

**1st Half
2015**

DEUTSCHE
WINDGUARD

STATUS OF LAND-BASED WIND ENERGY DEVELOPMENT IN GERMANY

On behalf of:



STATUS OF LAND-BASED WIND ENERGY DEVELOPMENT

This factsheet describes the status of land-based wind energy development in Germany as of 30th June 2015 and examines the development of new construction during the course of the first half of 2015.

NET AND GROSS ADDITION

The net addition during the first half of 2015 comes to 1 093 MW, or 285 wind turbine generators (WTG). The net addition is made up of 443 WTG erected over the course of the first six months of 2015 with a capacity of 1 185 MW (gross addition), as well as 158 dismantled WTG with a capacity of 92 MW. Contained in the gross addition are 41 repowering WTG with a capacity of 119 MW.

Table 1: Status of Land-based Wind Energy Development (30th June 2015)

	Status of Land-based Wind Energy Development	Capacity [MW]	Number of WTG
Development 1st half 2015	Net addition during first Half of 2015	1 093.21	285
	Gross addition during first Half of 2015	1 185.49	443
	Repowering share	119.40	41
	Dismantling in first Half of 2015 (incl. subsequent registration)	92.28	158
Cumulative 30.06.2015	Cumulative WTG portfolio Status: 30 th June 2015	39 208.94	25 152

The development of annual added and cumulative wind energy capacity in Germany over time is depicted in Figure 1. The net addition for the first half of 2015 is 34 % lower compared to the net addition of the first half of 2014 (1 659 MW).

