FACHAGENTUR
WIND UND SOLAR

Status of Onshore Wind Energy Development in Germany

First Half of 2025

On behalf of

BWE
Bundesverband WindEnergie

VDMA
Power Systems

Status of Onshore Wind Energy Development in Germany

First Half of 2025

Jürgen Quentin

Imprint

Published by:
Fachagentur Wind und Solar e. V.
Fanny-Zobel-Strasse 11 | 12435 Berlin
www.fachagentur-wind-solar.de
post@fa-wind-solar.de

Responsible under German press law: Dr Antje Wagenknecht

The Wind and Solar Energy Agency is a non-profit association. It is registered with the Charlottenburg District Court, VR 32573 B

Author: Jürgen Quentin

Published on: 15 July 2025

Suggested citation: FA Wind und Solar (ed.), Status of Onshore Wind Energy Development in Germany in the First Half of 2025.

Created on behalf of:
German Wind Energy Association and VDMA Power Systems

Contents

Preliminary note

The analysis is based on data from the Market Master Data Register (MaStR), on publications by the Federal Network Agency (BNetzA) in connection with onshore wind energy tenders, as well as on our own research. The data has been checked for plausibility, partially supplemented and in some cases corrected. Findings on repowering are largely based on our own research and interviews with stakeholders. Shutdowns of wind turbines were partially added where reports confirm them, but final shutdown has not yet been registered. The temporal allocation of permits is based on the initial permit date. A later modification date resulting from changes to the permitted wind turbine does not affect the temporal allocation of the permit. The analysis also includes wind turbines permitted during the period under review that have not yet been entered in the MaStR, but for which the author has the official approval documents.

The evaluation includes wind turbines with a minimum capacity of 100 kilowatts (kW). Wind turbines are considered decommissioned from a generator capacity of 80 kW.[1]

This publication has been released before the deadline[2] for register entries has expired. Further reports that may increase the number of permits, commissioning and shutdowns are therefore possible. Delayed registrations and subsequent changes to register entries may also result in discrepancies in the situation presented here for the first half of the year.

[1] Small wind turbines play only a minor role in Germany. In the first half of 2025, according to the register, 60 wind turbines with only 379 kW (approximately 0.4 MW) of capacity were commissioned. By mid-2025, 1,024 small wind turbines (up to 80 kW generator capacity) with a total capacity of 9.2 MW were registered as “in operation” nationwide.

[2] Section 5 of the MaStR Ordinance provides that registration must take place within one month of commissioning. The one-month period also applies to provisional and final shutdowns as well as “approvals” under the Federal Immission Control Act. The last data retrieval in MaStR for the analysis took place on 14/07/2025 (12:00 pm).

Summary

The first half of 2025 marks a clear upward trend in both gross expansion and permits granted for new wind turbines. The number of new wind turbines commissioned increased by two thirds compared to the same period last year. The volume of newly permitted capacity reached a new record after six months.

By the end of June, 7,851 megawatts (MW) of new wind energy capacity had been permitted nationwide by the authorities. Compared to the first half of 2024, capacity increased by 55 percent. Never before has so much wind energy capacity been approved in a first half-year. Just over one third of the permitted capacity comes from North Rhine-Westphalia (2,677 MW), which, for the third year in a row, clearly leads the federal state ranking. In second-placed Lower Saxony, 1,000 MW less was permitted – specifically 1,568 MW. Bavaria follows in third place with permits for just under 600 MW of wind energy capacity. Despite the exceptionally high number of permit notices, processing times continued to decline in almost all federal states. On average across Germany, approval procedures completed this year took 18 months, shortening by 20 percent compared to 2024.

The abundance of new permits also affected the tender rounds. The volume of capacity auctioned this year was fully awarded by the Federal Network Agency. The awarded volume (just over 7,500 MW) increased by 80 percent compared to the first half of 2024. The persistently high number of permits already suggests that the bidding rounds in the second half of the year will also be heavily over-subscribed.

In the first six months, 409 new wind turbines with a capacity of 2,202 MW were commissioned – two thirds more than in the same period last year. Here too, North Rhine-Westphalia leads the state statistics with 598 MW of gross expansion, followed by Lower Saxony (502 MW) and Schleswig-Holstein (341 MW). Repowering accounts for 35 percent of the newly installed capacity – almost unchanged from the previous year. The number of shutdowns so far this year is one quarter below that of the first half of 2024 but based on past experience is likely to increase due to subsequent reports in the coming weeks.

After deducting the shutdowns, net additions in the first half-year amounted to 1,876 MW. The total number of wind turbines increased by 198 wind turbines.

By the end of June, the nationwide total comprised around 28,900 wind turbines with a capacity of 65.3 gigawatts (GW). 11.3 GW of the installed capacity has no longer been eligible for remuneration under the Renewable Energy Sources Act (EEG) since the beginning of the year. The average age of the wind park in Germany is 15.4 years. The highest average age (20.5 years) is found among wind turbines in the Free State of Saxony. The youngest wind park is in Saarland, with an average of 11.1 years in operation.

In the first half of 2025, onshore wind turbines generated around 49 billion kilowatt-hours (kWh) of electricity. Although the amount of electricity fell by 18 percent due to a very low-wind spring, onshore wind energy remained the most important energy source for electricity generation in Germany, with a share of 22 percent.

Table 1: Status of onshore wind energy development

First half of 2025	Wind turbines	Capacity [MW]
Newly permitted	1,276	7,851
Gross installation	409	2,202
Thereof repowering	138	777
Decommissioned	210	326
Net installation	199	1,876
Total fleet as of 30/06/2025	28,925	65,344

1 Commissioning of new wind turbines

In the first six months of 2025, 409 onshore wind turbines with a total electrical capacity of 2,202 MW were commissioned in Germany. 35 percent of the newly installed wind energy capacity was realised as part of repowering. In terms of installed capacity, gross expansion are two thirds above the previous year's figure (1,319 MW) and also represent the highest half-yearly figure since 2017.

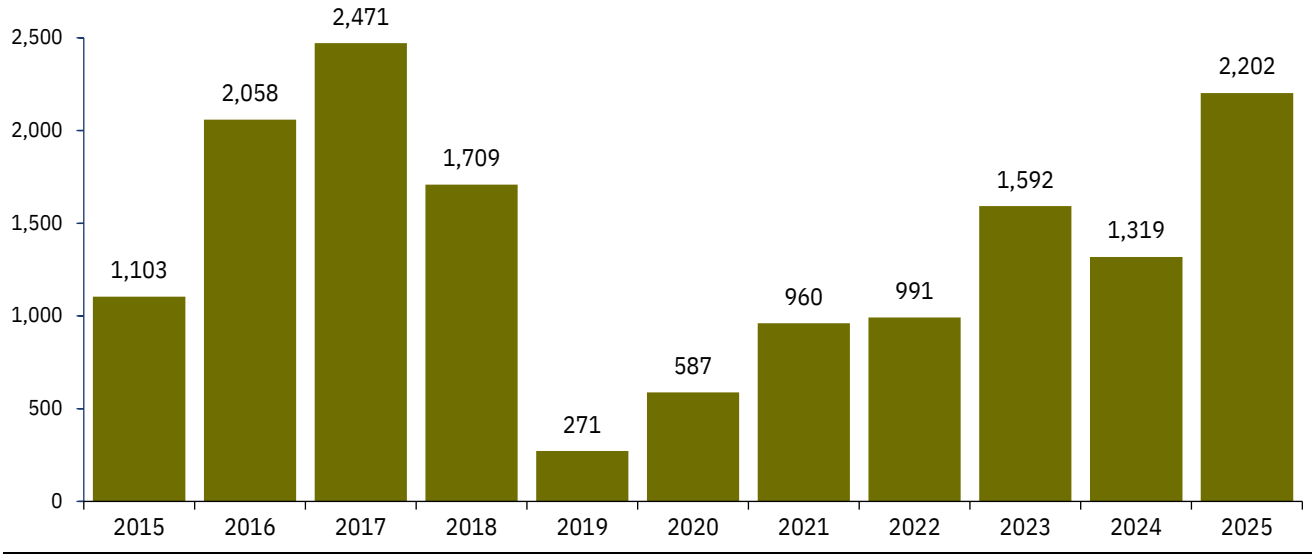

Figure 1: Wind energy capacity commissioned onshore in each first half-year (gross installation)
Data: MaStR; figures in megawatts

After deducting the decommissionings reported in the first half of the year (210 wind turbines, 326 MW), net additions amount to 1,876 MW or 199 wind turbines.

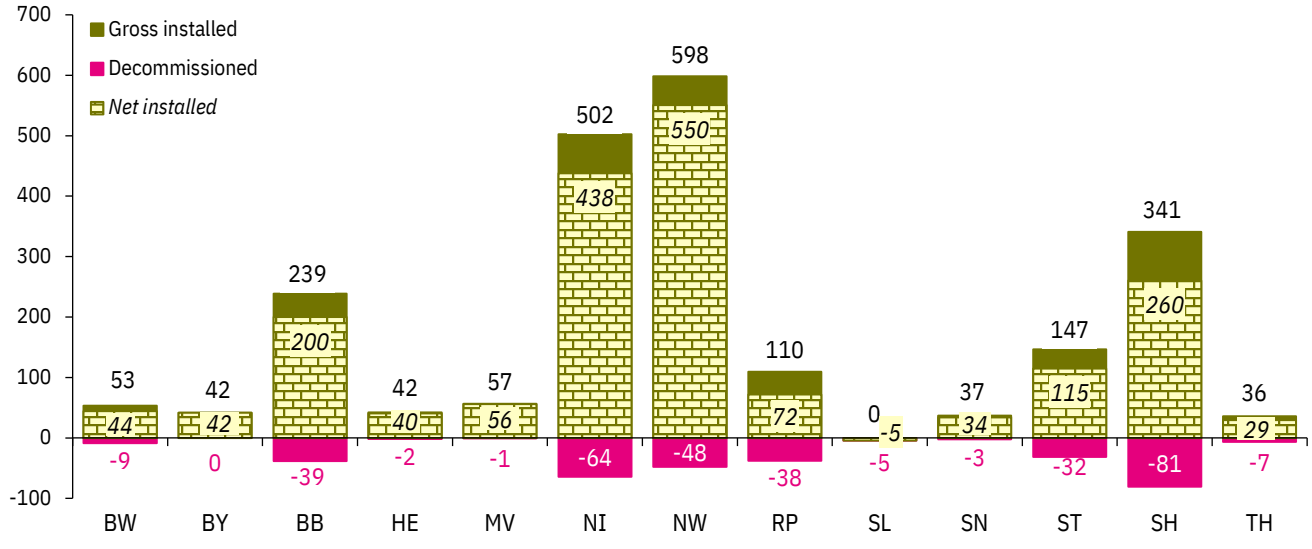

Figure 2: Gross/net installation of wind energy capacity in the first half of 2025 by federal state
Data: MaStR; figures in megawatts

1.1 Regional distribution of commissioning

27 percent of the newly installed wind energy capacity in the first half of the year is located in North Rhine-Westphalia (598 MW). This is followed by Lower Saxony with 502 MW of newly commissioned capacity. In third place is Schleswig-Holstein, where wind turbines with a capacity of 341 MW were connected to the grid. In Saxony, only seven wind turbines were commissioned, and in Thuringia only six. In Saarland as well as in the three city states, there was no increase in the first six months.

