

**1st. Half
2013**

Deutsche
WindGuard

STATUS OF WIND ENERGY DEVELOPMENT IN GERMANY

On behalf of:



Power Systems

STATUS OF WIND ENERGY DEVELOPMENT ON JUNE 30 2013

In the first half of calendar year (CY) 2013, 406 onshore wind turbine generators were installed in the Federal Republic of Germany. The total output of these turbines is about 1,038 MW. By 30 June 2013, the total number of additionally installed onshore turbines raises the installed combined power output to about 32,036 MW. The output is distributed among 23,312 turbines.

Tab. 1: Status of Wind Energy Development as of 30 June 2013

| | Status of wind energy development | Capacity (MW) | No. Of turbines (WT) |
|----------|--|------------------|----------------------|
| Onshore | New installations, 1st half 2013 Onshore | 1.038,07 | 406 |
| | Installed total capacity Onshore - June 30, 2013 | 32.036,43 | 23.312 |
| Offshore | New installations, 1st half 2013 Offshore | 105 | 21 |
| | Installed total capacity Offshore - June 30, 2013 | 385,30 | 89 |
| Total | Total new installations, 1st half 2013 | 1.143,07 | 427 |
| | Installed total capacity - June 30, 2013 | 32.421,73 | 23.401 |

In the first half of 2013, 21 offshore wind turbines with a combined power output of 105 MW were connected to the grid for the first time. The data collected in the first half of 2013 shows a cumulative power output of about 385 MW. The output is distributed amongst 89 wind turbines.

The total of all on- and offshore wind turbines installed in Germany in the first half of 2013 amounts to 427 turbines with an installed power output of 1,143 MW. The cumulative power output of all wind turbines installed in Germany as of 30 June 2013 comes to 32,422 MW.

The new construction for the first half of 2013 is around 139.25 MW, which is 13.9%, above the new construction noted for the first half of 2012 (new construction, first half of 2012: 1,003.82 MW). Thus, new construction levels were slightly higher compared to the first half of 2012.

STATUS OF ONSHORE WIND ENERGY DEVELOPMENT

Figure 1 graphically illustrates the data mentioned above of onshore wind energy in Germany over the course of the past 20 years.

