

## Maritime Issues -Renewable energy including offshore wind power generation: Europe installs 3.6 GW of offshore wind power generation capacity in 2019

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### 【概要 : Summary】

The EU plans to become carbon neutral by 2050. In order to achieve this target, Europe will have to transform its energy system and to replace fossil fuels with renewable energy sources including solar, hydro, tidal, geothermal, biomass and also wind power. Regarding wind power, besides the onshore wind power generation, offshore power generation is gaining momentum. The idea to going offshore for the installation of wind power generation sites was born out of the lack of space for large onshore wind projects in the densely populated areas of Western Europe. Furthermore, offshore wind turbines can utilise the more regular and stronger marine winds.

In the next decades, an ambitious expansion of the European offshore wind installations for power generation is expected. The target is to increase offshore wind capacity to nearly 130 GW by 2040, or even to around 180 GW. In order to achieve this target, the construction of offshore wind farms will have to be decisively accelerated, in quantity, size and power capacity.

In February 2020, the wind industry's association WindEurope published its latest report on key trends and statistic for offshore wind installation in 2019, summarising the construction activities and other data on European offshore wind farms. In 2019, 3.6 GW of new net offshore wind capacity was

installed in Europe, thereby setting a new record in annual installations. However, WindEurope also warned that the current level of new installations and investments is behind what the European Commission considers necessary to decarbonise the energy system and deliver on the European Green Deal. The Commission expects that between 230 GW and 450 GW of offshore wind are needed by 2050, requiring Europe to build 7 GW of new capacity a year by 2030 and to increase this number to 18 GW per year by 2050.

### 【記事 : Article】

#### 1. Background of the offshore wind energy capacity development in the EU

In the EU, the utilisation of wind power as renewable energy source is expected to overtake the other energy source like coal, nuclear and gas as the EU's largest single power source. Wind power is considered being one of the key elements to achieve the carbon neutrality target in 2050. Regarding wind power generation, besides onshore wind parks, the offshore wind power generation has gained attention. Offshore wind generation benefits from the ever-larger turbines and the utilisation of the stronger and steadier winds at sea. In Europe, the offshore wind industry has been moving fast from a niche technology, which started with the first wind turbine of the Vindeby Offshore Wind Farm, in 1991,

to a mainstream supplier of low-carbon electricity. In the first half of 2019, according to WindEurope, The wind industry's association with over 400 members with headquarters in more than 35 countries, a combined result of new installations onshore and offshore led to an increase of new wind capacity to 4.9 GW, compared to 4.5 GW in 2018 in the same period. However, in 2019 onshore installations were seriously down due to a near collapse of the construction figures in Germany. Installations were seriously slowed down in Germany, due to resistance of local communities against the construction of turbines in their neighbourhoods. The on-going lawsuits and new regulations significantly delayed the installation of new onshore wind parks, at least in Germany. Also considering this slow down due to the lack of cooperation in local communities in Germany, the idea to go offshore could serve as a solution to allow the construction of larger offshore wind farm projects. So far, most of the offshore wind capacity in Europe has been installed in the North Sea by Germany and the UK, as well as off the coasts of Denmark and the Netherlands. However, more offshore wind farms are expected to be built in the Atlantic and the Mediterranean, not only including bottom-fixed turbines but also floating wind farms off Portugal and France.

Regarding the future development, according to the International Energy Agency (IEA), offshore wind power generation could become the major source of power generation in Europe by 2042. A new WindEurope report, entitled "Our Energy. Our Future", states that the European Commission estimates that 450 GW of offshore wind power generation would meet 30% of Europe's electricity demand in 2050. The European Commission's European Green Deal (EGD) underlines that " ...increasing offshore wind production will be essential, building on regional cooperation between Member States". The EGD includes an offshore wind strategy and the European Green Deal Investment Plan (EGDIP)'s Just Transition Fund (JTF) focuses on GHG emission reductions, among others and explicitly rules out support for fossil fuel infrastructure,

production or consumption.