The increase in expansion compared to the same period last year was not uniform across all federal states. Some regions recorded a significant increase in capacity: in Saxony, half-year expansion increased more than sixfold, albeit from a very low base. Rhineland-Palatinate recorded a 125 percent increase in expansion. In Baden-Wuerttemberg, Bavaria and North Rhine-Westphalia, growth rates are in the upper double-digit percentage range. Hesse is the only federal state to report a negative balance compared to the six-month development last year.

Table 2: Commissioning of new wind turbines/capacity in the first half of 2025; data: MaStR

Federal state [Abbreviation]	Wind turbines	Capacity [MW]	Share of total expansion [MW]	Change compared to first half 2024 [MW]	Ø Hub height [m]	Ø Rotor diameter [m]	Ø Generator capacity [MW]
Baden-Wuerttemberg [BW]	13	53.3	2.4%	86.7%	158	143	4.10
Bavaria [BY]	8	41.5	1.9%	98.9%	164	152	5.19
Brandenburg [BB]	45	238.6	10.8%	72.9%	158	149	5.30
Hesse [HE]	8	42.3	1.9%	-26.3%	165	154	5.29
Mecklenburg-Vorpommern [MW]	10	56.5	2.6%	45.4%	158	161	5.65
Lower Saxony [NI]	91	502.3	22.8%	69.8%	150	151	5.52
North Rhine-Westphalia [NW]	117	598.1	27.2%	97.8%	142	147	5.11
Rhineland-Palatinate [RP]	19	109.5	5.0%	124.9%	163	160	5.76
Saxony [SN]	7	36.7	1.7%	559.7%	165	153	5.24
Saxony-Anhalt [ST]	24	146.6	6.7%	8.1%	166	157	6.11
Schleswig-Holstein [SH]	61	341.1	15.5%	38.1%	109	146	5.59
Thuringia [TH]	6	35.8	1.6%	-	167	154	5.97
Germany	409	2,202.2	100%	66.7%	146	150	5.38

In the southern region[3], 40 new wind turbines with a total capacity of 204 MW were connected to the grid, most of them in the area of Rhineland-Palatinate (110 MW) and in Baden-Wuerttemberg (53 MW). The share of the southern region in gross expansion amounts to nine percent, meaning that commissioning there has doubled compared to the first half of 2024 (18 wind turbines, 98 MW).

1.2 Wind turbine configuration

For several years now, there has been strong momentum in the development of generator capacity in new wind turbines, which is now also reflected in the commissioned wind turbines. While the average generator capacity of wind turbines commissioned in 2015 was still 2.7 MW, this value exceeded the five-megawatt threshold for the first time in new wind turbines in 2024. Currently, the average generator capacity is 5.4 MW – meaning it has doubled over the past ten years. Almost two thirds (64%) of this year's new wind turbines have more than 5.5 MW of generator capacity. By contrast, wind turbines with up to 3.5 MW account for only three percent of gross expansion.

[3] The geographical area fully includes Baden-Wuerttemberg and Saarland. Bavaria and Rhineland-Palatinate are also largely covered by the regional boundary, with the exception of a few districts in the far north. In Hesse, five districts (south of the Main River) and the independent city of Darmstadt are part of the southern region; see Section 3 No. 43c in conjunction with Annex 5 EEG.

Rotor blade lengths have increased by over 40 percent over the past decade. Accordingly, hub heights have also grown during the same period – in this case by nearly one fifth.

This trend will continue in wind turbine configurations in the coming years, as the most recently permitted but not yet realised wind turbines already have an average generator capacity of 6.2 MW. The average hub height has exceeded the 155-metre mark. The mean rotor diameter of the wind turbines permitted this year exceeds the 160-metre mark (see Section 5.3).

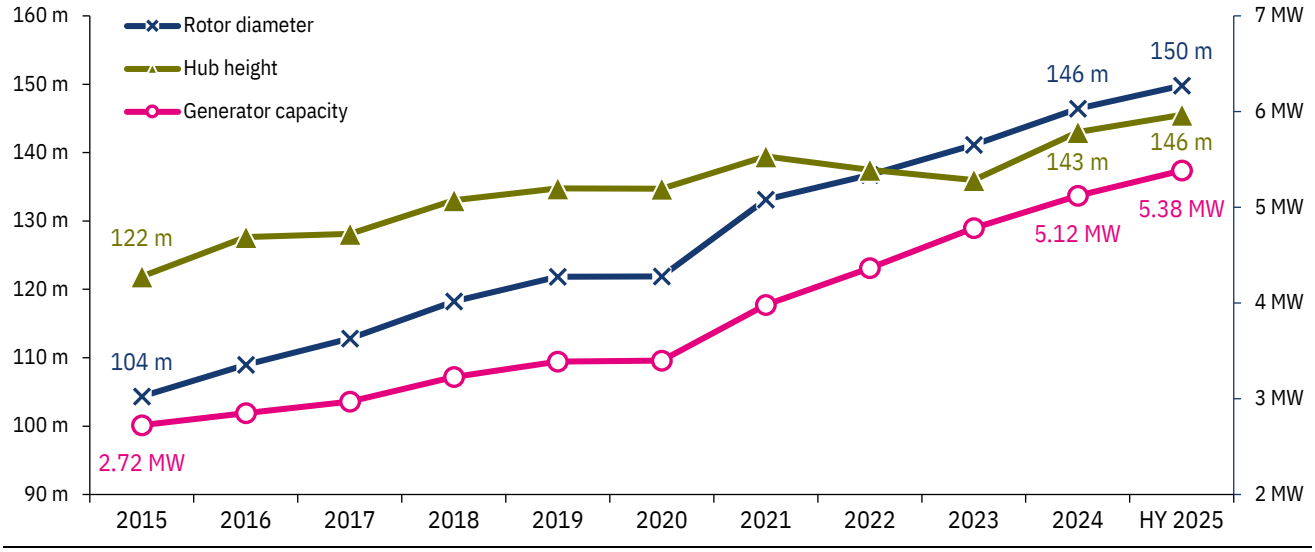

Figure 3: Configuration of wind turbines commissioned each year
Data: MaStR, own research; figures in megawatts and metres

1.3 Realisation period

The period from (initial) permit to commissioning of wind turbines, referred to here as the realisation period, has continuously increased in recent years. Whereas in the years 2011 to 2017[4] it typically took just under a year to connect a wind turbine to the grid after permit, this step most recently took more than twice as long. In the first half of 2025, the average realisation period was 27 months, the same as in the previous three years. The shortest realisation period in the first half of the year was just under seven months, while the longest stretched over almost seven and a half years (89 months).

The persistently long realisation periods of recent years are partly due to the tendering process, as it takes an average of six months[5] from (initial) permit to the award of the bid. Once this year's new wind turbines were awarded bids, it then took an average of 20 months for them to be commissioned. This is also due to the fact that a considerable number of wind turbines undergo changes to the original permit – either because the capacity is increased or a type change, sometimes in combination with a change of manufacturer, is carried out. Such subsequent changes to the originally permitted situation can be identified in 30 percent of this year's commissioned wind turbines, with eight percent more capacity (+54 MW) being realised than originally permitted. Lengthy legal proceedings against the permit can also cause delays in the realisation process. Lately, there have been increasing indications that wind turbines are being constructed but, due to grid connection problems, can only be commissioned significantly later. All these circumstances have an impact on the realisation period, as by definition all time spent after the granting of the initial permit is counted as part of the realisation phase.

[4] More detail on this period: FA Wind (2023), Typische Verfahrenslaufzeiten von Windenergieprojekten - Empirische Datenanalyse für den Zeitraum 2011 bis 2022.
[5] Data basis: 7,221 wind turbines that were awarded a bid in the tendering years 2018 to (May) 2025. Installations that were re-awarded a bid after expiration of deadlines are not included.

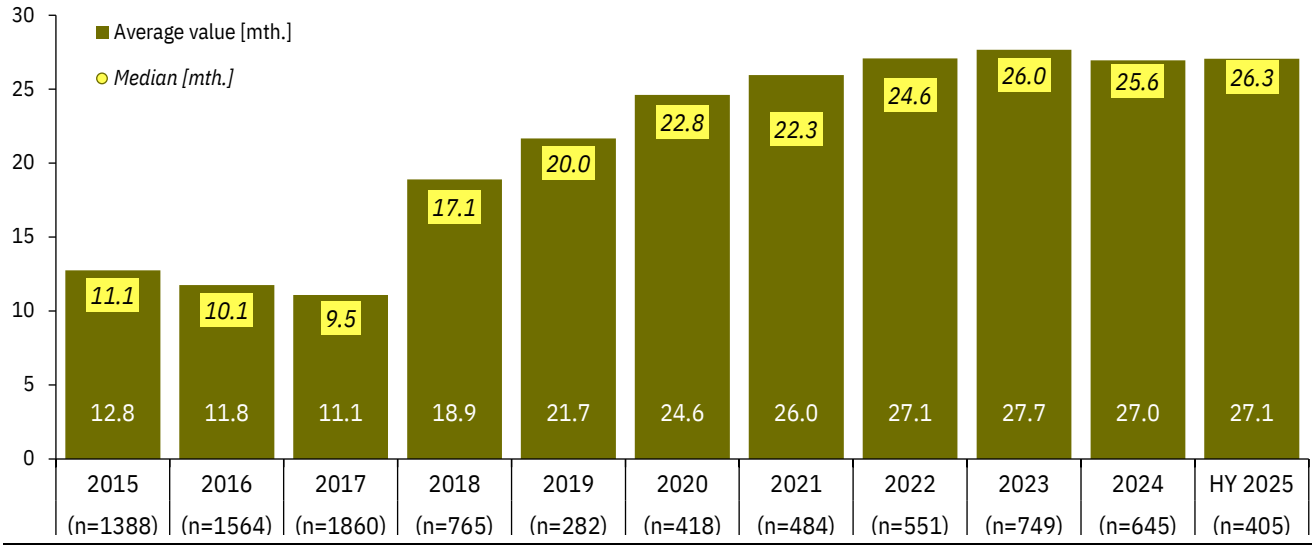

Figure 4: Realisation period (permit to commissioning) of wind turbines commissioned each year
Data: MaStR, own research; figures in months

2 Repowering and decommissioning

Almost half of Germany's existing fleet of wind turbines has been in operation for at least 15 years. Around 9,700 wind turbines are already over 20 years old. As wind turbines age, the question increasingly arises whether the existing site can continue to be used with modern, higher-capacity machines (repowering), or whether the old wind turbines will be decommissioned without replacement at the end of their technical service life.

2.1 Repowering

138 wind turbines with 777 MW of capacity were commissioned in the first half of 2025 as part of repowering. With respect to installed gross capacity, the repowering share amounted to 35 percent.

