

Year
2013

Deutsche
WindGuard

STATUS OF LAND-BASED WIND ENERGY DEVELOPMENT IN GERMANY

On behalf of:



Power Systems

STATUS OF LAND-BASED WIND ENERGY DEVELOPMENT AS OF 31 DECEMBER 2013

In the course of calendar year (CY) 2013, 1,154 land-based wind turbine generators (WTG) with a total capacity of 2,998.41 MW were erected in Germany. This gross addition includes at least 269 repowering turbines with a capacity of 766.28 MW. Further captured was the dismantling of 416 WTG's with a capacity of 257.91 MW. Hence, as of 31 December 2013, a total of 23,645 WTG's

Table 1: Status of Land-based Wind Energy Development for 2013

	Status of Land-based Wind Energy Development	Capacity [MW]	Number [WTG]
Cumulative 2012	Corrected, cumulative WTG portfolio Status: 31 December 2012	30,989.33	22,907
Development 2013	Gross additions during 2013	2,998.41	1,154
	Repowering share (non-binding)	766.28	269
	Dismantling in 2013 (non-binding)	257.91	416
Cumulative 2013	Cumulative WTG portfolio Status: 31 December 2013	33,729.83	23,645

with a total capacity of 33,729.83 MW were installed. The data collected for repowering and dismantling are non-binding and discussed further in the section "Repowering and Dismantling".

Table 1 shows the cumulative values and the development for 2013.

The development of the annual additions to wind energy and the cumulative capacity is depicted in Figure 1. The WTG's installed in 2013 with a capacity of 2,998.41 MW equate to an increased gross annual capacity addition of 29 % compared to 2012. The cumulative capacity increased by 8.8 % to 33,729.83 MW between 31 December 2012 and 31 December 2013.

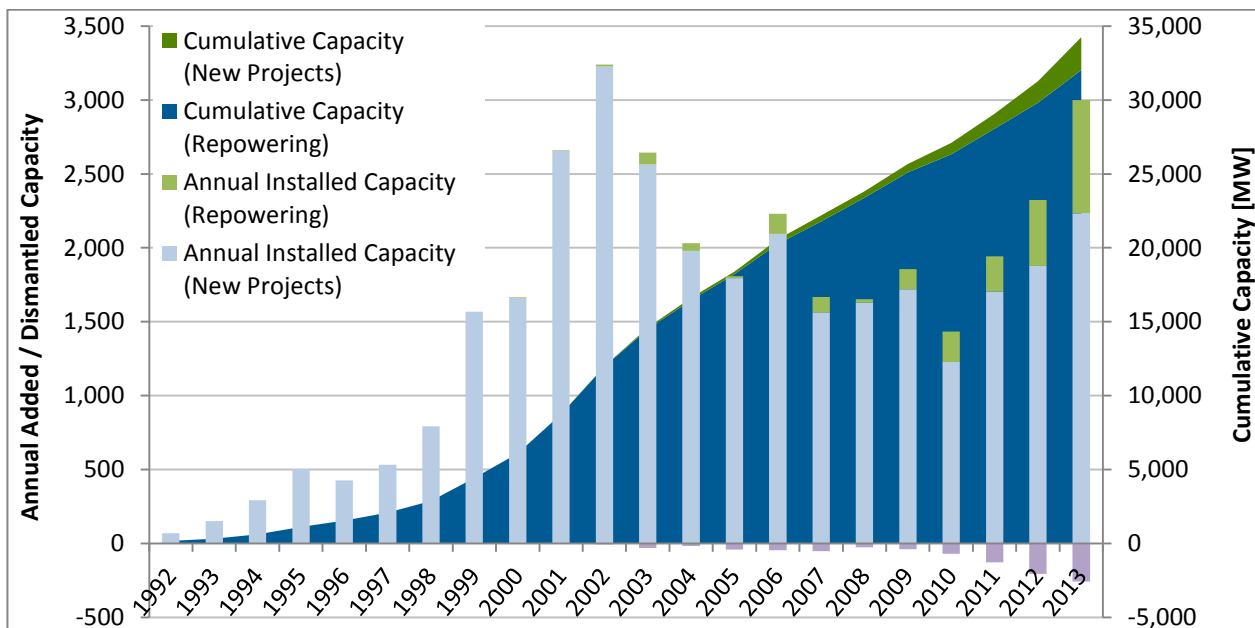


Figure 1: Development of the Annual Installed and Cumulative Capacity (MW) from Land-based Wind Energy in Germany, Status: 31 December 2013

The data since the end of 2012 were determined by inquiries with industry stakeholders as well as other research.