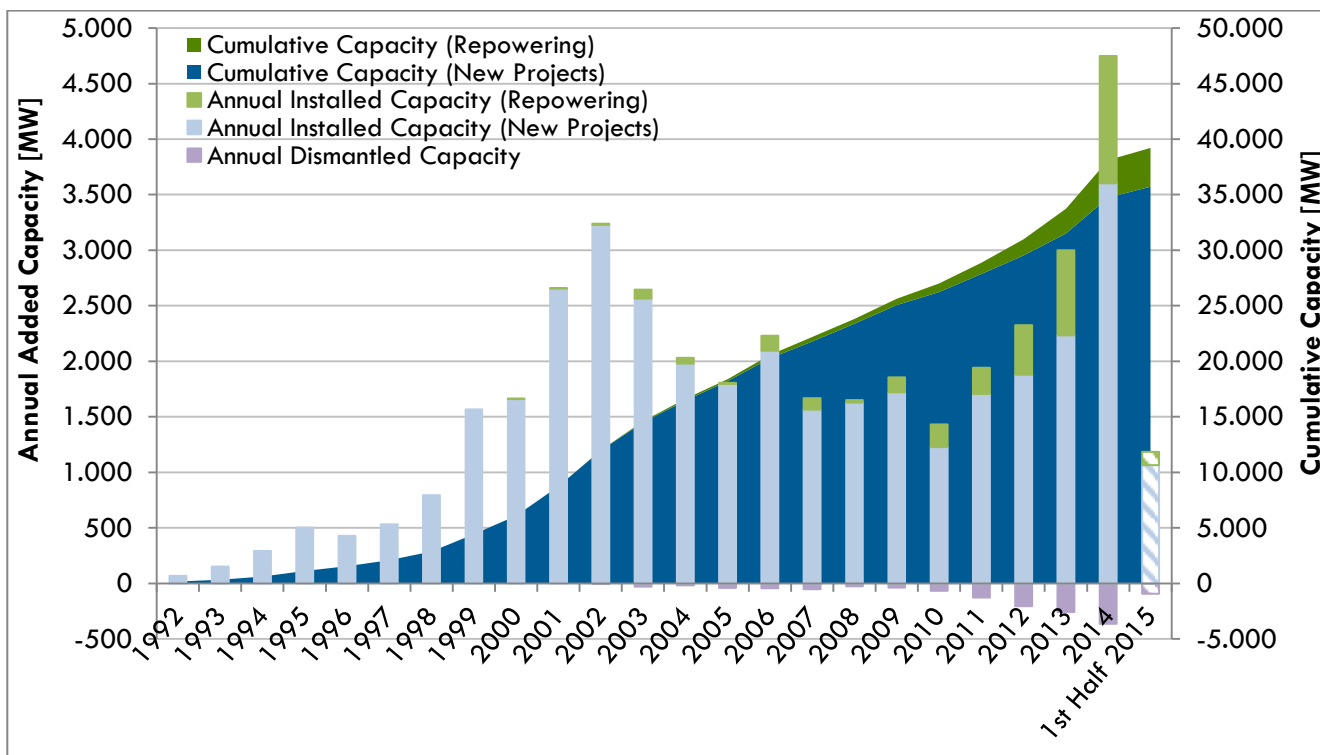


Figure 1: Development of the Annual Installed and Cumulative Capacity (MW) of Land-based Wind Energy in Germany incl. Repowering and Dismantling, Status 30th June 2015

DISMANTLING AND REPOWERING

In the first half of 2015, 158 WTG with a capacity of 92 MW were identified as having been dismantled. This includes reconciliation with decommissioned WTG as published in the WTG register, as well as taking late notifications from the previous year into consideration. The average capacity of dismantled WTG is about 584 kW.

Due to the discontinuation of the repowering bonus with the 2014 amendment to the Renewable Energy Law (EEG), the definition of repowering WTG is being narrowed. Prior to the amendment, each WTG that replaced at least one old WTG in the same or an adjacent county received the repowering bonus and was thus identified as a repowering WTG. Without the bonus, the term repowering is now used if a new WTG replaces an existing one. It can be assumed that this is taking place in spatial relation and that WTG that replace old ones in adjacent counties will no longer be classified and thus captured as repowering projects. In the framework of the statistical data collection for the first half of 2015, 41 WTG of a total of 443 new WTG could be identified as repowering WTG. With an identified capacity of 119 MW, this is equivalent to a repowering share of 10 % of the gross addition for the first half of 2015. The repowered WTG possess an average capacity of 2 912 kW.

Without the financial incentive for repowering projects, WTG are only dismantled if they can no longer be operated economically profitable, the state of the technology does not allow for continued operation or the pressure to free up land is very high. All WTG currently in operation receive at least a base compensation, since WTG that were erected prior to the year 2000 were guaranteed to get EEG compensation until 2020 when EEG 2000 went into effect. Therefore, it can be assumed that prior to 2020, a dismantling of old WTG will not intensify.

CUMULATIVE PORTFOLIO

Taking into consideration the net additions for the first half of this year, by 30th June 2015 a total of 25 152 WTG with a cumulative capacity of 39 209 MW were installed in Germany. It should be noted that the cumulative values in particular are non-binding and that they are most likely overestimated due to the underestimation of dismantling during previous years. With the last amendment to the EEG, which took effect 1st August 2014, a central WTG register was established. WTG additions, as well as repowering, are captured by it in detail. Reporting to the registry is mandatory for operators. The register provides for reliable and comprehensive data about repowering and dismantling from August 2014 onward. More detailed research about the actual cumulative portfolio requires a separate independent study.

AVERAGE TURBINE CONFIGURATION

The average WTG configuration of units installed in the first half of 2015 is shown in Table 2. The mean capacity of WTG installed during the given time period is 2 676 kW. The average rotor diameter is 104 meters and the average hub height reaches 120 meters. The specific area capacity, which is derived from the WTG capacity and the area covered by the rotor, averages at

Table 2: Average Turbine Configuration of WTG installed in first Half 2015, Status 30th June 2015

Average Land-based WTG Configuration, installed in 1 st half 2015		
1 st Half 2015	Average Turbine Capacity	2 676 kW
	Average Rotor Diameter	104 m
	Average Hub Height	120 m
	Average Specific Area Capacity	323 W/m ²

323 W/m² (Watts per square meter). In the last several years, increasingly more optimized weak-wind WTG became available that had rather low specific area capacities (about 220 - 270 W/m²). The following section (“Regional Distribution of Wind Energy Development”) deals in more detail

with regional differences regarding average WTG configuration.

