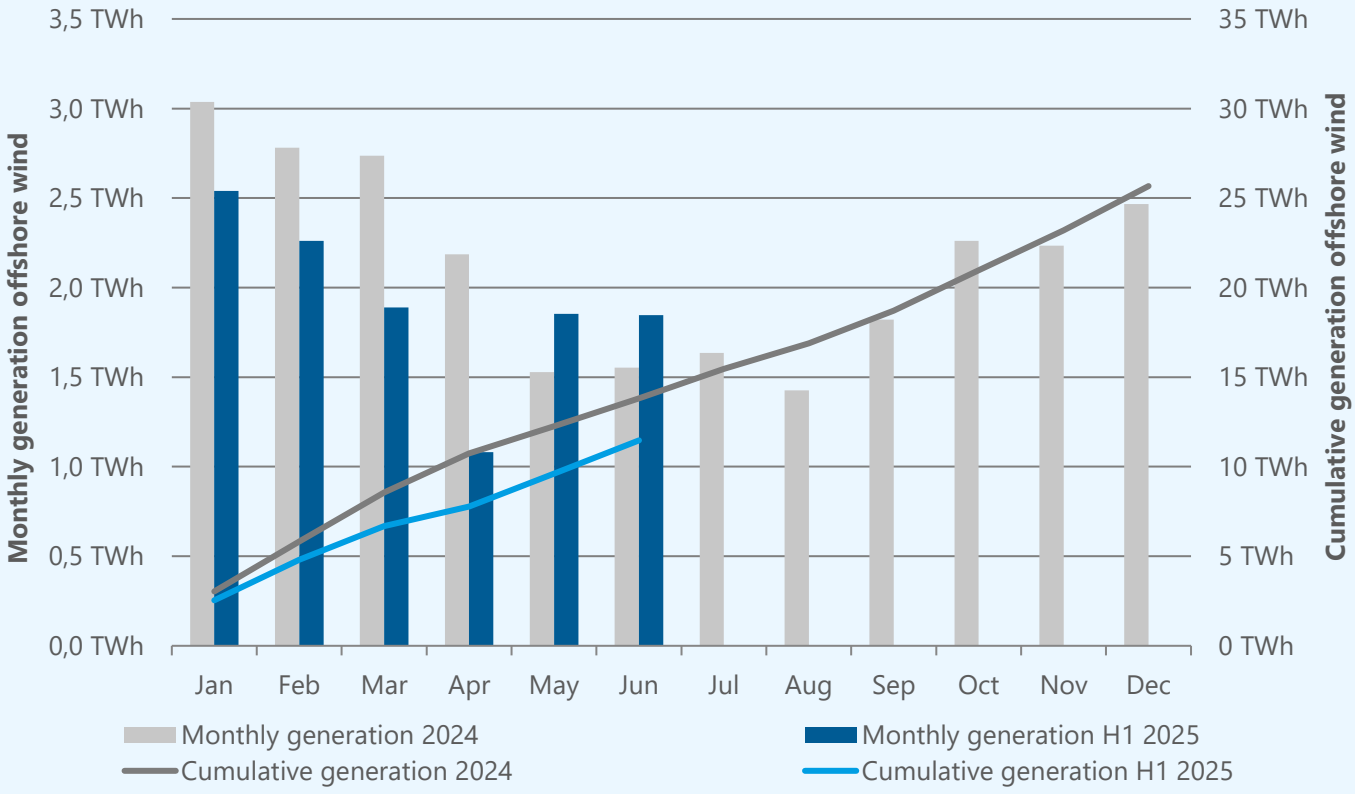
Power Generation and Market Values

The monthly market values for electricity from offshore wind energy ranged from a minimum of 5.82 ct/kWh (June 2025) to a maximum of 11.73 ct/kWh (February 2024) over the course of the first half of 2025. Overall, the monthly market values in the first half of 2025 were at a higher level than in the same period of 2024, averaging 8.41 ct/kWh.

Offshore wind energy generated a total of 11.5 TWh of electricity in the first six months of 2025. The highest monthly generation of 2.5 TWh was achieved in January 2025, while the lowest monthly generation of 1.1 TWh was recorded in April 2025. Overall, electricity generation in the first half of 2025 was at a lower level than in the same period in 2024. Offshore wind energy accounted for 5.2% of German electricity generation in the first half of 2025.



Monthly market values for offshore wind energy (Database: Netztransparenz)



Power generation offshore wind (Database: Bundesnetzagentur | SMARD.de)

About Deutsche WindGuard

In the complex energy market, Deutsche WindGuard is committed to providing unbiased, manufacturer-independent consulting and comprehensive scientific, technical and operational services.

About the German Windenergy Association (BWE)

The German Wind Energy Association (BWE) is a partner to more than 3.000 companies in the wind industry sector and represents the interests of its approximately 17.000 members. BWE pools the combined know-how of a diverse industry sector.

About the German Offshore Wind Energy Association (BWO)

The aim of the BWO is to represent the political interests of the offshore wind industry in Germany. The BWO acts as central point of contact for politicians and authorities at federal and state level for all questions relating to offshore wind energy.

About the German Offshore Wind Energy Foundation

The non-profit organization's overall purpose is to consolidate the role of offshore wind energy in the energy mix of the future in Germany and Europe and to promote its expansion in the interests of environmental and climate protection. Since 2005, it has been established as a non-partisan, supra-regional and cross-sector think tank as well as an independent communication platform for the entire offshore wind energy industry.

About VDMA Power Systems

VDMA Power Systems is the association for the power plant engineering. It represents the interests of manufacturers and suppliers of electricity and heat generation systems in Germany and abroad. These include wind energy, photovoltaic and hydropower plants, engines and thermal power plants as well as storage and sector coupling technologies.

About WAB e.V.

The WAB is the nationwide contact for the offshore wind industry, the onshore network in the Northwest and promotes the production of green hydrogen from wind power. The association includes around 250 smaller and larger companies as well as institutes from all areas of the wind industry, the maritime industry, the emerging hydrogen economy and science.

About WindEnergy Network e.V. (WEN)

The WEN is the leading company network for wind energy in the northeast region with currently 100 member companies. The aim is to promote the expansion of companies and supply chains in order to enhance regional value creation in the future sector renewable energies. The key topics are windenergy on- and offshore, maritime technologies in connection with offshore windenergy as well as the development of green hydrogen.