Basis of data 1992 – 2011: DEWI

REPOWERING AND DISMANTLING

There are no comprehensive values for the development of repowering and dismantling in Germany due to the lack of a central turbine register that captures these projects separately. The values that can be provided for dismantling and repowering are not binding and only show captured, repowered and dismantled WTG's. Despite extensive research and inquiries with industry stakeholders, it can be assumed that not all repowering and turbine dismantling efforts of 2013 could be and thus were captured. Actual repowering and dismantling numbers are likely to be higher than what has been captured.

In the framework of the statistical data collection for 2013, of all newly erected WTG's 269 have been identified as repowered ones (meaning that for a newly erected WTG an old WTG was dismantled in the same or adjacent administrative district/county). With an identified capacity of 766.28 MW, this equates to a repowering share of at least 25.6 % of the gross new construction of 2013. Furthermore, 416 WTG's were dismantled in 2013 with a total capacity of 257.91 MW.

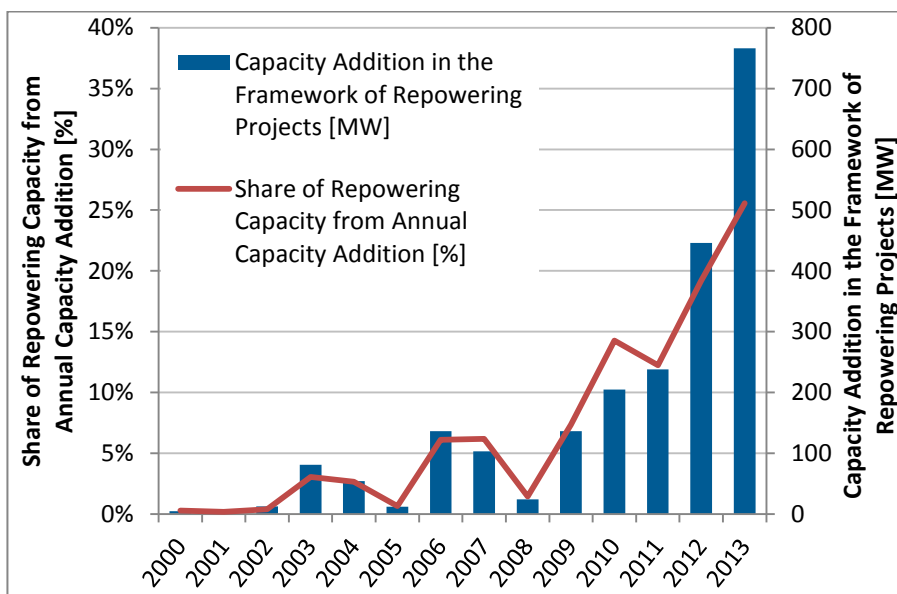


Figure 2: Development of Proportional and Absolute Installed Capacity in the Framework of Repowering Projects

The repowering WTG's possessed an average capacity of 2,849 kW, while the average dismantled WTG's had a capacity of 620 kW. Figure 2 shows the annual installed capacity in the framework of repowering projects, as well as the repowering-share of the annual gross capacity addition in relation to elapsed time.

Independent from the capturing of repowering turbines that are included in the annual gross capacity addition, the net new capacity can be derived from the annual gross new construction and dismantling of WTG's. Based on the data available, for 2013 this capacity is 2,740.50 MW. An underestimation of the dismantling numbers, which is possible in this case, hence leads to an overestimation of the net capacity addition of wind energy.

AVERAGE TURBINE CONFIGURATION

The average land-based WTG installed in 2013 had a capacity of 2,598 kW, a rotor diameter of 95 meters and a hub height of 117 meters. The average turbine configuration Germany-wide is listed in Table 2. Regional differences are detailed further in the next section (Regional Distribution).

Table 2: Average Turbine Configuration of WTG's erected in 2013

Average Land-based Turbine Configuration, Installation in 2013		
2013	Average Turbine Capacity	2,598 kW
	Average Rotor Diameter	95 meters
	Average Hub Height	117 meters

Figure 3 shows the development of the average land-based turbine capacity of annual new installations and of the cumulative turbine portfolio. Compared to 2012, the average capacity of WTG erected annually has increased by 9.3 %. An examination of the average capacity within the turbine portfolio shows an increase of 5.4 % to 1,427 kW compared to the status of 31 December 2012.

