

**1<sup>st</sup> half  
2016**

*DEUTSCHE*  
**WINDGUARD**

## STATUS OF OFFSHORE WIND ENERGY DEVELOPMENT IN GERMANY

On behalf of:

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Arbeitsgemeinschaft  
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## STATUS OF OFFSHORE WIND ENERGY DEVELOPMENT

The status of offshore wind energy development in Germany during the first half of 2016 and on a cumulative basis is described within the present factsheet. Table 1 summarises the data of additions during first half 2016, as well as the cumulative offshore portfolio data. Further explanations on development trends are provided on the following pages.

### TURBINES FEEDING INTO THE GRID

43 offshore wind turbines (OWT) with a total capacity of 258.0 MW achieved their first feed-in to the grid during the first half of 2016. 39 of the newly online OWT (234.0 MW) were installed during the previous year (2015), whereas the remaining 4 OWT (24.0 MW) were installed and commissioned within the first half of 2016.

Compared to the first half of 2015 with largescale addition due to catch-up effects (422 OWT,

1 765.3 MW) significantly less OWT were feeding in to the grid for the first time. With respect to feed-in capacity, the additions in the first six months of 2016 amount to 15% of the 2015 value from the same period. In terms of the number of turbines, only 10% of the new feed-ins from January to June 2015 were achieved during the same period of 2016.

Table 1: Offshore wind energy development, as of 2016-06-30

	Status of Offshore Wind Energy Development	Capacity [MW]	Number of OWT
Additions 1st half 2016	OWT's (feeding in)	258.0	43
	Installed OWT's (no feed-in)	312.0	52
	Foundations w/o OWT		76
Cumulative (2016-06-30)	OWT's (feeding in)	3 552.22	835
	Installed OWT's (no feed-in)	324.00	54
	Foundations w/o OWT		142

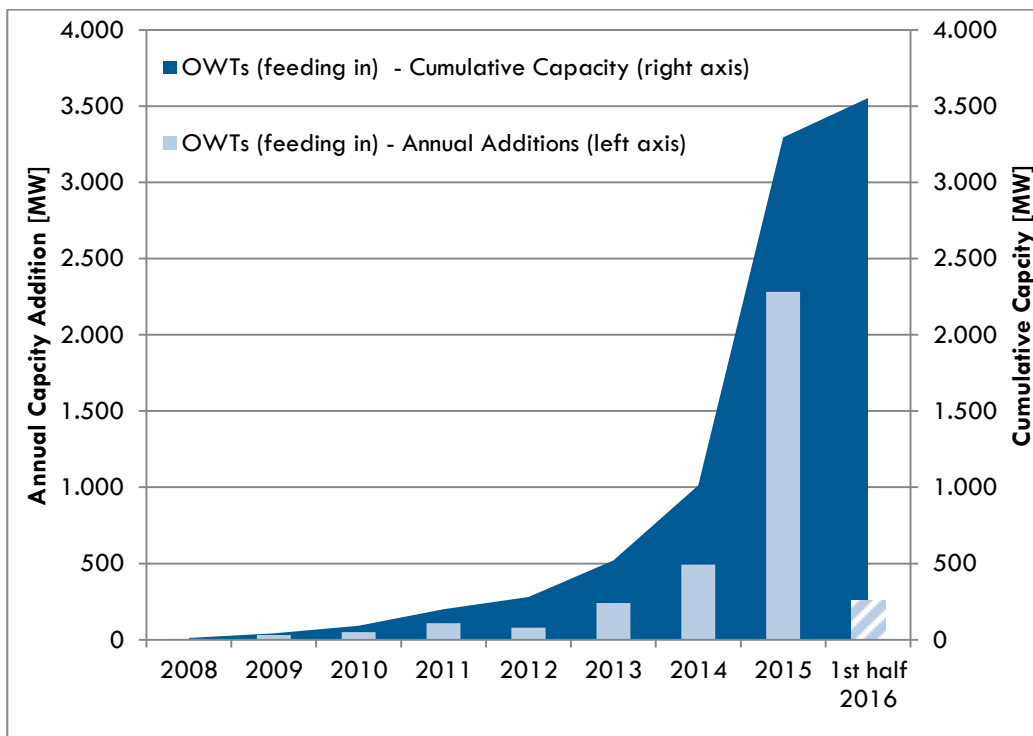


Figure 1: Development of offshore wind energy in Germany (capacity of OWT feeding into the grid) as of 2016-06-30

Figure 1 illustrates the expansion of offshore wind energy in Germany, with regard to online OWT (in MW).