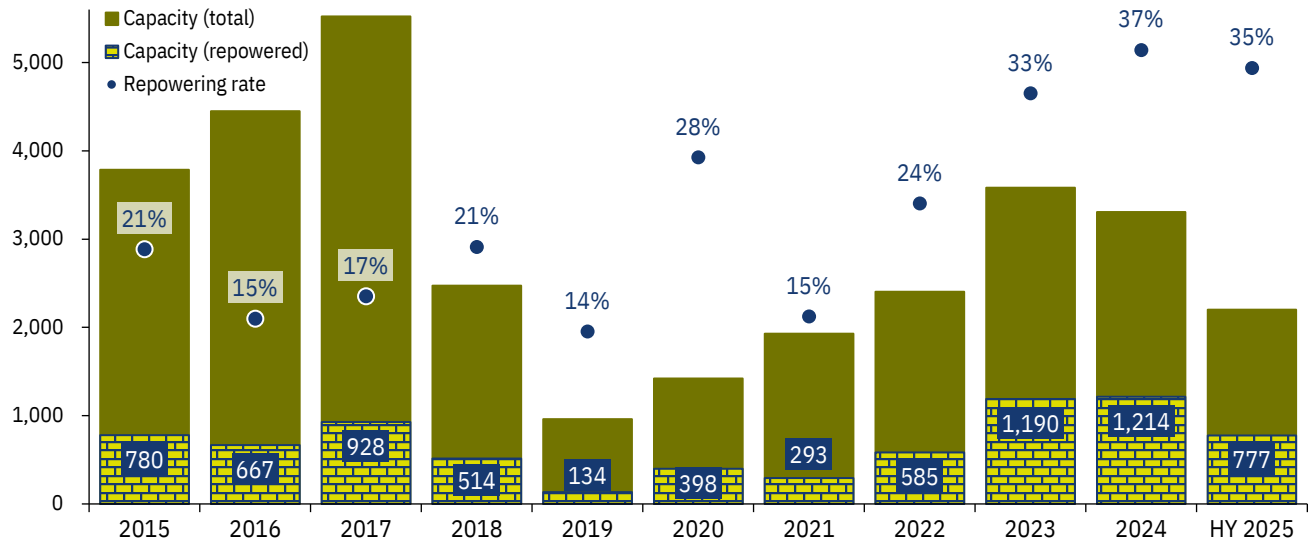

Figure 5: Share of repowering capacity in (semi-)annual commissioning
Data: MaStR, own research; figures in megawatts

Repowering projects were implemented in eleven federal states. A quarter of the capacity realised through this was located in North Rhine-Westphalia (195 MW). Just under one fifth of the repowered capacity each was connected to the grid in Lower Saxony (148 MW) and Saxony-Anhalt (147 MW). Saxony-Anhalt also recorded the highest repowering share at 100 percent, followed by Saxony (85%) and Mecklenburg-Vorpommern (71%).

Table 3: Regional distribution of repowering in the first half of 2025; data: MaStR, own research

Federal state	Wind turbines	Capacity [MW]	Share of total expansion [MW]
Baden-Wuerttemberg	1	4.2	7.9%
Bavaria	1	5.6	13.4%
Brandenburg	13	73.7	30.9%
Mecklenburg-Vorpommern	7	39.9	70.6%
Lower Saxony	27	147.6	29.4%
North Rhine-Westphalia	37	194.6	32.5%
Rhineland-Palatinate	9	51.6	55.9%
Saxony	6	31.1	84.8%
Saxony-Anhalt	24	146.6	100%
Schleswig-Holstein	11	70.0	20.5%
Thuringia	2	12.0	33.5%
Germany	138	776.8	35.3%

2.2 Decommissioning

In the first six months of this year, 210 wind turbines with a total capacity of 326 MW were officially recorded as permanently decommissioned. Compared to the first half of 2024, this represents a drop of almost 25 percent in terms of capacity. Based on past experience, the figures are likely to increase in the coming weeks due to late reporting. Nevertheless, there is still no clear wave of decommissioning that might have been expected as a result of the approximately 9,700 existing wind turbines that are no longer supported. The volume of decommissioned wind turbines so far correlates more closely with the level of repowering activity, suggesting that older wind turbines are mainly being taken offline as replacements for new ones.

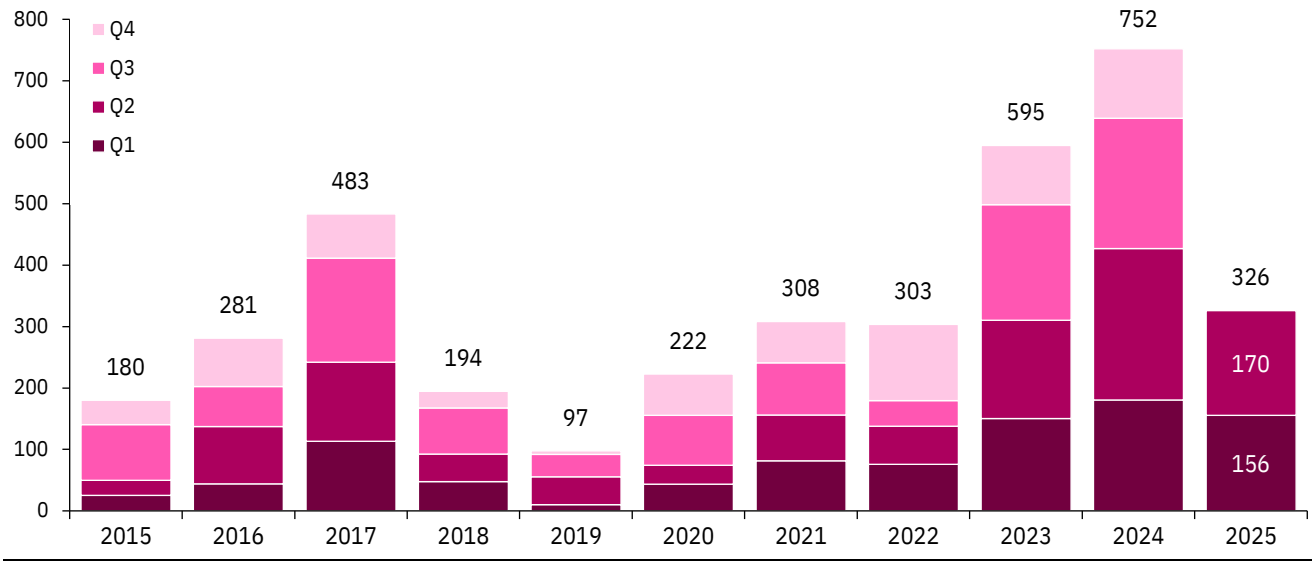

Figure 6: Wind energy capacity decommissioned per quarter
Data: MaStR, AnlReg; figures in megawatts

The average age of the wind turbines decommissioned in the first half of 2025 was 22.2 years in operation. The shortest operating period was just under nine years, while the longest spanned almost 34 years. Two thirds of the decommissioned wind turbines had a generator

capacity between 1 and 2 MW. The highest number of decommissioned wind turbines was recorded in Schleswig-Holstein (45 wind turbines, 81 MW), followed by Lower Saxony (42 wind turbines, 64 MW) and North Rhine-Westphalia (38 wind turbines, 48 MW).

Table 4: Regional distribution of decommissioned wind turbines in the first half of 2025; data: MaStR

Federal state	Wind turbines	Capacity [MW]	Installation age [years]
Baden-Wuerttemberg	5	8.9	21.1
Brandenburg	24	38.6	21.9
Hesse	3	1.9	26.5
Mecklenburg-Vorpommern	2	0.7	28.7
Lower Saxony	42	64.4	22.6
North Rhine-Westphalia	38	47.7	22.1
Rhineland-Palatinate	22	37.7	21.6
Saarland	3	4.5	20.3
Saxony	3	2.5	25.4
Saxony-Anhalt	19	31.7	21.4
Schleswig-Holstein	45	80.8	21.9
Thuringia	4	6.5	23.3
Germany	210	325.9	22.2

Since 2015, around 3,100 wind turbines with a total capacity of 3.7 GW have been decommissioned. The largest amount of wind energy capacity taken offline during this period was in Lower Saxony (1,144 MW), followed by Schleswig-Holstein (898 MW) and North Rhine-Westphalia (485 MW).

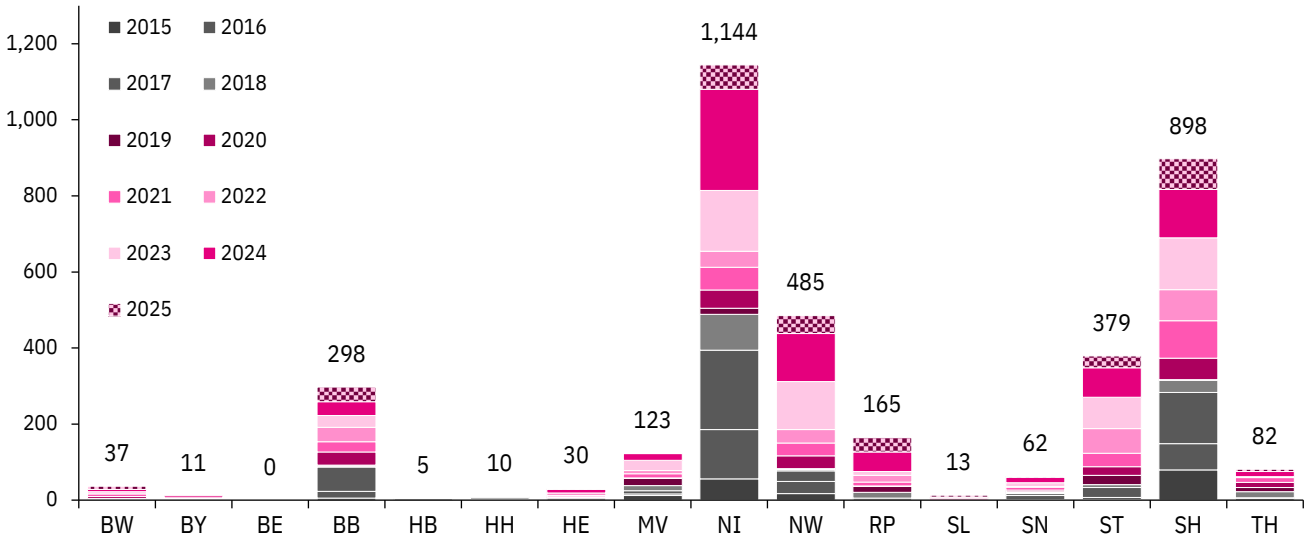

Figure 7: Wind energy capacity decommissioned between 2015 and June 2025 by federal state
Data: MaStR, AnlReg; figures in megawatts

3 Total fleet of onshore wind turbines

At the end of June 2025, according to the Market Master Data Register, around 28,900 wind turbines with a capacity of 65.3 GW were in operation. When looking at the ratio of installed wind energy capacity to land area (wind turbine density), it becomes clear that by far the largest federal state, Bavaria – aside from Berlin – has by far the lowest wind turbine density. With only 39 kilowatts[6] per square kilometre (kW/km²) of land area, the specific figure in Bavaria is six times lower than in the much more densely populated North Rhine-Westphalia.[7] Among the coastal states, Mecklenburg-Vorpommern stands out. Despite comparable wind conditions[8], wind turbine density in this second-largest coastal state is significantly lower than in Lower Saxony, at 165 kW/km². Compared to Schleswig-Holstein, Mecklenburg-Vorpommern lags behind its neighbouring state by a factor of 3.5. The highest area-specific wind turbine figure is recorded in Schleswig-Holstein at 583 kW/km², followed by Bremen and Brandenburg. Nationwide, the average wind turbine density in mid-2025 was 183 kW/km².