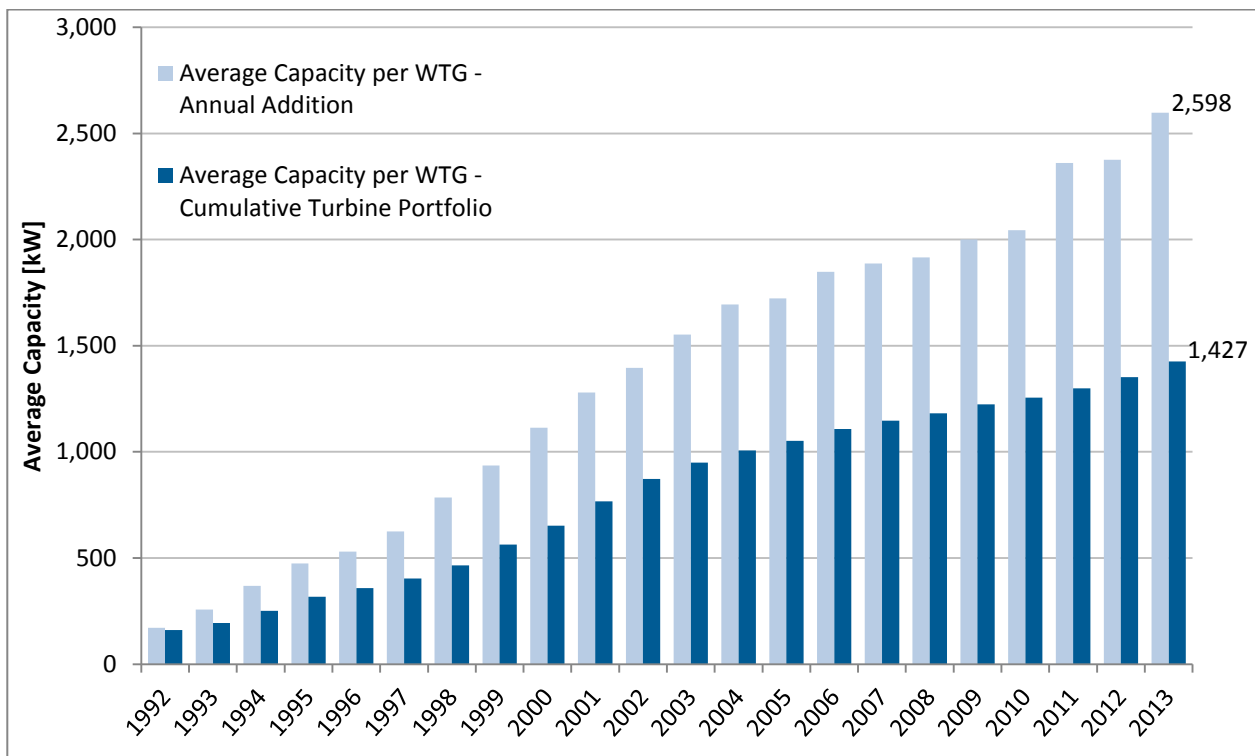


Figure 3: Development of the Average Capacity of Land-based WTG's Erected and Cumulatively Present in the Turbine Portfolio in Germany, Status: 31 December 2013

REGIONAL DISTRIBUTION OF WIND ENERGY DEVELOPMENT

The distribution of gross additions to wind energy in 2013 is shown in Table 3. The northern German states had the largest addition in 2013 with 40.8 % of total new construction. With addition shares of 14.3 %, 13.4 % und 13.0 %, Schleswig-Holstein, Mecklenburg-West Pomerania and Lower Saxony occupy 1st, 3rd and 4th places of the new construction statistics, respectively. Rhineland-Palatinate comes in second place with 13.8 % of the gross new construction for 2013. With 8.4 % of the overall new construction, Bavaria adds noticeably to the numbers of the southern German states. 34.8 % of new capacity was installed in central Germany. With 8.5% the largest share falls on Brandenburg, occupying 5th place in the statistic.

Table 3: Addition to Wind Energy in the German States, Status: 31 December 2013

Rank	State	Gross Addition in 2013			Average Turbine Configuration in 2013		
		Added Capacity [MW]	Added Number [WEA]	Share of Added Capacity of Total Addition	Average Turbine Capacity [kW]	Average Rotor Diameter [m]	Average Hub Height [m]
1	Schleswig-Holstein	427.95	162	14.3%	2,642	89	85
2	Rhineland-Palatinate	413.40	149	13.8%	2,774	100	134
3	Mecklenburg-Western Pomerania	401.54	135	13.4%	2,974	97	114
4	Lower Saxony	389.84	151	13.0%	2,582	90	110
5	Brandenburg	255.00	106	8.5%	2,406	94	122
6	Bavaria	251.58	98	8.4%	2,567	105	136
7	North Rhine-Westphalia	237.85	108	7.9%	2,202	85	112
8	Saxony-Anhalt	225.95	88	7.5%	2,568	93	122
9	Hesse	184.20	72	6.1%	2,558	106	133
10	Thuringia	105.50	45	3.5%	2,344	97	124
11	Saxony	35.50	15	1.2%	2,367	94	111
12	Saarland	34.10	12	1.1%	2,842	108	136
13	Baden-Wuerttemberg	31.60	11	1.1%	2,873	109	138
14	Hamburg	2.40	1	0.1%	2,400	117	141
15	Bremen	2.00	1	0.1%	2,000	90	105
16	Berlin	0.00	0	0.0%	-	-	-
	Total	2,998.41	1,154	100%	2,598	95	117