The cumulative number of OWT feeding into the grid has increased to 835 OWT with a total capacity of 3 552.22 MW. This equals a growth of 8% compared to the previous year's level.

### INSTALLED TURBINES AND FOUNDATIONS

From 1<sup>st</sup> January 2016 until 30<sup>th</sup> June 2016, 56 additional OWT with a capacity of 336.0 MW have been installed. 52 of these OWT with a capacity of 312.0 MW did not achieve the first feed in during the first half of 2016. Including the installations of 2015 there are 54 wind turbines set for the first feeding into the grid as of June, 30<sup>th</sup> 2016.

Between 1<sup>st</sup> January 2016 and 30<sup>th</sup> June 2016 another 76 foundations were installed, of which none were supplemented with an OWT yet. Including the foundations installed in the previous year, 142 foundations were available for the next installation steps by the end of the first half of 2016.

### POLITICAL DEVELOPMENT TARGET AND ASSIGNED GRID CONNECTION CAPACITY

The current political target for offshore wind energy, set by the federal government of Germany, aims for a total installed capacity of 6.5 GW by 2020. The maximum legally assignable grid connection capacity until the end of 2017 is 7.7 GW for projects that can be installed and online by 2020. The progress towards the implementation of this capacity, as of 30 June 2016, is shown in Figure 2 below. The figure depicts the total capacity of OWT feeding into the grid, as well as capacity of OWT installed, under construction (if at least the construction of the foundations at the OWP had commenced) and capacity of OWP for which final investment decisions have been made.

In addition to the 3 553 MW already feeding in and the completely installed 324 MW, a capacity of 1 486 MW was under construction as of 30 June 2016. A final investment decision had been made for another 810 MW. In total, 80% of the assigned grid connection capacity has been finalised or is in solid progress at the end of the first half of 2016. Grid connection commitment for an additional capacity of approximately 1 469 MW has been assigned to OWP, which are to be financed and implemented within the next couple of years. The unassigned capacity on a level of up to 50 MW may be allocated to prototype wind turbines until 31<sup>st</sup> December 2016.

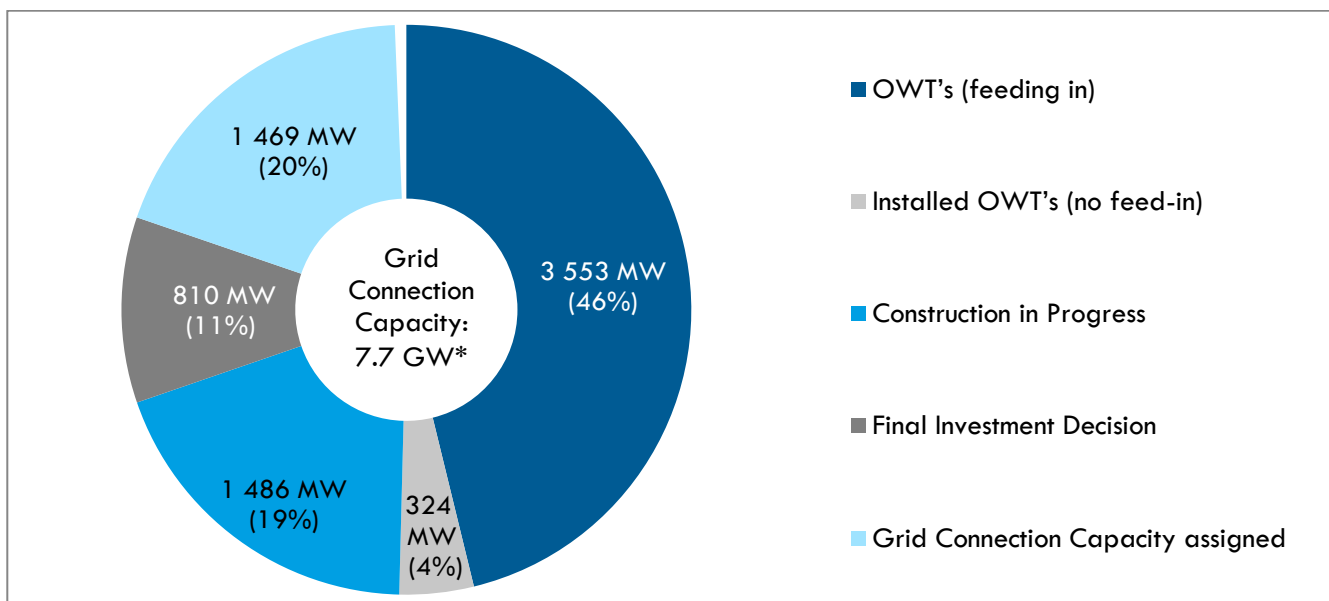


Figure 2: Offshore capacity in solid progress (meaning at least final investment decision) and its share of the assigned grid connection capacity as of 2016-06-30