3.1 Regional distribution of existing wind turbines

The most wind energy capacity is installed in Lower Saxony (13.4 GW), followed by Brandenburg and Schleswig-Holstein (each 9.2 GW), and North Rhine-Westphalia (8.3 GW). The average generator capacity of existing wind turbines is 2.26 MW – that is, less than half the capacity of today's new wind turbines. The average total height of existing wind turbines is 145 metres, while wind turbines commissioned in 2025 to date have an average total height of 220 metres.

As of mid-2025, wind turbines were in operation in 272 out of 294 rural districts. Additionally, wind turbines were located in 44 independent cities. In terms of wind turbine density per district area[9], Dithmarschen in Schleswig-Holstein leads the national comparison with 1,655 kW/km². Second place goes to the Schleswig-Holstein district of Nordfriesland with a wind turbine density of 1,193 kW/km². Although more wind energy capacity is connected to the grid in Nordfriesland than in the neighbouring district, its much larger area results in a lower wind turbine density than in Dithmarschen. Third place goes to the district of Paderborn (1,063 kW/km²) in North Rhine-Westphalia. This is followed, with nearly equal values, by the North Rhine-Westphalian district of Lippe (849 kW/km²) and the district of Aurich in Lower Saxony (838 kW/km²).

[6] The unit kilowatt was chosen because using megawatts per square kilometre would result in values mostly below 1 (conversion factor 1,000 to megawatt).

[7] In 2022, Bavaria had a population density of 190 inhabitants per square kilometre (inh./km²), while in NRW the population density was 532 inh./km², nearly three times higher; source: Statistische Ämter des Bundes und der Länder, Fläche und Bevölkerung nach Ländern.

[8] See FA Wind und Solar (2025), Gütefaktoren von Windenergieanlagen an Land, Section 1.2.

[9] The city states (Berlin, Bremen, Hamburg) were not included in this analysis, as they do not have district structures.

Table 5: Regional distribution of existing wind turbines as of 30/06/2025; data: MaStR, own research

Federal state	Wind turbines	Capacity [MW]	Share of total fleet [MW]	Installation density [kW/km²]
Baden-Wuerttemberg	808	1,933	3.0%	54
Bavaria	1,163	2,721	4.2%	39
Berlin	6	17	0.03%	19
Brandenburg	4,090	9,185	14.1%	310
Bremen	85	202	0.3%	481
Hamburg	65	123	0.2%	163
Hesse	1,188	2,681	4.1%	127
Mecklenburg-Vorpommern	1,853	3,852	5.9%	165
Lower Saxony	6,202	13,400	20.5%	281
North Rhine-Westphalia	3,745	8,333	12.8%	244
Rhineland-Palatinate	1,782	4,230	6.5%	213
Saarland	215	547	0.8%	213
Saxony	856	1,395	2.1%	76
Saxony-Anhalt	2,738	5,631	8.6%	275
Schleswig-Holstein	3,263	9,214	14.1%	583
Thuringia	869	1,882	2.9%	116
Germany	28,925	65,344	100%	183

13 percent of the existing fleet of wind turbines in Germany has a generator capacity of up to 750 kW. However, these wind turbines contribute only three percent to total generation capacity. One third of existing wind turbines falls into the 1 to 2 MW capacity category. This segment accounts for 26 percent of the total installed capacity. Almost one quarter of existing wind turbines are equipped with generator capacities between 2 and 3 MW. Another nearly one quarter of active wind turbines have been installed with more than 3 MW. The high operating age of the approximately 15,000 wind turbines with up to 2 MW generator capacity highlights the considerable repowering potential that could be harnessed in the coming years.

Table 6: Capacity categories of existing wind turbines as of the end of June 2025; data: MaStR

Capacity categories	Wind turbines	Capacity [MW]	Share [wind turbines]	Share [capacity]	Installation age [years]
P ≤ 750 kW	3,685	1,924	12.7%	2.9%	26.8
750 < P ≤ 1,000 kW	1,866	1,652	6.5%	2.5%	19.8
1,000 < P ≤ 2,000 kW	9,505	16,929	32.9%	25.9%	19.9
2,000 < P ≤ 3,000 kW	6,616	16,426	22.9%	25.1%	11.0
3,000 < P ≤ 4,000 kW	4,709	15,475	16.3%	23.7%	8.5
P > 4,000 kW	2,544	12,938	8.8%	19.8%	2.7

3.2 Age structure of existing wind turbines

At the end of June 2025, the German wind park in operation had an average age of 15.4 years. Figure 8 breaks down installed wind energy capacity by year of commissioning. As of mid-2025, around 1.8 GW of capacity installed before the turn of the millennium remained in operation. Together with capacity that was installed between 2000 and 2004 and is still in operation, the volume of wind energy capacity no longer supported since the beginning of 2025 totals 11.3 GW (magenta bars, Figure 8).

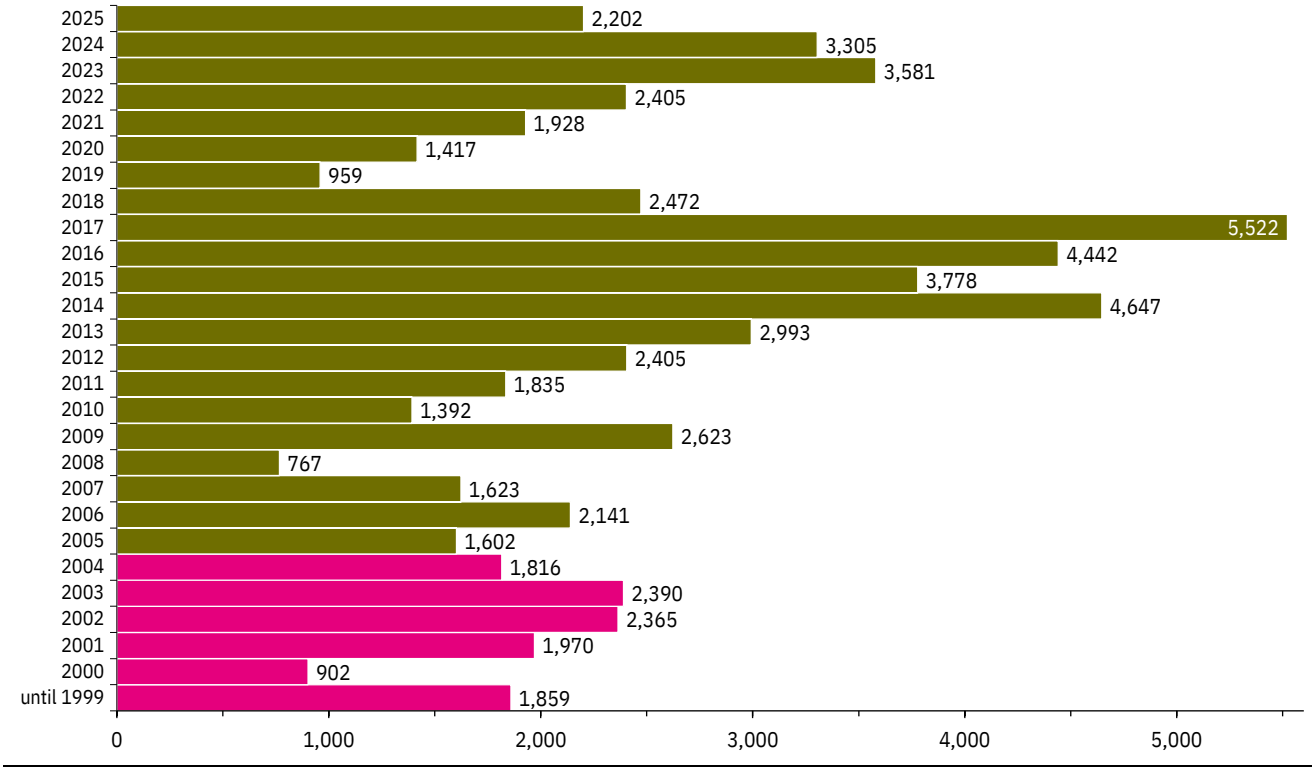

Figure 8: Installed wind energy capacity by year of commissioning (magenta = no longer supported)
Data: MaStR; figures in megawatts

One fifth of the wind energy capacity installed as of mid-2025 has been in operation for at least 20 years. A further 13 percent has been operating for between 15 and 20 years. Almost one quarter of capacity nationwide has been generating electricity from wind energy for 10 to 15 years. 44 percent of installed generation capacity has been in operation for up to ten years.

The age structure of the turbine fleet varies considerably across the federal states. In Saxony, for instance, the share of wind energy capacity that will no longer be eligible for support by the end of 2025 is 45 percent – more than twice the national average (20%). Saxony also has the oldest turbine fleet in the country, with an average age of 20.5 years. In Brandenburg, Mecklenburg-Vorpommern, Lower Saxony and Saxony-Anhalt as well, the share of wind energy capacity that will reach the end of its support period by year's end is above the national average. Of the capacity commissioned between 2005 and 2009 that will lose its EEG support within the next five years, Brandenburg, Lower Saxony, Saxony and Saxony-Anhalt all have above-average shares still in operation. In Saxony, 60 percent of installed capacity will lose its entitlement to EEG remuneration by the end of 2029. In Saxony-Anhalt, more than half (53%) will reach the end of its support period by then.

The youngest wind parks – apart from Berlin[10] – are found in Saarland (Ø 11.1 years) and Bavaria (13.1 years). There, only 13 percent (Saarland) and 17 percent (Bavaria) of wind energy capacity is older than 15 years.

In most federal states, the largest share of capacity was connected to the grid between 2011 and 2020. During this ten-year period, 75 percent of installed capacity in both Bavaria and Saarland was added, while in Hesse it was nearly two thirds. More than half of regional wind energy capacity was commissioned in that period in Baden-Wuerttemberg, Mecklenburg-Vorpommern, Rhineland-Palatinate, Schleswig-Holstein and Thuringia.

[10] The six wind turbines currently in operation there have been running for an average of 9.8 years.

