Roll Out of Offshore Wind Farms Driving HVDC Market

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- Asia for instance is emerging as a key market for offshore wind farms with GE and Toshiba entering into a strategic partnership.
- HVDC technology is already getting a lot of traction especially when it comes to transmitting power from offshore wind farms to on shore.

There has been a rapid growth in the offshore wind farms installations in the recent years. Out of all other pathways leading to a sustainable future, offshore wind has the highest potential for growth which could help countries in achieving net neutrality goals in the long run. Global installed offshore wind capacity has grown from 3 GW in 2010 to beyond 34 GW in 2020. Although both HVAC and HVDC technologies have been used to transmit power from offshore wind farms to central grids, in the recent years HVDC has risen as the most viable technology to transfer power from offshore wind farms to onshore grids mainly due to significantly lower power losses during transmission.

Offshore Wind Farm Development Across the Globe

Pushed by environmental concerns and net neutrality goals regions (Asia, Europe and North America), are moving towards deployment of renewables including offshore wind farms.

Asia for instance is emerging as a key market for offshore wind farms with GE and Toshiba entering into a strategic partnership to partly localize manufacturing of turbines in Japan. North America led by the US on the other hand although has a negligible installed capacity of offshore wind energy but Biden's clean energy plans are seen as a game changer for offshore wind installations in the country. However, Europe is the leading region in terms of offshore wind energy installed capacity and is expected to continue leading at least during the ongoing decade.

Asia

Asia is emerging as a key market for offshore wind farms which is expected to grow tremendously by the end of ongoing decade. For instance, to realize the potential of offshore wind in Japan, both GE and Toshiba have signed a strategic partnership agreement aimed at localization of 'critical phases of the manufacturing process' for GE's Haliade-X offshore wind turbine. It is also focused on commercialization of the technology by making GE's offshore wind technology more competitive in auctions in Japan.

Europe

Europe on the other hand has installed 2.9 GW of offshore capacity during 2020 which includes 356 new offshore wind turbines connected to the grid. The region now has a total offshore wind installed capacity of 25 GW which includes 5,402 grid connected wind turbines installed across 12 member states.

By 2020, eight new offshore projects were already in Final Decision Investment in four member states with construction planned to start in upcoming years.

North America

Biden administration is also pushing towards a clean energy revolution and offshore wind is right at the center of the strategy. The US Department of Energy, Interior and Commerce has set a target of 30 GWs of offshore wind capacity by 2030 as opposed to mere 42 MWs of current capacity and just one operational offshore commercial wind farm off the coast of Rhode Island.