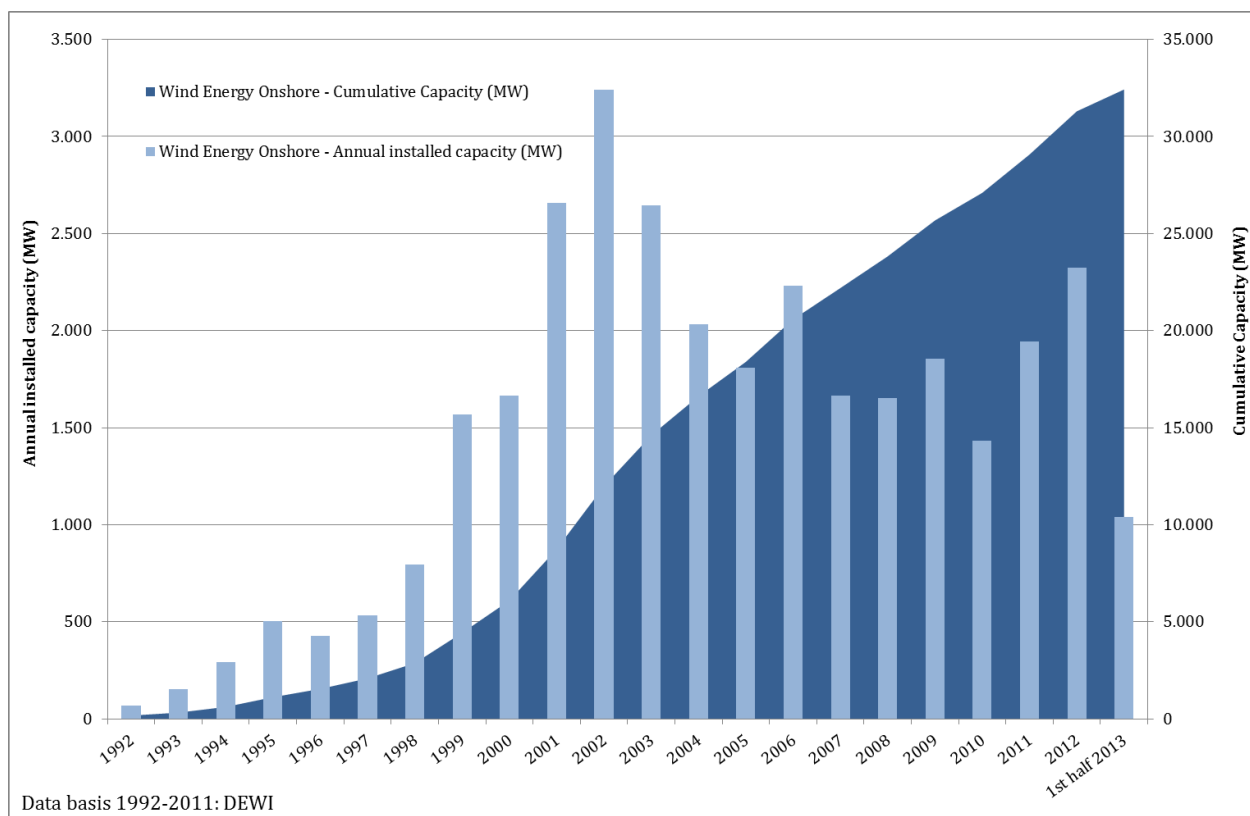


Fig.1: Development of installed annual capacity and cumulative capacity from wind energy in Germany (in MW), Status as of June 30, 2013.

In the first half of 2013, 406 new onshore turbines were erected with a total power output of 1,038.07 MW. With regard to the overall installed power, it should be noted that small corrections have been made for the year 2012. Wind turbines with an installed power output of about 10 MW were only erected in the first half of 2013 rather than in 2012, as anticipated.

When comparing the new-construction numbers of the first half of 2012 (onshore additions of 958.82 MW) with those of the first half of 2013, there is a slight increase for onshore wind energy of about 79 MW, which is equivalent to an increase of 8.2%.

STATUS OF OFFSHORE-WIND ENERGY DEVELOPMENT

In the first half of 2013, a total of 21 offshore wind turbines with a combined output of 105 MW fed into the grid for the first time. By 30 June 2013, a total output of about 385 MW from offshore wind turbines was connected to the grid. At the same time, 38 wind turbines that had been erected in the North Sea were without grid connection. Table 2

provides an overview of new construction in the area of offshore wind energy.

Tab.2: Offshore Wind Energy Development, Status 30 June 2013

| Status of offshore wind energy development | Capacity (MW) | No. Of turbines (WT) |
|---|---------------|----------------------|
| New installed capacity, 1st half 2013 (Initial feed-in) | 105,00 | 21 |
| Installed total capacity - June 30, 2013 (Turbines, which feed electricity into the grid) | 385,30 | 89 |
| Errected turbines, status June 30, 2013 (Not yet connected to the grid) | | 38 |
| Foundation structures (Errected 1st half 2013) | | 155 |