The development of average WTG capacity respective to annual new installations (gross addition) over time and the total land-based WTG portfolio is depicted in Figure 2. In the first half of 2015, the average WTG capacity of 2 676 kW was 0.5 % lower than in the year 2014. The average WTG capacity of the total portfolio rose by 1.7 % to 1 559 kW compared to the status at the end of 2014.

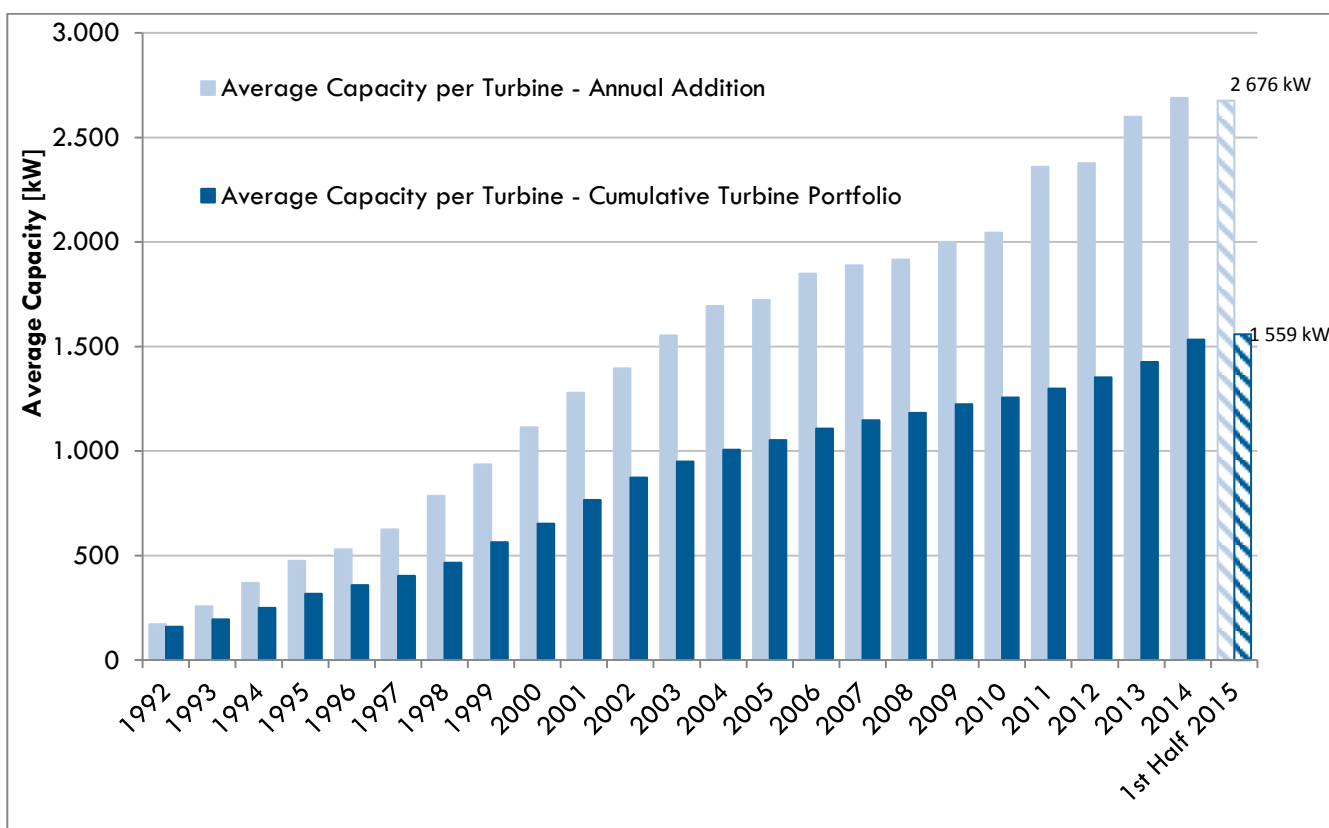


Figure 2: Development of the Average Capacity of Land-based WTGs Newly Installed and Cumulatively Present in the German Turbine Portfolio, Status: Status 30th June 2015

REGIONAL DISTRIBUTION OF WIND ENERGY DEVELOPMENT

The regional distribution of the gross addition, as well as the average WTG configuration according to the German states is shown in Table 3. As in the previous year, at 333 MW (28.1 %) Schleswig-Holstein received more than a quarter of the installed capacity during the time period in question. With 171 MW (14.4 %), Brandenburg surpassed Lower Saxony, which follows in third place with 137 MW (11.6 %). Combined, the three states above received more than half (54.1 %) of the additions in the first half of 2015. A notable increase in additions can be observed in North Rhine-Westphalia with a 9.5 % share (113 MW) in additions. Fifth and sixth places are held by two southern states, namely Bavaria with 8 % (94 MW) and Rhineland-Palatinate with 7 % (82 MW). The remaining 10 states together contribute 254 MW (21.5 % of the semi-annual additions), whereat no WTG were installed in Bremen and Berlin in the first half of the year.

Table 3: Addition to Wind Energy in the German States in the first Half 2015, Status 30th June 2015

Rank	State	Gross Addition - 1 st Half 2015			Average Turbine Configuration - 1 st Half 2015			
		Added Capacity [MW]	Added Number WTG	Share of Added Capacity of Total Addition	Average Turbine Capacity [kW]	Average Rotor Diameter [m]	Average Hub Height [m]	Average specific area capacity [W/m ²]