\*Due to differences between the installed or planned capacity of offshore wind projects and the assigned grid connection capacity the sum of the projects does not reach exactly 7.7 GW.

## DISTRIBUTION ACROSS THE NORTH AND BALTIC SEA

The distribution of installations and commissioning activities within the North and the Baltic Sea in the first half of 2016 is shown in Table 2. Additionally, the cumulative status of the development for both offshore regions is displayed. All OWT feeding in for the first time during the first half of 2016 (43 OWT, 258 MW) are located in the North Sea. A similar picture is given for the 52 OWT (312 MW) and 76 foundations installed during the first six months of the year. In the Baltic Sea construction work took place, but no foundations were completed in the first half of 2016.

Overall, by 30 June 2016, 733 OWT located within the North Sea with a cumulative capacity of 3 213.42 MW fed into the grid, whereas 102 OWT with 338.8 MW cumulative capacity were online in the Baltic Sea. This corresponds to a share of 90% in the North Sea and 10% in the Baltic Sea. Additionally, another 54 OWT (324.0 MW) are currently installed but not feeding into the grid yet in the North Sea. Furthermore, as of 30<sup>th</sup> June 2016, 142 foundations are installed in the North Sea.

Table 2: Distribution across the North and Baltic Sea as of 2016-06-30

Regional Distribution		North Sea		Baltic Sea	
		Capacity [MW]	Number of OWT	Capacity [MW]	Number of OWT
Additions 1 <sup>st</sup> half 2016	OWT (feeding in)	258.00	43	0.00	0
	Installed OWT (no feed-in)	312.00	52	0.00	0
	Foundations w/o OWT		76		0
Cumulative (2016-06-30)	OWT (feeding in)	3 213.42	733	338.80	102
	Installed OWT (no feed-in)	324.0	54	0.00	0
	Foundations w/o OWT		142		0

## TURBINE CONFIGURATION

The average turbine configuration is displayed in Table 3. Average nameplate capacity, hub height and rotor diameter increased significantly compared to the OWT initially feeding-in during the previous year. The average nameplate capacity of OWT feeding in for the first time during the first half of 2016 is 6 000 kW. This represents an increase of 45% in comparison with the average of 2015. The average rotor diameter increased by 29% to 154 m and the average hub height rose by 24% to 110 m.

The average nameplate capacity of all turbines feeding in by the end of June 2016 was 4 254 kW, the average rotor diameter was 121 m and the average hub height was 90 m.

Table 3: Average turbine configuration of OWT (feeding in) as of 2016-06-30

Average Turbine Configuration of OWT (feeding in)	Additions 1 <sup>st</sup> half 2016	Cumulative (2016-06-30)
Average Nameplate Capacity	6 000 kW	4 254 kW
Average Rotor Diameter	154 m	121 m
Average Hub Height	110 m	90 m

OFFSHORE-WIND PROJECTS – ACTIVITIES IN FIRST HALF OF 2016

In the first six month of 2016 installation activities were carried out in seven offshore wind projects (OWP). During this period two OWP, **Gode Wind 1** and **Gode Wind 2**, achieved the installation of all OWT and the first feeding into the grid of some OWT. The offshore wind projects **Nordsee One** and **Sandbank** which began constriction in 2015, managed to complete the installation of foundations in the first half of 2016. The erection of foundations was also started in the two offshore wind projects **Veja Mate** and **Nordergründe**. In the OWP **Wikinger** - currently the only OWP under construction in the Baltic Sea - the start of construction was also recorded during the course of the first half of 2016. Until June, 30<sup>th</sup> 2016 no foundations have been completed there. In addition to the offshore wind projects which are already under construction, a final investment decision has been made for two additional OWP and a single turbine (**Arkona Becken Südost**, **Borkum Riffgrund 2** und **GICON SOF**). The commissioning of these OWP is scheduled for 2019. A graphical overview of the status and the location of the German offshore wind energy projects is displayed in Figure 3. In addition to the OWP shown in the figure below, five more projects (**Albatros**, **Trianel Windpark Borkum [Phase II]**, **Deutsche Bucht**, **EnBW Hohe See** und **Merkur Offshore**) hold grid connection commitments.