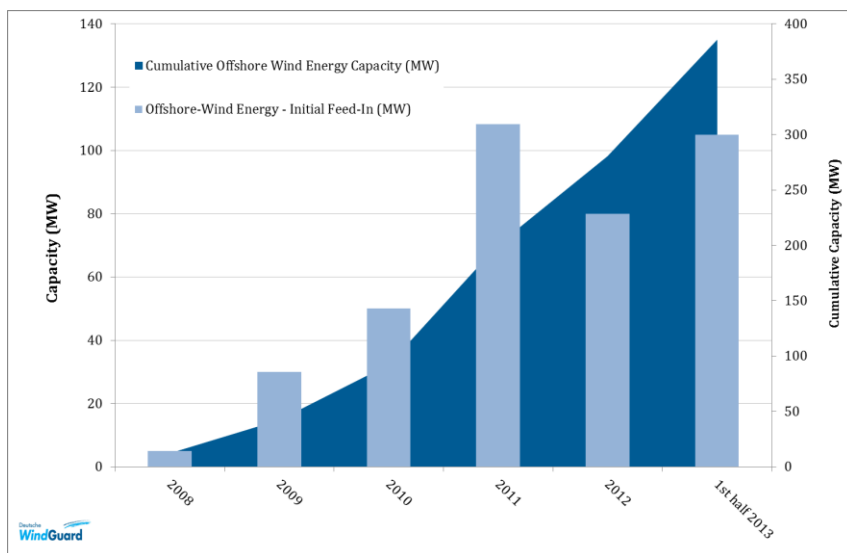


Fig. 2: Development of offshore wind energy in Germany (Capacity of turbines feeding into the grid initially per year and cumulative capacity), Status as of June 30, 2013.

Figure 3 gives an overview of offshore projects currently partially completed or under construction in the North Sea. At this time there are seven such projects, encompassing a volume of about 1,714 MW, which will be connected to the grid in the medium term.

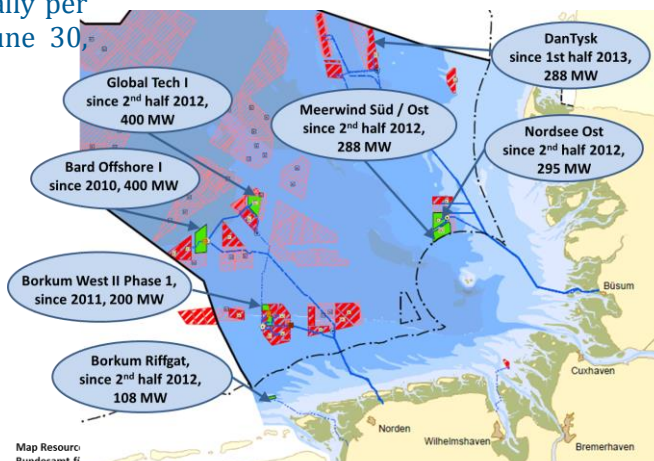


Fig. 3: Offshore Windfarms under construction, Status as of June 30, 2013

REPOWERING AND DISMANTLING OF WIND TURBINES

No binding values exist for the development of repowering in Germany. This is due to the absence of a central turbine registry that would allow for these projects to be accounted for separately.

In the framework of statistical data collection, construction of seven repowering turbines with a total output of around 22.7 MW could be identified for the first half of 2013. At the same time, the dismantling of 52 wind turbine generators with a total output of 18.13 MW was identified.

The data basis for the numbers cited here is information provided by manufacturers and larger planning bureaus. This approach allowed two of the most important players to be involved in the information gathering process. Still, it must be assumed that not all repowering projects that had been realized in the first half of 2013 were identified this way. Considering these circumstances, it should be assumed that a larger number of turbines have been dismantled than previously determined.

The following circumstances complicate the identification of repowering projects:

- Change of manufacturer between the old and the new project, resulting in the manufacturer of the turbines for new project having no knowledge about the details of the old project.
- Old turbines may be located in counties adjacent to the new project, by which a repowering is not readily apparent and also often unbeknownst to the permitting agencies.
- Based on the current regulations of the Renewable Energy Law 2012 (EEG 2012), in most cases an old turbine is replaced by a new one. This means that old turbines are being partially brokered to adjacent projects, if the number of dismantled turbines is larger than the number of new ones. Hence, two repowering projects can result out of one old project.
- Many of the repowering activities currently in progress are being realized by local operators and so-called “citizen’s wind farms” (Bürgerwindparks) and thus are unknown on a national level.
- Lack of a central turbine registry, including capturing repowering information.

AVERAGE TURBINE CONFIGURATION

Table 3 provides the average values for power, rotor diameter and hub height for on- and offshore turbines separately.

Tab. 3: Average turbine configuration, 1st half 2013

| Average turbine configuration, 1st half 2012 | | | |
|--|---------|----------|---------|
| | Onshore | Offshore | Gesamt |
| Average capacity of wind turbines | 2557 kW | 5000 kW | 2677 kW |
| Average rotor diameter | 93,1 m | 122 m | 94,5 m |
| Average hub height | 115,2 m | 90 m | 114 m |

The average power output of onshore wind turbines in the first six months of 2013 was 2,557 kW with an average hub height of about 115 meters and an average rotor diameter of about 93 meters. In the offshore region, the average power output was 5,000 kW with an average hub height of about 90 meters and an average rotor diameter of 122 meters.