1	Schleswig-Holstein	333.49	118	28.1%	2 826	106	94	326
2	Brandenburg	171.20	63	14.4%	2 717	110	136	292
3	Lower Saxony	136.95	51	11.6%	2 685	95	119	382
4	North Rhine-Westphalia	112.56	47	9.5%	2 395	95	116	348
5	Bavaria	94.49	37	8.0%	2 554	111	140	270
6	Rhineland-Palatinate	82.40	28	7.0%	2 943	105	140	346
7	Hesse	62.75	25	5.3%	2 510	119	140	224
8	Saxony-Anhalt	57.85	23	4.9%	2 515	92	126	382
9	Mecklenburg-Western Pomerania	35.50	12	3.0%	2 958	102	131	365
10	Saarland	33.70	12	2.8%	2 808	113	143	280
11	Saxony	28.60	14	2.4%	2 043	88	103	334
12	Thuringia	26.60	9	2.2%	2 956	108	132	323
13	Baden-Württemberg	5.40	2	0.5%	2 700	97	144	367
14	Hamburg	4.00	2	0.3%	2 000	100	100	255
15	Berlin	0.00	0	0.0%	-	-	-	-
16	Bremen	0.00	0	0.0%	-	-	-	-
	Gesamt	1 185.49	443	100%	2 676	104	120	323

The average WTG capacity varies between 2 000 kW in Hamburg and 2 958 kW in Mecklenburg-Western Pomerania. WTG with comparably low capacities are found particularly in the central German states, while generators with larger capacities came into operation in the north and south. The average rotor diameter lies between 88 meters in Saxony and 119 meters in Hesse. Compared to central and northern Germany, on average larger rotor diameters are installed in the south. The average hub height of WTG installed in the first half of 2015 is between 94 meters in Schleswig-Holstein and 144 meters in Baden-Württemberg. In central and particularly in the south of Germany, erected towers are distinctly higher than in the north. This is influenced in particular by Schleswig-Holstein, where decidedly lower towers are being installed compared to the rest of the states. The specific area capacity lies between 224 W/m² in Hesse and 382 W/m² in Lower Saxony and Saxony-Anhalt. On average, a significantly higher specific area capacity is installed in the north compared to the south of the country, where weak-wind types with low specific capacity are being utilized.