## 2. Construction of offshore wind farms in the EU

The global offshore wind market grew nearly 30% per year between 2010 and 2018, benefitting from rapid technology improvements. On 6 February 2018, WindEurope released a new report, highlighting that 2017 was a record year for Europe and UK offshore wind projects. In 2017, a record 3,148 MW of additional capacity was installed, which was twice as much as the previous year (1,558 MW in 2016). More than 3.1 GW of net capacity was connected to the grid across Europe in 2017, taking the total capacity on the European continent to 15.8 GW. However, despite the record growth, offshore wind farms in Europe are mainly concentrated within a small cluster of countries. In fact, 98% of offshore wind capacity comes from the UK, Germany, Denmark, the Netherlands and Belgium. In 2017, the UK and Germany accounted for the main increase in offshore wind installations, adding 1.7 GW and 1.3 GW respectively. The UK accounted for the largest amount of 43% installed offshore capacity across Europe in 2017, followed by Germany with 34%. Denmark has a share of 8%, followed by the Netherlands (7%) and Belgium (6%). In 2018, there were installed 2.6 GW (gigawatt) of new offshore wind energy capacity in Europe in 15 new offshore wind farms. The total of installed offshore wind capacity grew by 18% to a total of 18.5 GW. The UK and Germany accounted for 85% of these installations in 2018, with an installed 1.3 GW and 969 MW, respectively. The figures for 2018 with 15 new offshore wind farms completed suggested that the expansion of offshore wind energy would further continue. According to WindEurope, by the end of 2020, 14–17% of the entire EU's electricity demand could be covered by wind power generation facilities.

## 3. Expansion of offshore wind installations in Europe in 2019

WindEurope regularly publishes surveys on the

development of the wind generation industry and determines the number and level of installations of foundations and turbines, and the subsequent dispatch of first power to the grid. Regarding the offshore installations in Europe, 1.9 GW of new offshore wind generation capacity was installed in the first half of the year 2019, up from the 1.1 GW in the same period in 2018. Out of the 1.9 GW of new offshore installations added in the first half 2019, 931 MW were installed in the UK, 374 MW in Denmark, 370 MW in Belgium and 252 MW in Germany.

In February 2020, WindEurope published its latest report entitled "Offshore Wind in Europe. Key trends and statistics 2019". It summarises the figures of construction activity and other data in European offshore wind farms from 1 January to 31 December 2019. According to this latest survey, the European wind power generation industry installed 3.6 GW of new net offshore wind capacity in 2019, thereby setting a new record in annual installations. This corresponds to 502 new offshore wind turbines connected to the grid, across 10 wind farms in 12 countries. 7 wind farms were completed (fully grid-connected), while another 3 have partial grid connection and they will complete the connection of turbines in 2020.

Europe now has a total installed offshore wind capacity of 22,072 MW. This corresponds to a total of 5,047 grid-connected wind turbines across 12 countries. Four new offshore wind projects reached Final Decision Investment (FID) in four different countries during 2019. In 2019, the majority of wind power generation facilities were installed in the UK (1,764 MW), followed by Germany (1,111 MW), Denmark (374 MW), Belgium (370 MW) and Portugal (8 MW). The data also includes demonstration sites and factors in decommissioning where it has occurred. In fact, 2 turbines (2 MW each) were decommissioned at the Blyth Demonstrator in the UK. Construction work started on 5 other wind farms where no turbines have yet been grid-connected.

Siemens Gamesa Renewable Energy account for 62% of the turbines connected to the grid. MHI Vestas

Offshore Wind connected 28% and supplied turbines to five countries.

Due to the rapid innovation and infrastructure development, the offshore wind capacity in Europe has reached 22,072 MW. The UK and Germany still are leading the wind farm sites, closely followed by Belgium, Denmark and some others.

However, besides the record 3,6 GW of new capacity installed in 2019, this result is still below the annual minimum necessary for meeting the ambitions outlined in the European Commission's Green Deal. The currently 22.1GW of installed wind capacity in Europe shows that it still is a long way to reach the 450 GW in the European Commission's envisaged target for 2050.

By average, the EU Member States would now need to install a total of about 14 GW annually in order to reach the 2050 target. According to the WindEurope chief executive Giles Dickson, the EU Offshore Wind strategy is expected to be presented later this year and should "map out clearly how to mobilise the investments needed for 450 GW". The strategy should provide a master plan to develop the offshore and onshore grid connections and to set up the maritime spatial planning for the next decades. This will require an even closer cooperation between governments in the North Sea and the Baltic. It should also include the UK, besides the Brexit situation. The UK has directed half of Europe's investment into offshore wind capacity expansion in the last decade and will remain by far the biggest market. Furthermore, offshore wind farms are also increasing their capacities. The average size of the offshore turbines installed in 2019 was 7.8 MW, 1 MW larger than in 2018. Furthermore, a 12 MW offshore wind turbine prototype has been installed in Rotterdam. As a result of the increasing size of offshore turbines, the wind farms' average size doubled in the past decade. The wind farms' average size was 300 MW in 2010 and it is now over 600 MW. The largest is Hornsea 1 in the UK with 1.2 GW. Also the average distance to shore (59 km) and water depth (33 m) continue to increase even though most

wind farms are bottom-fixed.