The turbine configuration for the first six months of 2013 results in an average power output of all newly installed turbines of 2,677 kW. Hence, compared to 2012, an increase of 257 kW can be noted (2012 value: 2,420 kW).

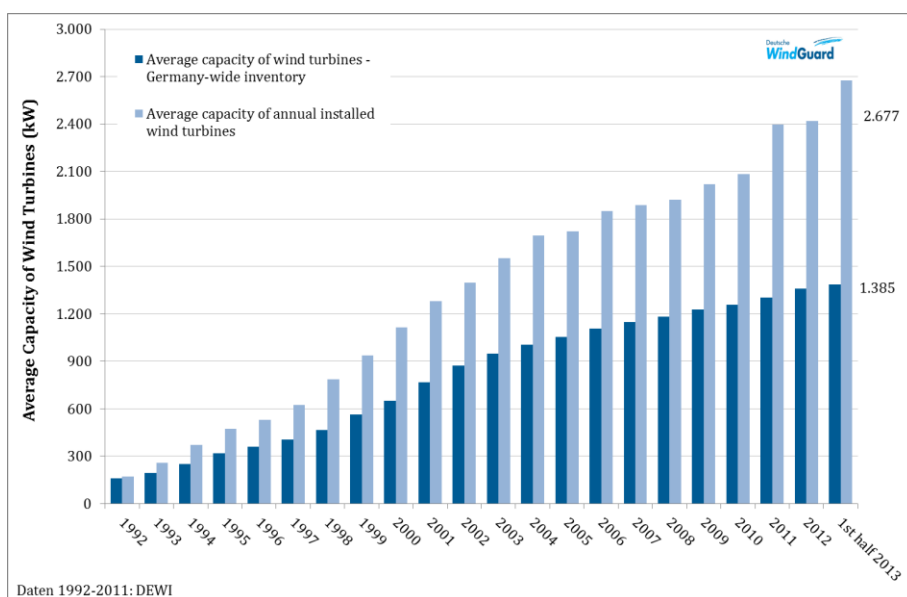


Fig. 4: Development of average capacity of annual installed turbines, as well as Germany-wide inventory, Status as of June 30, 2013

By the 30 June 2013 cutoff date, along with the increase of the semi-annual average power output, an increase of the average power output of the entire turbine inventory to 1,385 kW can be observed. Figure 4 illustrates the average values for semi-annual new installations, as well as the average of the entire turbine inventory.

REGIONAL DISTRIBUTION OF WIND ENERGY DEVELOPMENT

In the first half of 2013, Lower Saxony a state in Northern Germany and Rhineland-Palatinate a state in Southern Germany had the largest number of new construction, at 16% each with respect to power output. Schleswig-Holstein, again a state in Northern Germany, came in third place at about 12 % of installed power. The states of Mecklenburg-West Pomerania and Brandenburg are trailing at 10 and 8%, respectively. Offshore wind energy makes up 9.2% of the power installed in the first six months of 2013.

The detailed analysis according to all federal states is shown in Table 4. Next to the new construction data for the first half of 2013, the average turbine configuration installed in the individual federal states for the timeframe in question is also shown. Notably interesting is the low hub height in Schleswig-Holstein when compared to other states. The reason for this height variance is the height restriction of the state's land use planning guidelines.