REGIONAL DISTRIBUTION OF THE CUMULATIVE PORTFOLIO OF WIND TURBINES

The cumulative capacity and number of turbines according to the German states can be ascertained from Table 4. It must be noted again that the cumulative values may deviate from fact as the exact number of dismantled turbines is not known.

With 8 355 MW of installed capacity, Lower Saxony has the highest installed cumulative capacity. Brandenburg follows with 5 627 MW. In Schleswig-Holstein WTG with a cumulative capacity of 5 389 MW are installed.

Comparing the same time frames of 2014 and 2015 shows that the distribution of installed wind energy

Table 4: Cumulative Capacity and Number of Turbines in the German States, Status: 30th June 2015

Region / State		Cumulative Capacity [MW] Status: 30th June 2015	Cumulative Number Status: 30th June 2015
North	Lower Saxony	8 354.61	5 628
	Schleswig-Holstein	5 388.83	3 289
	Mecklenburg Western Pomerania	2 733.52	1 737
	Bremen	167.11	83
	Hamburg	60.29	54
Central	Brandenburg	5 627.21	3 381
	Saxony-Anhalt	4 392.04	2 623
	North Rhine-Westphalia	3 773.89	3 059
	Hesse	1 242.17	840
	Thuringia	1 153.04	734
	Saxony	1 093.85	869
	Berlin	4.30	2
South	Rhineland-Palatinate	2 808.37	1 497
	Bavaria	1 617.86	833
	Baden-Württemberg	555.30	398
	Saarland	236.55	125
		39 208.94	25 152

capacity did not change. The north of the country continues to hold 43 % of the capacity. Central

Germany holds 44 % of the cumulative capacity and the south of the country trails with 13 % of the cumulative capacity.

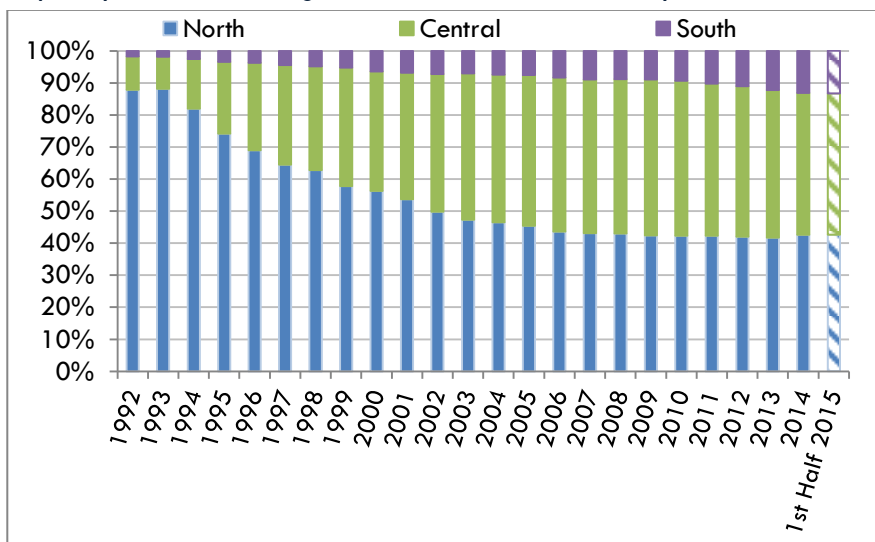


Figure 3: Distribution of the Germany-wide installed Cumulative Capacity across the Regions, Status: 30th June 2015

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