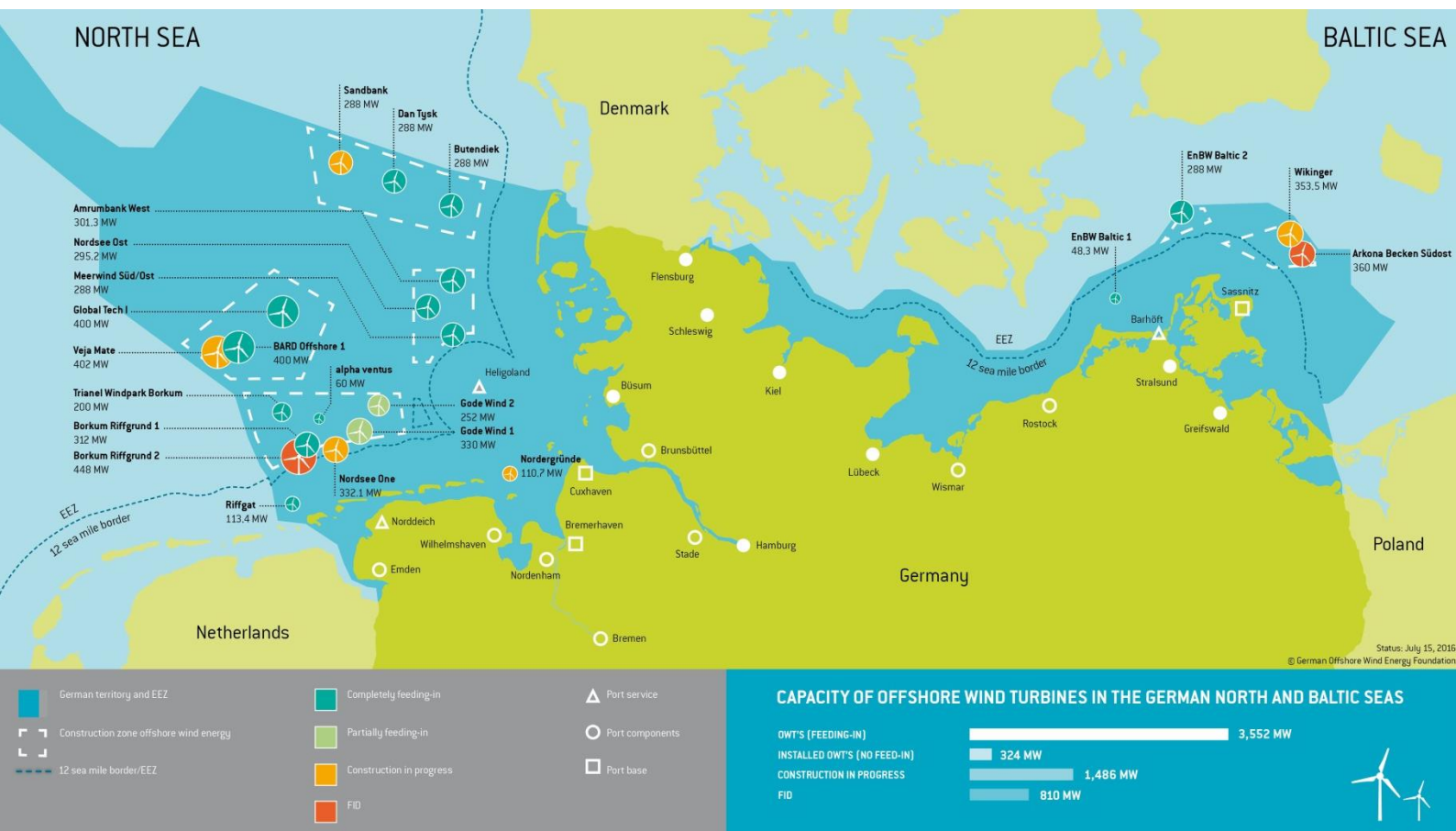


Figure 3: Completely / partially feeding in OWP, OWP under construction and OWP with final investment decision as of 2016-06-30

**Data Collection and Adaptation:**  
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The data was obtained through a survey with industry representatives, as well as additional research.

Data for the previous year was adjusted.