Tab. 4: New wind energy construction for the first six month of 2013 in the German states

| Rank | State / Region | Installed capacity, 1st half 2013 | | | Average turbine configuration, | | |
|------|-------------------------------|-----------------------------------|---------------------------|--------------------------------------|-----------------------------------|----------------------------|------------------------|
| | | Installed capacity (MW) | No. Of wind turbines (WT) | Share of 1st half 2013 installations | Average capacity of turbines (kW) | Average Rotor diameter (m) | Average Hub height (m) |
| 1 | Lower Saxony | 186,80 | 72 | 16,3% | 2.594 | 91,5 | 121,4 |
| 2 | Rhineland-Palatinate | 185,20 | 65 | 16,2% | 2.849 | 100,9 | 133,2 |
| 3 | Schleswig-Holstein | 141,25 | 52 | 12,4% | 2.716 | 87,6 | 77,8 |
| 4 | Mecklenburg-Western Pomerania | 117,87 | 37 | 10,3% | 3.186 | 98,3 | 108,2 |
| 5 | Brandenburg | 88,40 | 42 | 7,7% | 2.105 | 83,7 | 116,9 |
| 6 | Saxony-Anhalt | 77,35 | 31 | 6,8% | 2.495 | 88,9 | 126,6 |
| 7 | North Rhine-Westphalia | 74,80 | 40 | 6,5% | 1.870 | 79,0 | 99,4 |
| 8 | Bavaria | 68,70 | 27 | 6,0% | 2.544 | 109,7 | 130,7 |
| 9 | Hesse | 46,40 | 19 | 4,1% | 2.442 | 104,6 | 132,6 |
| 10 | Saxony | 22,20 | 10 | 1,9% | 2.220 | 95,0 | 121,0 |
| 11 | Thuringia | 21,00 | 8 | 1,8% | 2.625 | 102,3 | 111,9 |
| 12 | Saarland | 8,10 | 3 | 0,7% | 2.700 | 97,3 | 125,0 |
| 13 | Baden-Wuerttemberg | 0,00 | 0 | 0,0% | - | - | - |
| 14 | Bremen | 0,00 | 0 | 0,0% | - | - | - |
| 15 | Hamburg | 0,00 | 0 | 0,0% | - | - | - |
| 16 | Berlin | 0,00 | 0 | 0,0% | - | - | - |
| | Baltic Sea | 0,00 | 0 | 0,0% | - | - | - |
| | North Sea | 105,00 | 21 | 9,2% | 5.000 | 122,0 | 90,0 |
| | Total | 1.143,07 | 427 | 100% | 2.677 | 94,5 | 114,0 |

CUMULATIVE REGIONAL DISTRIBUTION OF WIND ENERGY DEVELOPMENT

Table 5 shows the distribution of the cumulative power output in Germany by states and at sea. Additionally, the states are categorized into the regions “North”, “Central” and “South”. The region “Sea” is listed separately. This allows for a geographical comparison of the development.

Tab. 5: Installed total capacity in German states, Status as of June 30, 2013

| | State / Region | Total capacity, June 30, 2013 (MW) | Total no. Of turbines, June 30, 2013 (WT) |
|---------|-------------------------------|------------------------------------|---|
| North | Lower Saxony | 7.512,43 | 5.528 |
| | Schleswig-Holstein | 3.700,14 | 2.947 |
| | Mecklenburg Western Pomerania | 2.067,00 | 1.541 |
| | Bremen | 149,01 | 77 |
| | Hamburg | 52,75 | 58 |
| Central | Brandenburg | 4.902,78 | 3.177 |
| | Saxony-Anhalt | 3.887,99 | 2.443 |
| | North Rhine-Westphalia | 3.257,44 | 2.940 |
| | Saxony | 1.024,74 | 854 |
| | Thuringia | 920,59 | 649 |
| | Hesse | 848,14 | 723 |
| | Berlin | 2,00 | 1 |
| South | Rhineland-Palatinate | 2.106,10 | 1.306 |
| | Bavaria | 937,59 | 581 |
| | Baden-Wuerttemberg | 501,48 | 381 |
| | Saarland | 166,25 | 106 |
| Sea | North Sea | 334,50 | 67 |
| | Baltic Sea | 50,80 | 22 |
| | Total | 32.421,73 | 23.401 |

With the regional distribution it must be noted that the majority of the installed power in the Northern States is allocated amongst the states of Lower Saxony, Schleswig-Holstein and Mecklenburg-West Pomerania. Due to their size, the city states of Bremen and Hamburg can only add a small percentage. The northern states make up 42% of the cumulative power output. The “Central” region has 46% of the cumulative power installed. There is a power accumulation in the southern state of Rhineland-Palatinate, followed by Bavaria. By 30 June 2013, 11% of the total power output was installed in the “South”.