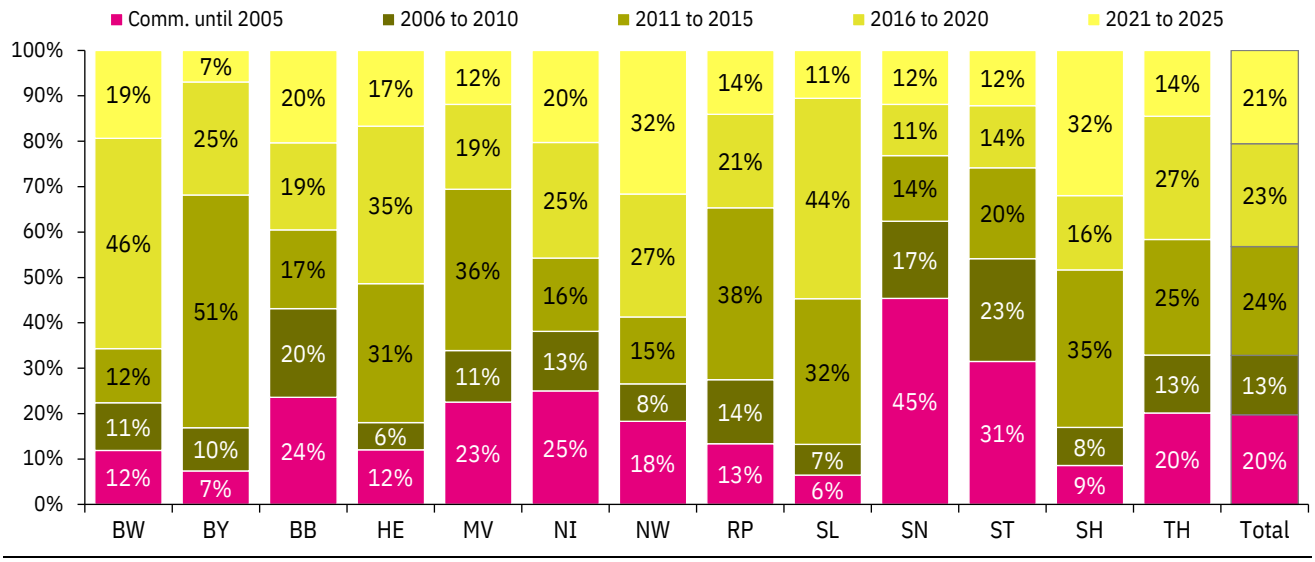

Figure 9: Age structure of installed wind energy capacity by year of commissioning
Data: BNetzA

4 Auction results

In 2025, the Federal Network Agency has so far conducted two tendering rounds for onshore wind turbines. Both auctions were heavily oversubscribed, and the Federal Network Agency was able to award the full auction volume of 7,541 MW in the form of bids.

Due to the high level of competition in this year's auction rounds, the volume-weighted bid value fell to 6.92 Euro cent per kilowatt hour (ct/kWh). The maximum bid value for 2025 was set by the Agency at 7.35 ct/kWh,[11] remaining unchanged for the third year in a row.

Given the continued high number of permits, it can be assumed that both remaining tender rounds this year will also be significantly oversubscribed.[12]

Table 7: Development of bid values for onshore wind energy; data: BNetzA

Year	Permitted maximum value [ct/kWh]	Volume-weighted award value [ct/kWh]
2019	6.20	6.14
2020	6.20	6.11
2021	6.00	5.88
2022	5.88	5.81
2023	7.35	7.33
2024	7.35	7.26
First half of 2025	7.35	6.92

Volumes that have been tendered, awarded a bid or bid on since 2020 but not awarded are shown in Figure 10.

[11] See BNetzA decision (Ref. no.: 4.08.01.01/1#36) dated 17/12/2024.
[12] As of mid-July, around 9.9 GW of wind energy capacity was registered in the database without an awarded contract. This alone would be more than sufficient to cover the remaining auction volume for 2025 (Aug: 3.4 GW; Nov: 3.4 GW).

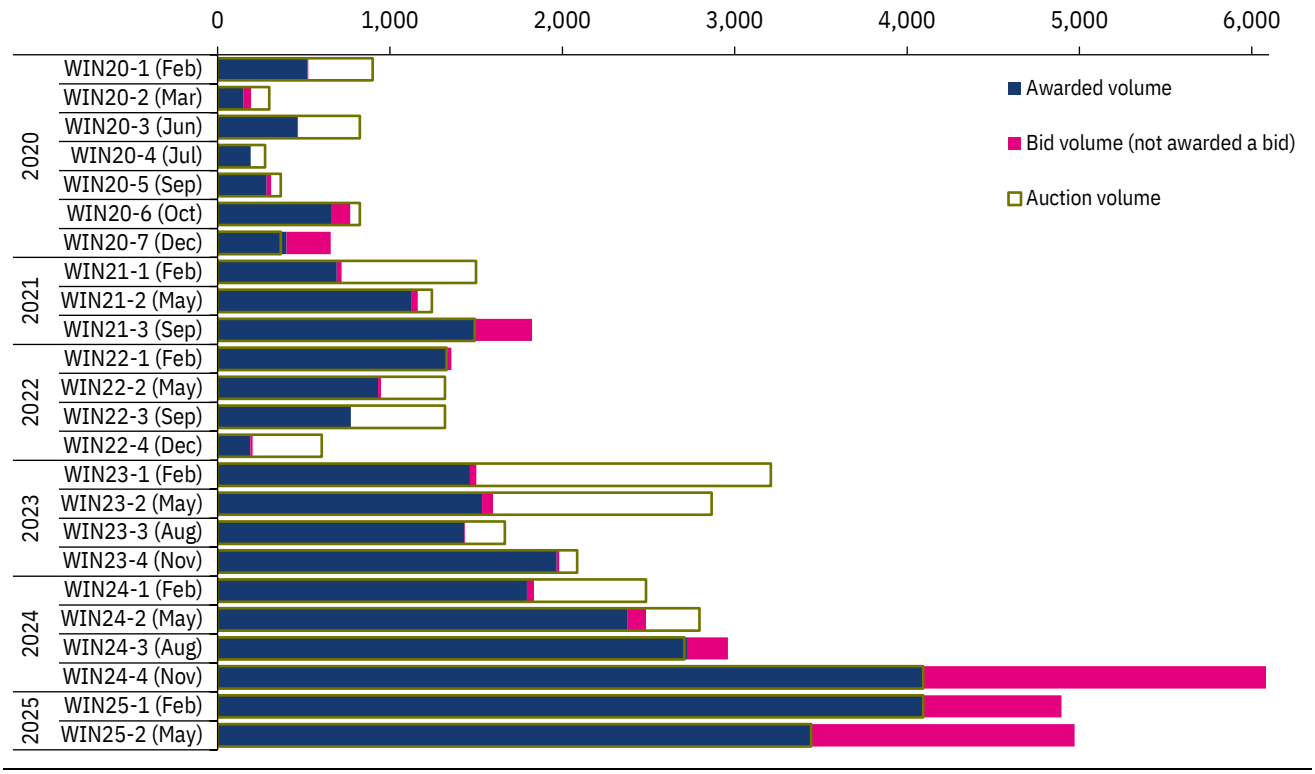

Figure 10: Tendered and awarded volumes of bidding rounds since 2020
Data: BNetzA

4.1 Regional distribution of bids in the bidding rounds

The largest shares of awarded volume in the first half of 2025 went to North Rhine-Westphalia (30%) and Lower Saxony (19%). Together, these two states received nearly half of the volume awarded a bid so far this year. In all federal states (except Saarland), awarded volumes increased compared to the first half of 2024 – overall by 80 percent. Award volumes increased particularly strongly in Bavaria (+188%), Hesse (+136%), North Rhine-Westphalia (+105%) and Thuringia (+148%).

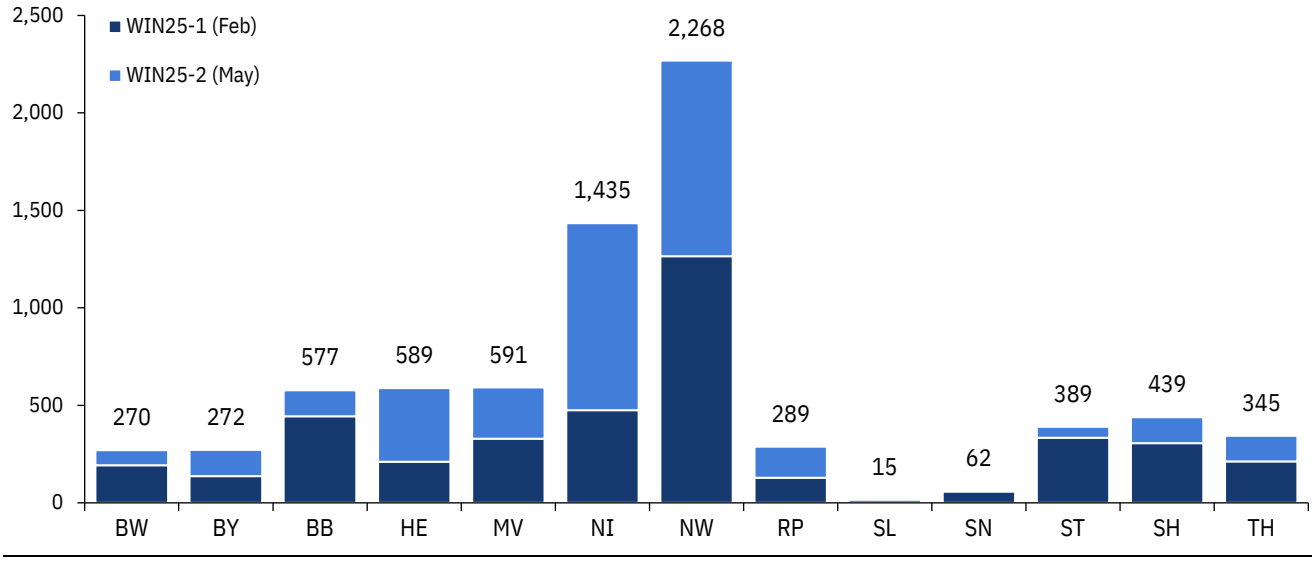

Figure 11: Distribution of awarded volumes across the federal states in the two auctions in the first half of 2025
Data: BNetzA; figures in megawatts

Area-specific bid volume is below the national average (21 kW/km²) in Baden-Wuerttemberg, Bavaria, Rhineland-Palatinate, Saxony, Saarland and Thuringia. For both the absolute and area-specific awarded volumes, North Rhine-Westphalia leads the comparison between federal states by a wide margin.

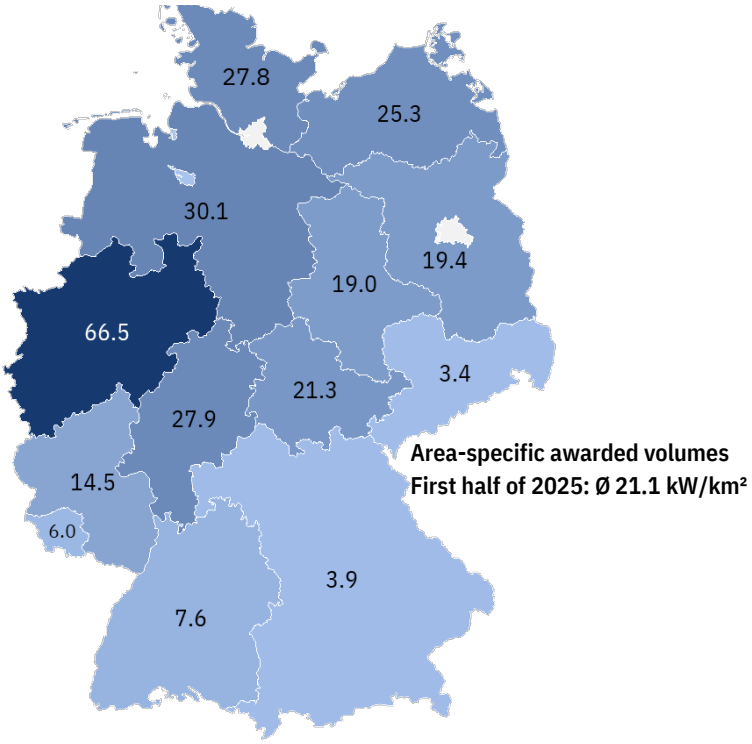

Figure 12: Area-specific awarded volumes from the two auctions in the first half of 2025
Data: BNetzA, Destatis; figures in kilowatts per square kilometre; map: FA Wind und Solar based on © GeoNames, Microsoft, TomTom

4.2 Realisation status of wind energy capacity awarded a bid

Of the 41.1 GW of wind energy capacity awarded a bid since the introduction of auctions, 15.9 GW has been realised to date. The regular realisation deadlines for bids have now expired for 15.2 GW of capacity awarded in bidding rounds held up to May 2022.