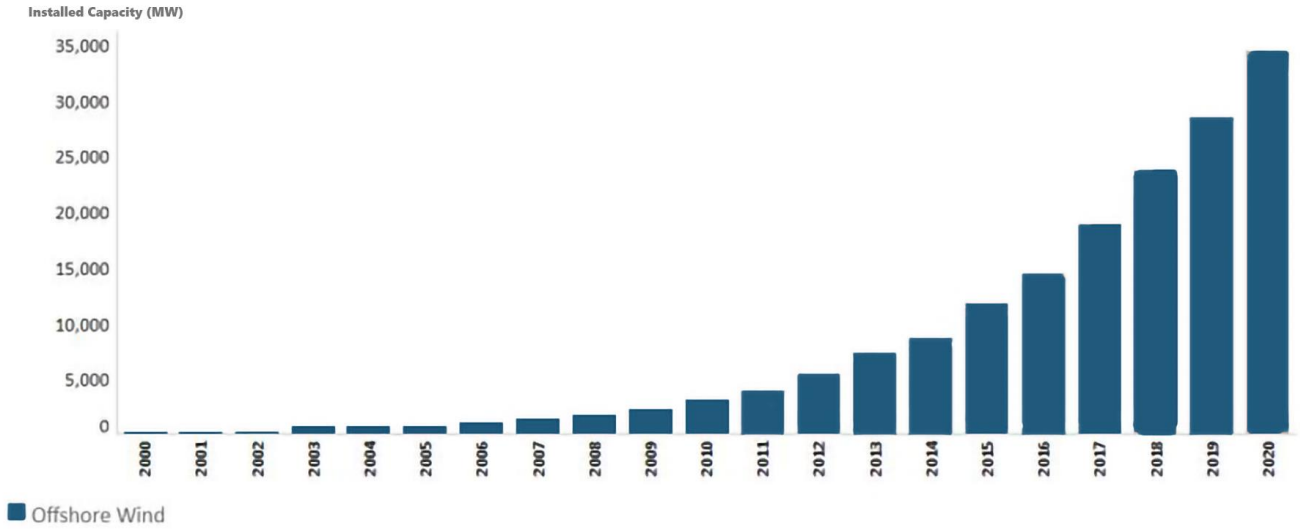

Figure 1: Global installed capacity of offshore wind energy.
Source: IRENA

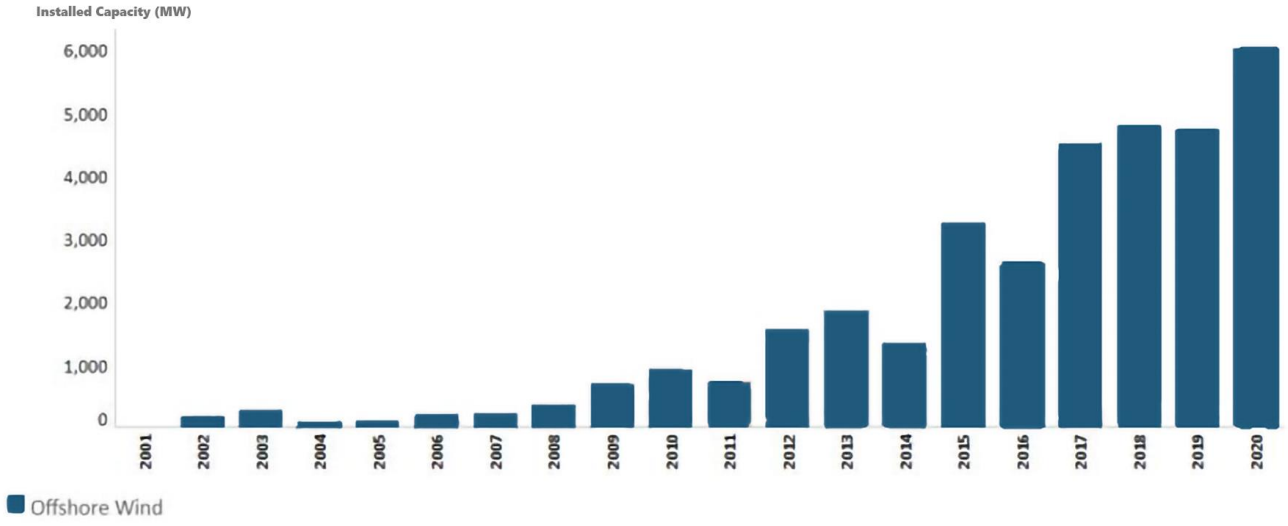

Figure 2: Global offshore wind energy capacity additions annually.
Source: IRENA

Recent Offshore HVDC Projects

A number of HVDC transmission projects are underway in US and Europe which underline the significance of HVDC transmission systems in evacuating power from offshore wind farms back to onshore.

In the United States, Siemens Energy has been awarded its first offshore grid connection project. The company will offer the high-voltage direct current (HVDC) transmission line that will bring green energy from Sunrise Wind, New York's first utility-scale offshore wind farm, to the mainland in a joint venture with Aker Solutions. It's the first HVDC-based offshore wind project in the United States. A joint venture between Ørsted, a Danish sustainable energy business, and Eversource, a US-based electricity provider, is developing the roughly 924-megawatt wind farm.

The world's largest offshore wind project, Dogger Bank Wind Farm, will feature "a novel platform design, unveiling the world's first automated High Voltage Direct Current (HVDC) offshore substation," according to the developers. The 3.6 GW Dogger Bank wind farm, when completed in 2026, will be the world's largest, producing enough electricity to meet about 5% of the UK's electricity demand. The wind farm is located 130 kms away from the shore.

Consortium of GE Renewable Energy's Grid Solutions and Sembcorp has been awarded the full contract for supply of HVDC transmission system capable of transmitting 1,320 MW of clean electricity at 320 kV from one of biggest offshore wind farms, Sofia.

Similarly, in Germany , in order to expand the offshore grid capacity for wind energy Tennet plans to connect three network systems with 2 GW capacity each to establish a 6 GW LanWin hub. This would in turn create a meshed HVDC grid in land and water which will deliver power to electrolysis projects, industries and consumers in three areas of Germany.

Looking Ahead

According to Power Technology Research, HVDC technology is already getting a lot of traction especially when it comes to transmitting power from offshore wind farms to on shore and it is expected that the technology will become a more popular choice in the future. US although has a mere 42 MWs of offshore wind capacity installed but it is expected to rival Europe especially with the Department of Energy, Commerce and Trade's plan to install 30 GWs of offshore wind till 2030.

Similarly, the success of GE and Toshiba's strategic partnership focused on partly localization the manufacturing of wind turbines will not only significantly impact the offshore wind generation capacity in Japan but also the demand for HVDC transmission systems. On the same lines Germany's 6 GW LanWin hub is also expected to play a crucial role in the country's push towards clean energy in turn driving the HVDC transmission systems market as well.

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