Figure 5 graphically shows the installed total power output distributed among the regions “North”, “Central”, “South” and “Sea” with respect to time.

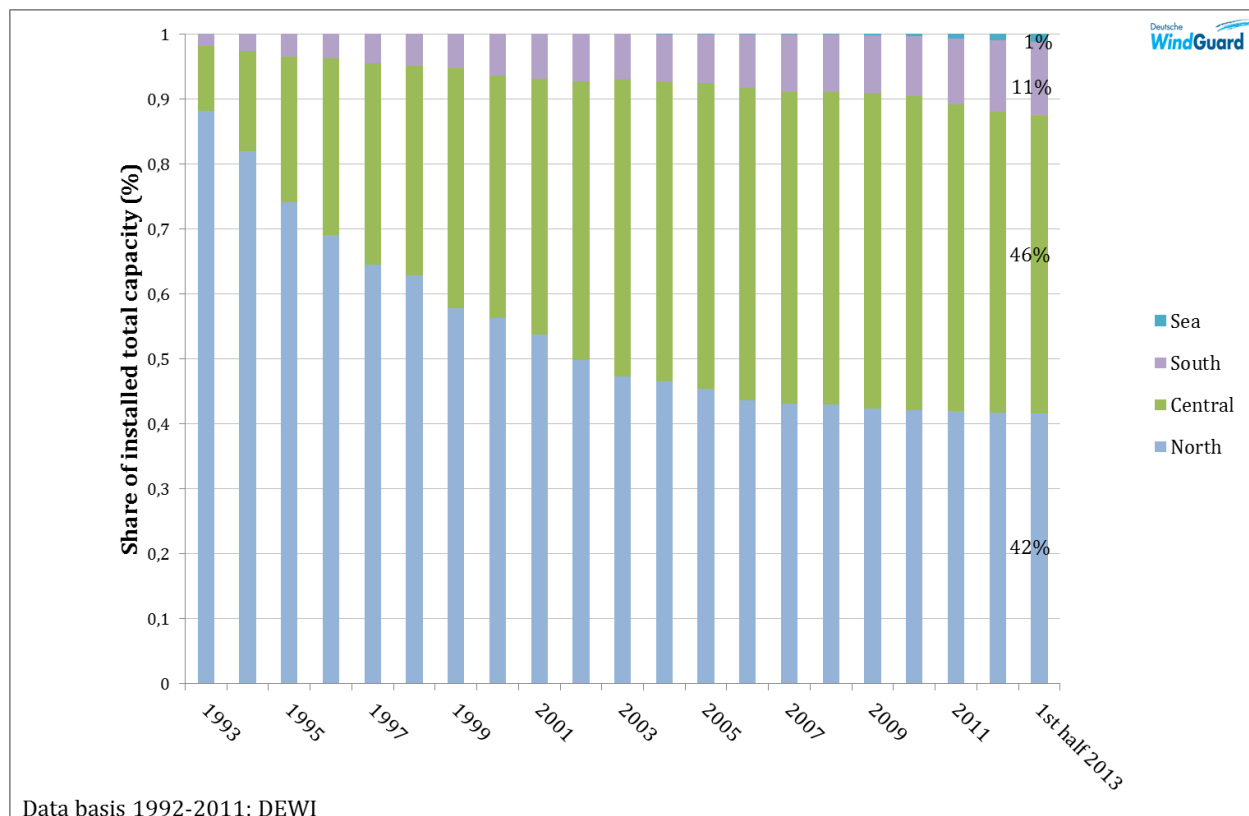


Fig. 5: Distribution of the installed total capacity among the Regions within Germany, Status as of 30 June 2013

From the onset of harnessing wind energy onshore until about 2005, a clear shift of shares to the regions of central and southern Germany can be observed. Over the last several years, the distribution has leveled off, where the “Central” region retains 46% of all turbine power output. It is trailed by the regions “North” with 42% and “South” with 11%. The robustness of these values is supported by the fact that between the first half of 2013 compared to the entire year of 2012 there was no change in the percentage spatial distribution.

Data Collection and Adaption

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