In 2017 – a year marked by bid to non-permitted projects – the realisation rate was just 12 percent. This was due to initial uncertainty caused by the transition to the auction-based support system. Since then, rates have risen significantly. 81 percent of the awarded volumes awarded in 2018 were realised. The realisation rates for the 2019 and 2020 award years each exceeded 90 percent. Nearly 90 percent of the 2021 bids have been implemented. Of the volumes awarded in the first two bidding rounds of 2022, 80 percent have been realised. For the two still-valid 2022 auctions, 92 percent of the awarded volumes have so far been implemented. Half of the capacity awarded a bid in 2023 has been realised to date. Some wind turbines awarded in last year's auctions have also already been commissioned.

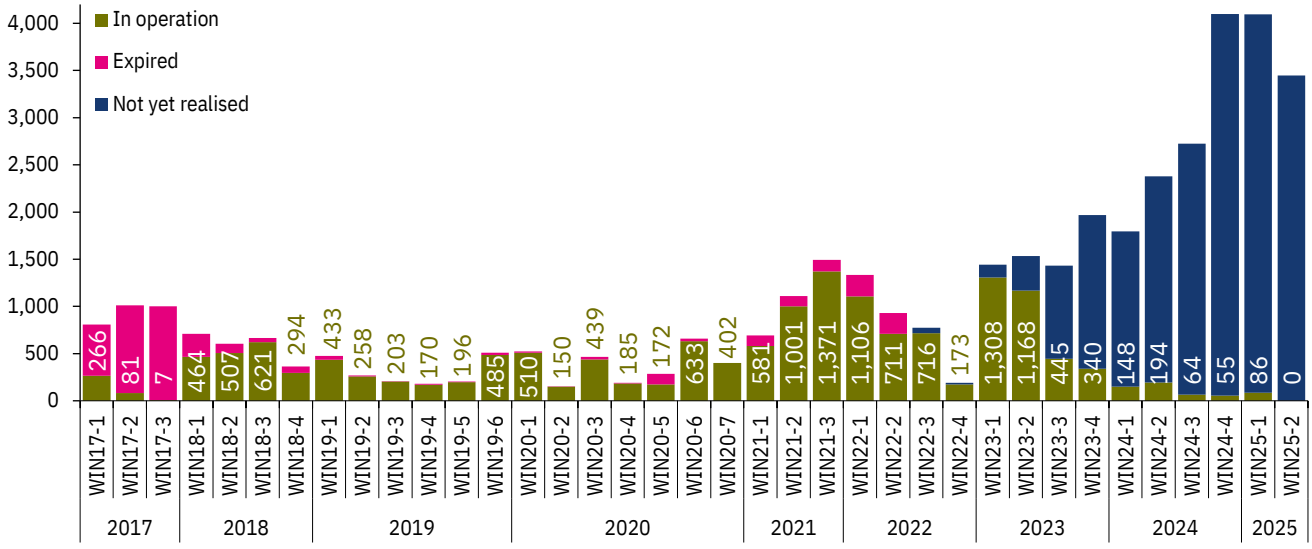

Figure 13: Wind energy capacity awarded a bid and realized by auction round
Data: BNetzA, MaStR, own research; figures in megawatts

Of the capacity awarded a bid between 2018[13] and May 2025, 41 percent has been realised so far. 80 percent of the capacity awarded a bid in 2018 has been commissioned. The 2019 bids were implemented at a rate of 94 percent. 93 percent of the capacity awarded a bid in 2020 is currently online. Almost 90 percent of the wind energy capacity awarded in 2021 has been realised. The realisation rates for capacity awarded a bid in February and May 2022 are 83 and 76 percent, respectively.

At least three gigawatts of awarded wind energy capacity have so far been brought online in Lower Saxony, North Rhine-Westphalia and Schleswig-Holstein. In Brandenburg, 2.3 GW of capacity awarded through the auction scheme has been realised. More than 500 MW of capacity awarded a bid has now been commissioned in Hesse, Mecklenburg-Vorpommern, Rhineland-Palatinate and Saxony-Anhalt.

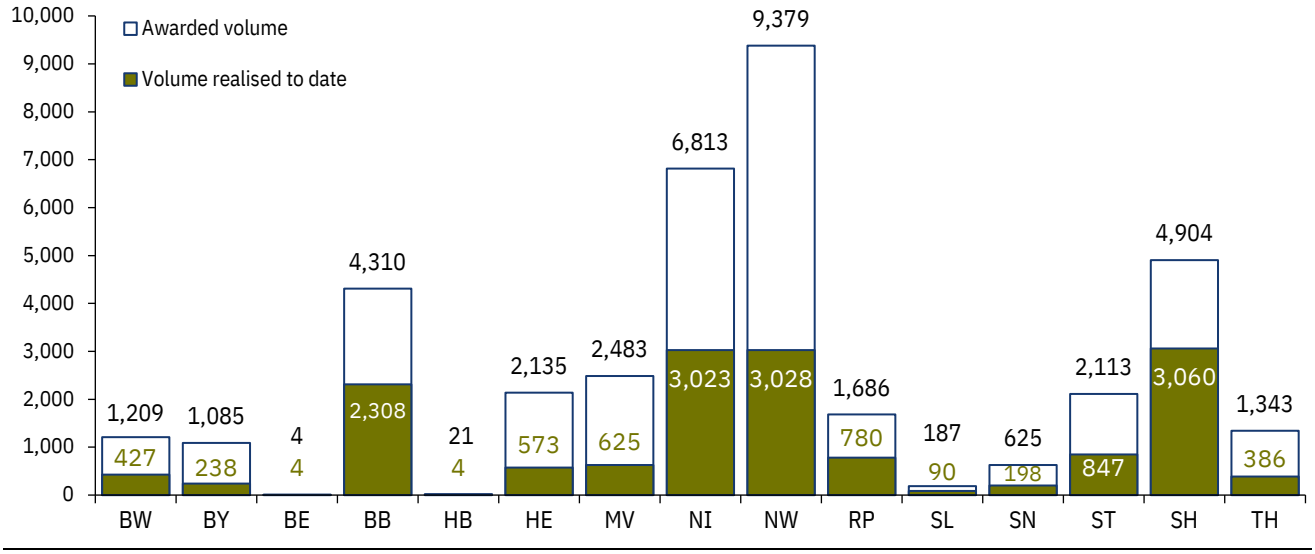

Figure 14: Wind energy capacity awarded a bid and realised shares by federal state – excluding 2017 auction year
Data: BNetzA, MaStR; figures in megawatts

[13] Of the awarded volumes in 2017, a year marked by non-permitted projects, only 13% were realised. Due to the low realisation rate, this auction year is not included here.

5 Permits for new wind turbines

In the first six months of 2025, new permits[14] were issued for 1,276 wind turbines with a total capacity of 7,851 MW. This means that, after six months, the third-largest volume of permits in the history of wind energy expansion in Germany has already been achieved this year. It also marks by far the strongest first half-year ever in terms of permit figures.[15]

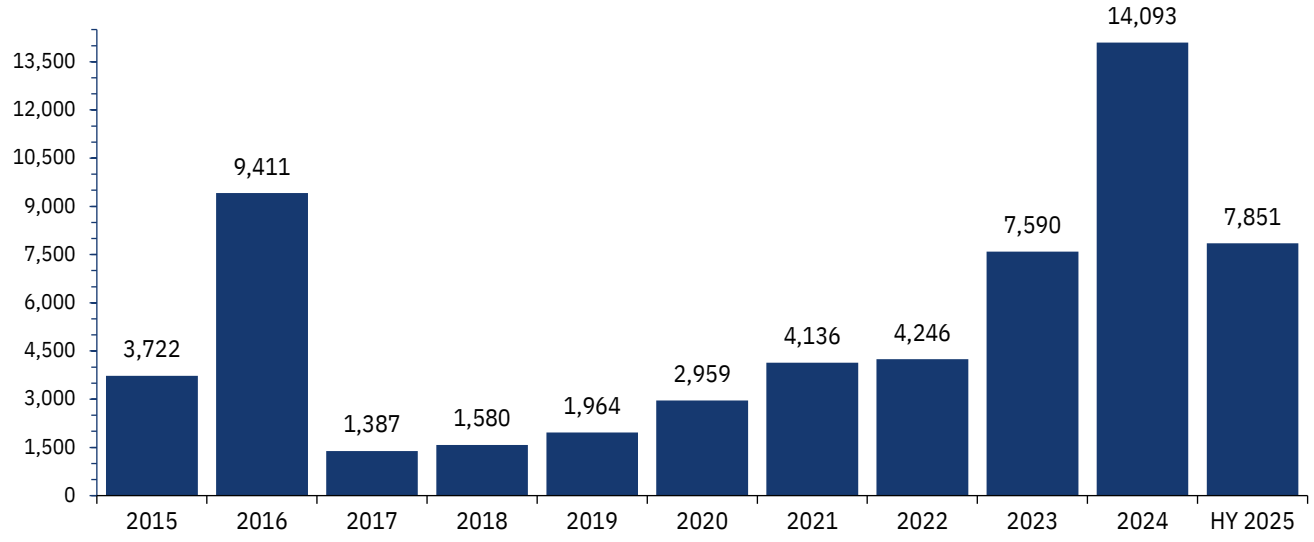

Figure 15: Newly permitted wind energy capacity in Germany by year
Data: MaStR, own research; figures in megawatts

As of mid-2025, the Market Master Data Register listed around 5,150 wind turbines permitted under the Federal Immission Control Act and a combined capacity of 30 GW that had not yet been reported as commissioned. Of these, around 3,580 wind turbines (21 GW) held a valid bid from the auction. 70 percent of the wind turbines currently recorded in the register were permitted within the past 18 months.

5.1 Regional distribution of permits

Among the federal states, North Rhine-Westphalia ranks first with 2,677 MW of newly permitted capacity and 441 wind turbines in the first half of the year – well ahead of the rest. It is followed by Lower Saxony with 1,568 MW. Remarkably, Bavaria comes in third, with 599 MW of wind energy capacity permitted by the end of June. No new permits were registered from the three city states in the first six months.

The southern region accounts for 13 percent of the wind energy capacity approved in the first half of the year. In total, 162 wind turbines with a capacity of 1,010 MW, equivalent to 13 percent, received official construction approval there. The largest shares come from districts in the Bavarian (599 MW) and Rhineland-Palatinate (256 MW) parts of the region.

[14] Only wind turbines that received an initial permit in the first half of 2025 are included in the count. Changes to existing permits issued during the year are not included in the 2025 statistics, as their (initial) permit had already been recorded at an earlier date.

[15] Second place is held by the first half of 2024, when 5,067 MW were permitted. To date, there has only been one half-year with a higher volume of permits – the second half of 2024, with 9,027 MW of newly permitted wind energy capacity.