Also shown in Table 3 is the average turbine configuration of new additions according to the German states. The average turbine capacity of the states is between 2 MW and 3 MW, with the extremes for the lowest capacity in Bremen and for the highest capacity in Mecklenburg-Western Pomerania. The southern German states generally have the largest rotor diameters and tallest hub heights, whereas the northern states are the opposite. Notably interesting is the low hub height in Schleswig-Holstein, showing an average height of 85.1 meters, which is about 32 meters below the average hub height of all turbines erected in 2013.

CUMULATIVE REGIONAL DISTRIBUTION OF WIND ENERGY DEVELOPMENT

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

With 7,646.12 MW of installed capacity, Lower Saxony is at the top of the list of cumulative wind energy development. The second and third places are taken by two states from central Germany, Brandenburg and Saxony-Anhalt with

5,047.19 MW and 4,048.19 MW cumulative capacity, respectively. Overall, by 31 December 2013, 46 % of the cumulative capacity was installed in the Central Region, but has slightly declined since 2009. At the end of 2013, 42 % of the total installed capacity is located in the Northern Region, with no notable change since 2009. The remaining 12 % capacity

is installed in the Southern Region. Its share of the cumulative capacity has increased by about 1 % annually since 2008. The development of the cumulative capacity distribution is depicted graphically in Figure 4

Table 4: Cumulative Capacity and Number of Turbines in the German States

Region / State		Cumulative Capacity Status: 31 Dec. 2013 [MW]	Cumulative Number Status: 31 Dec. 2013 [WEA]
North	Lower Saxony	7,646.12	5,490
	Schleswig-Holstein	3,897.49	2,929
	Mecklenburg Western Pomerania	2,338.53	1,612
	Bremen	151.01	78
	Hamburg	55.15	59
	Central	Brandenburg	5,047.19
Saxony-Anhalt		4,048.19	2,501
North Rhine-Westphalia		3,414.67	2,984
Saxony		1,039.14	858
Thuringia		993.44	675
Hesse		973.54	754
Berlin		2.00	1
South		Rhineland-Palatinate	2,303.09
	Bavaria	1,120.47	652
	Baden-Wuerttemberg	533.05	391
	Saarland	166.75	100
Total		33,729.83	23,645

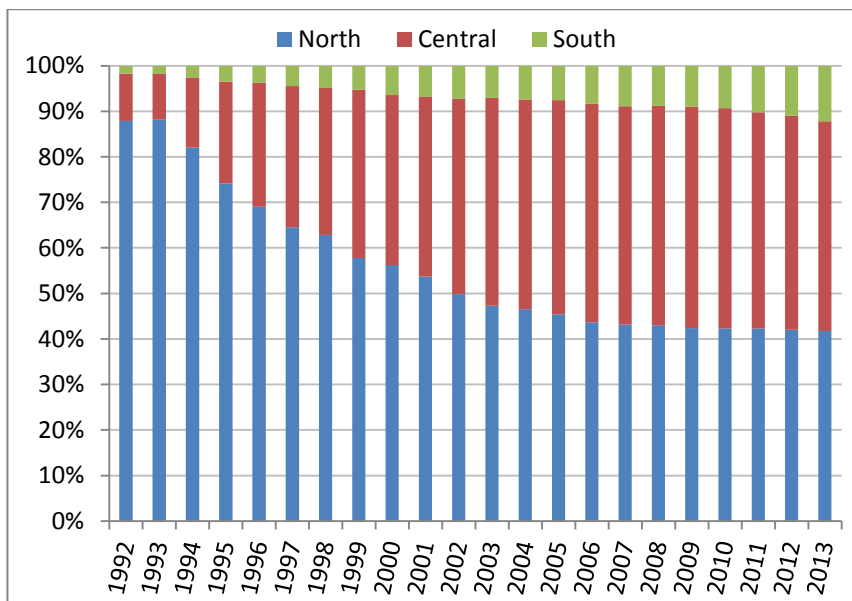


Figure 4: Distribution of the Germany-wide Cumulative Capacity across the Regions, Status: 31 December 2013

Data Collection, Preparation and Translation:

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