**Graph 1: Overview of grid connected offshore wind power projects at the end of 2019**

COUNTRY	NO. OF WIND FARMS CONNECTED <sup>1</sup>	CUMULATIVE CAPACITY (MW)	NO. OF TURBINES CONNECTED	NET CAPACITY CONNECTED IN 2019 (MW)	NO. OF TURBINES CONNECTED IN 2019
UK	40	9,945	2,225	1,760	252
Germany	28	7,445	1,469	1,111	160
Denmark	14	1,703	559	374	45
Belgium	8	1,556	318	370	44
Netherlands	6	1,118	365	0	0
Sweden	5	192	80	0	0
Finland	3	70.7	19	0	0
Ireland	1	25.2	7	0	0
Spain	2	5	2	0	0
Portugal	1	8.4	1	8	1
Norway	1	2.3	1	0	0
France	1	2	1	0	0
Total	110	22,072	5,047	3,623	502

Source:

<https://windeurope.org/wp-content/uploads/files/about-wind/statistics/WindEurope-Annual-Offshore-Statistics-2019.pdf>

Regarding the floating offshore wind farms, the launch of the new Portuguese floating project WindFloat Atlantic, means that Europe now has 45 MW of floating offshore wind. Furthermore, France, the UK, Norway and Portugal are all developing new floating wind farm projects. France plans to auction a large-scale floating wind farm in 2021.

However, WindEurope warned that the current level of new installations and investments is behind schedule and what the European Commission considers necessary to decarbonise the energy system and to deliver on the European Green Deal. The Commission expects that between 230 GW and 450 GW of offshore wind power generation is needed by 2050, requiring Europe to build 7 GW of new capacity a year by 2030 and to further increase the annual new capacity to 18 GW by 2050. The new EU Offshore Wind Strategy in the Green Deal should map out clearly how to mobilise the investments needed for these targets.

## 4. Future capacity expansion of offshore wind farms

According to the IEA's report entitled "World Energy Outlook 2019", offshore wind has the potential to generate more than 420 000 TWh per year worldwide. However, much work remains to be done by governments and industry for exploring the real potential of this source of clean energy. Regarding the current development of offshore wind farms, it can be expected that Europe will further increase its grid-connected offshore wind capacity. As new sites in the offshore region will have to be found, it will need further innovations, including floating turbines that can accelerate the offshore wind generation in order to meet sustainable energy goals. According to WindEurope, by 2040, the offshore wind capacity could rise to nearly 130 GW, or even to around 180 GW and become Europe's largest single source of energy. The 450 GW vision for offshore wind by 2050 will require a significant increase in the annual installation rate for wind turbines. In an earlier report, WindEurope stated that 212 GW should be deployed in the North Sea, 85 GW in the Atlantic (including the Irish Sea), 83 GW in the Baltic, and 70 GW in the Mediterranean and other Southern European waters. This would also reflect the relative wind resources, proximity to energy demand and location of the supply chain. However, currently, Europe installs only around 3 GW per year, although it achieved a new record of 3.6 GW in 2019. This figure would have to be increased to 7 GW per year by the second half of the 2020s. After 2030, over 20 GW per year for the offshore wind industry would have to be installed in order to achieve the 2050 target.

More offshore wind farm activities in European seas will lead to increased spatial demands and growing competition between sea users. Authorities should allow different activities within and around offshore wind farms in order to increase the functionality of their locations at sea, as multi-use of space will be increasingly necessary. Furthermore, the electricity grid infrastructure in

Europe has also to anticipate the major growth in both offshore and onshore wind energy, which will require the expansion of offshore grids and the reinforcements of onshore grids. European governments must be more determined and decisive to enabling higher levels of deployment of offshore wind power generation. In 2020, the European Commission will have to present its strategy how to achieve the 450 GW vision for offshore wind by 2050.

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