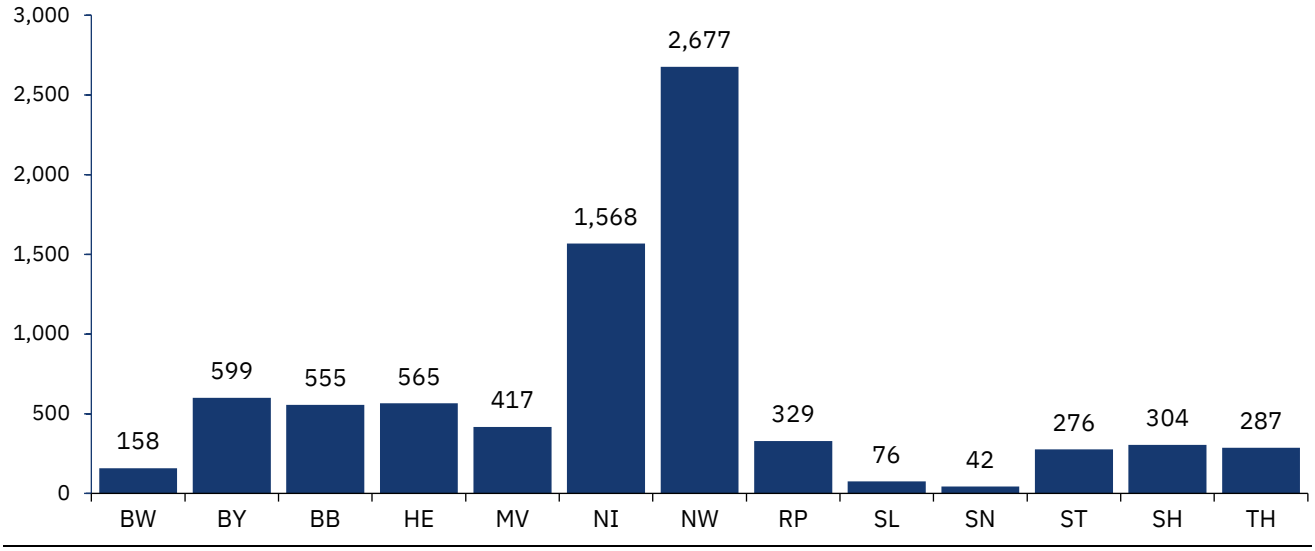

Figure 16: Newly permitted wind energy capacity in the first half of 2025 by federal state
Data: MaStR, own research; figures in megawatts

5.2 Permit period

Despite the unprecedented volume of new permits, the average processing time decreased again in most federal states in the first half of the year. On average across Germany, permit procedures completed this year took 18 months (median: 14 months), finishing around 20 percent faster than in the previous year (Ø 23 months). Figure 17 shows the average procedure duration, based on the year in which the permit decisions (initial rulings) were issued. It becomes clear that from 2017 onward, processing times increased almost continuously and progressively over six years. A reversal of this trend was seen for the first time last year. In the current year, processing times are at the level of 2017.

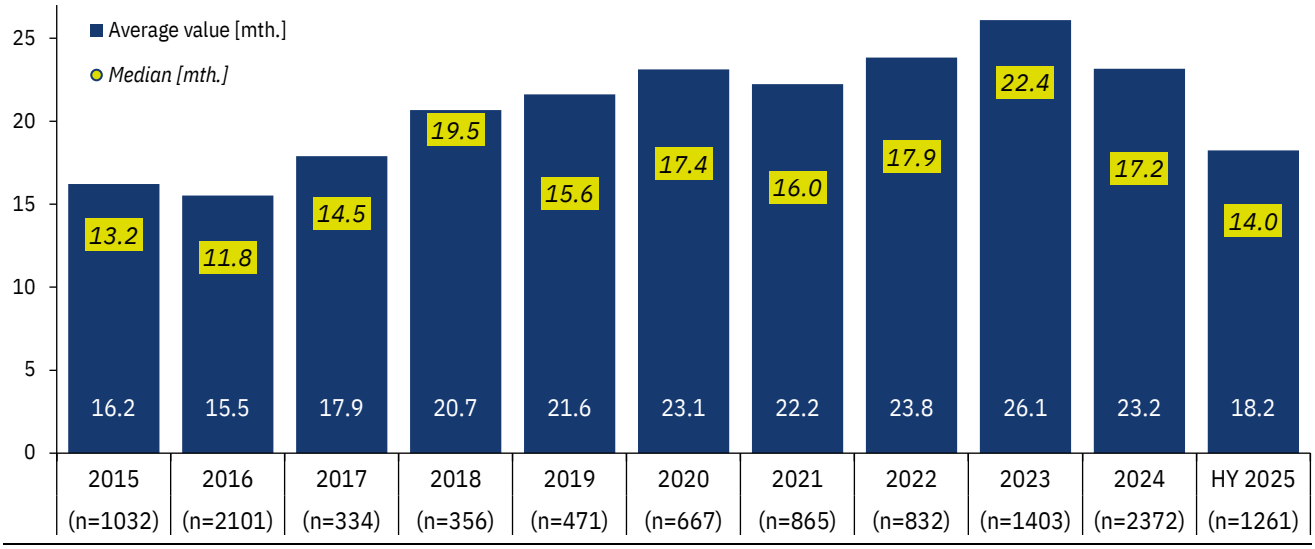

Figure 17: Duration of permit procedures by year
Data: MaStR, UVP-Portal, own research; figures in months

Significant differences in processing times were observed across federal states in 2025, ranging from eight months (Bavaria) to 45 months (Mecklenburg-Vorpommern). Long durations, as seen for example in Mecklenburg-Vorpommern, can also be attributed to the fact that numerous legislative changes in the previous legislative period are now leading to the completion of permit procedures that had previously stalled for years or were resumed after being rejected.

The change in processing duration compared to the 2024 permit year also varies greatly across states: while in Baden-Wuerttemberg and Thuringia permit times slightly increased this year, in all other states the average duration decreased – most notably in Saarland (-39%), Saxony (-36%) and Lower Saxony (-32%).

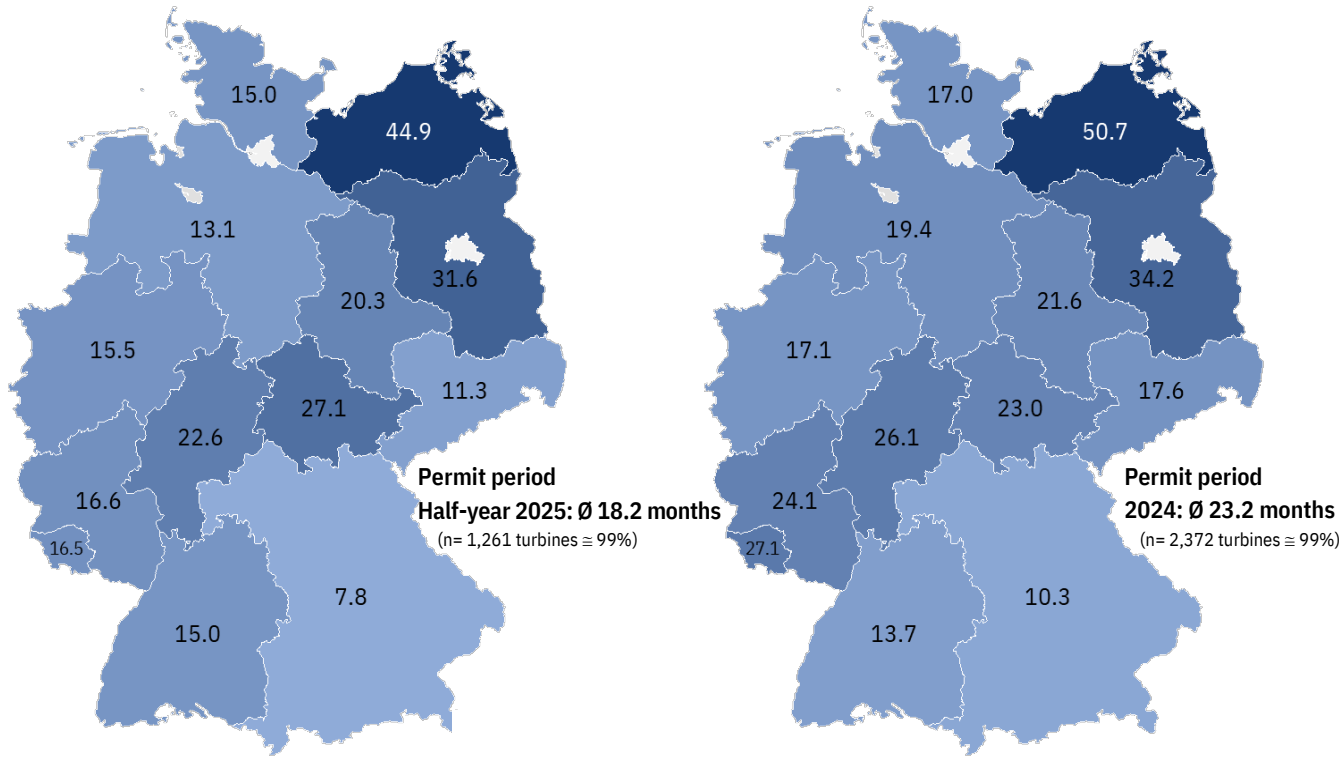

Figure 18: Duration of permit procedures completed in the federal states in 2024 and in the first half of 2025
Data: MaStR, UVP-Portal, own research; figures in months; map: FA Wind und Solar based on © GeoNames, Microsoft, TomTom

5.3 Wind turbine configuration

In the past decade, the generator capacity of newly permitted wind turbines has shown steady annual growth rates of six to ten percent. The average approved capacity has now reached 6.2 MW. 85 percent of wind turbines permitted in the first half of the year have a generator capacity of at least 5.5 MW. 40 percent were even permitted with more than 6.5 MW. There is no end to this trend in sight, as all major manufacturers already offer models in the 7 MW class.

Table 8: Wind turbines permitted in the first half of 2025 by capacity class; Data: MaStR

Capacity categories	Wind turbines	Capacity [MW]	Share [wind turbines]
P ≤ 3,500 kW	6	18.4	0.5%
3,500 < P ≤ 4,500 kW	103	431.5	8.1%
4,500 < P ≤ 5,500 kW	80	413.0	6.3%
5,500 < P ≤ 6,500 kW	572	3,345.6	44.8%
P > 6,500 kW	515	3,642.2	40.4%

6 Expected development of expansion and political targets

The Renewable Energy Sources Act (EEG 2023) sets out a capacity-based expansion pathway[16] for individual energy sources, including onshore wind. According to the law, “69 Gigawatts in 2024” of onshore wind energy capacity should have been online. This political target was clearly missed at the end of 2024, with only 63.5 GW installed. For 2026, the law foresees 84 gigawatts of wind energy

[16] See Section 4 No. 1 EEG.

capacity. Based on 65.3 GW connected as of mid-2025, a net 18.7 GW would need to be installed over the next 18 months. Even though 30.7 GW of permitted capacity currently exists, from today's perspective the 2026 target will likely be difficult to achieve.

The auction volumes set out in the EEG form the basis for the annual capacity expansion required and are also intended to offset the expected decommissioning of older wind turbines. Experience shows that it takes nearly two years for capacity awarded a bid to be realised through the commissioning of wind turbines.[17] Therefore, most of the additional capacity in the second half of this year will derive from awarded volumes made in 2023. So far, 3.1 GW of that has yet to be realised. If the current pace of implementation continues and failure rates remain comparably low as in previous years, gross expansion in the second half of the year are likely to reach between 3.0 and 3.3 GW of capacity. The gross expansion[18] forecast at the beginning of the year of 4.8 to 5.3 GW therefore still holds – and may even be exceeded under favourable conditions.

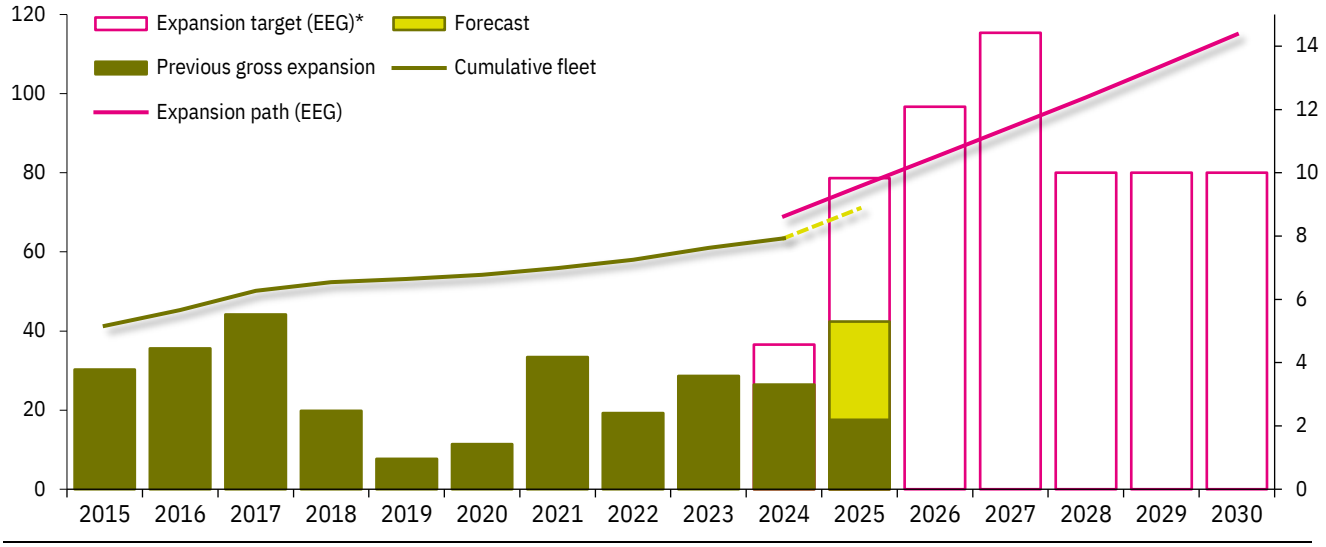

Figure 19: Expected gross expansion in 2025 and expansion targets under the EEG
Data: MaStR, BNetzA, EEG; figures in gigawatts; *) based on (planned) auction volumes from two years prior

7 Monthly electricity generation and market values

In the first half of 2025, the nationwide onshore wind park generated 49.3 terawatt-hours (TWh) of electricity. Compared to the same period last year (60.6 TWh), this represents a drop of 18 percent, due to an exceptionally low-wind period in the first four months of this year.

Despite the sharp decline in generation, onshore wind remained the most important energy source for electricity generation in Germany in the first half of the year, with a 22 percent share. The share of renewable energy in total electricity generation dropped by just two percentage points to just under 58 percent compared to the first half of 2024, thanks to a significant increase in solar power.[19]

[17] For the 3,000 wind turbines implemented so far with a successful bid, the average time from the award notification to commissioning was 20 months.
[18] See Status des Windenergieausbaus an Land in Deutschland im Jahr 2024, Chapter 6.
[19] Renewable energy shares in total electricity generation: first half of 2025: 57.8%, first half of 2024: 60.3%; see SMARD.de, "Actual Generation" dashboard.

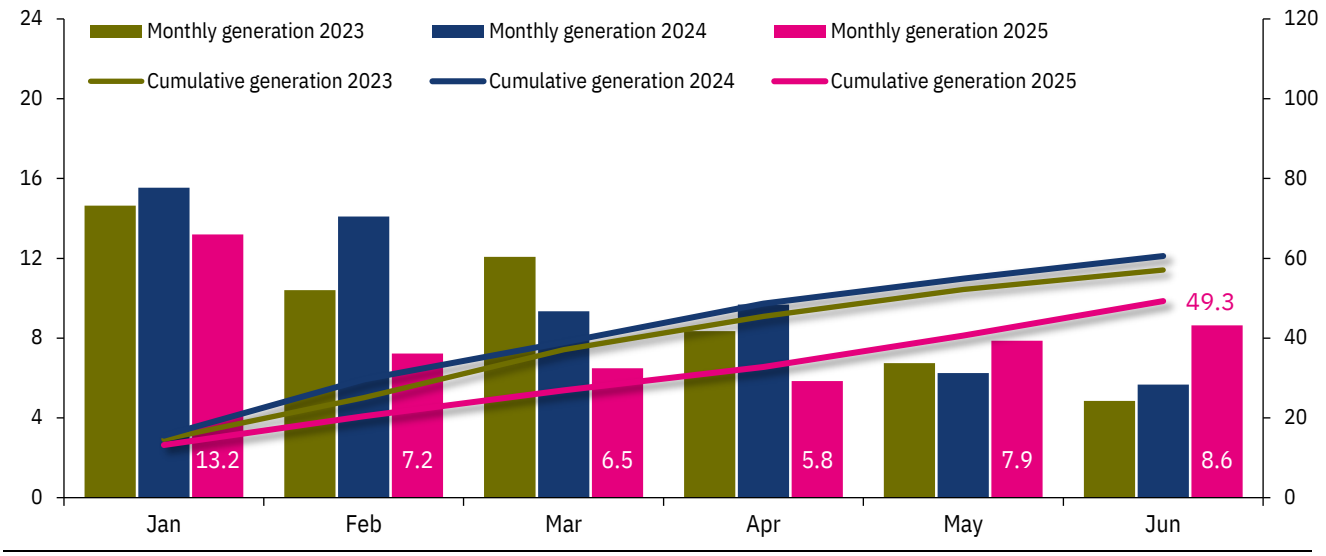

Figure 20: Electricity generation from onshore wind turbines
Data: BNetzA | SMARD.de; figures in terawatt-hours (TWh)

Monthly market values[20] for onshore wind electricity continued to fall in the first half of 2025. After record highs in 2022 – when the annual market value for onshore wind electricity reached 19.32 ct/kWh – market values began a steady decline from the beginning of 2023. In 2023, the annual market value for onshore wind fell to 7.62 ct/kWh, representing a drop of more than 50 percent compared to 2022. The downward trend continued in 2024, with the annual value falling to 6.29 ct/kWh – the lowest in the past four years. In the first half of 2025, the average market value rose significantly, reaching 7.71 ct/kWh, due to the very low-wind months in January through April.

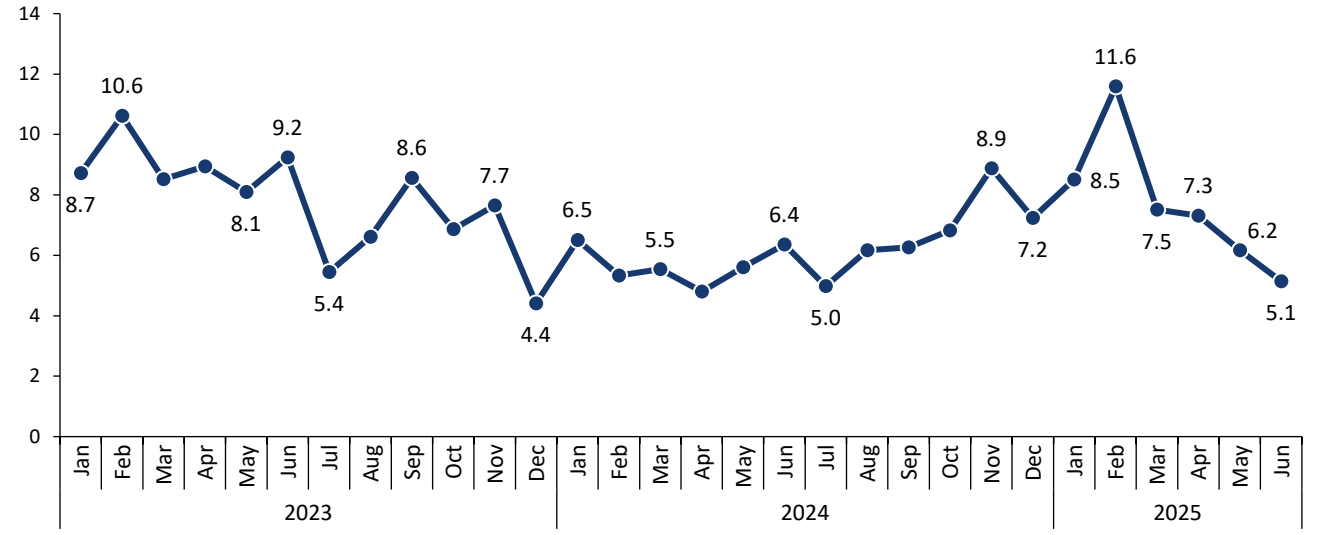

Figure 21: Monthly market values for electricity from onshore wind turbines
Data: Transmission system operators | Netztransparenz.de; figures in cents per kilowatt-hour (ct/kWh)

[20] Netztransparenz.de, monthly market values in accordance with Annex 1 (to Section 23a EEG) No. 5.2.

About the German Wind Energy Association (BWE)
As a member of the German Renewable Energy Federation (BEE), the BWE represents the entire wind energy sector with around 17,000 members. In collaboration with supplier and manufacturing companies rooted in German mechanical engineering, project developers, specialised lawyers, the finance sector, and companies in logistics, construction, service/maintenance, storage technologies, electricity trading, grid operation and energy supply, the BWE serves as the primary point of contact for policymakers, industry, academia and the media on all questions related to wind energy.

About VDMA Power Systems
VDMA Power Systems is the industry association for energy plant engineering. It represents the interests of manufacturers and suppliers of electricity and heat generation plants in Germany and abroad. This includes wind, solar and hydropower installations, engines, thermal power plants and storage and sector coupling technologies. VDMA Power Systems serves as a cross-technology information and communication platform focusing on energy and industrial policy, innovation and technology, markets and trade fairs, as well as press and public relations. VDMA Power Systems is a trade association within VDMA, Europe´s largest machinery industry association.

About the Wind and Solar Energy Agency
The Wind and Solar Energy Agency is a non-profit association. Its members include the federal government, the Länder, the leading municipal associations, business and environmental organisations, as well as companies. The association supports the environmentally and ecologically compatible use of onshore wind energy and solar energy in Germany. It prepares analyses, information resources and expert reports, among other things. Its work is based on the climate and energy policy goals of the European Union. The association operates on a basis of facts, legal precedent and scientific evidence.

FACHAGENTUR
WIND UND SOLAR

Fachagentur Wind und Solar e.V.

Fanny-Zobel-Strasse 11 | 12435 Berlin
T +49 30 64 494 60-60
post@fa-wind-solar.de | www.fachagentur-wind-solar.de