



The Development of Offshore Wind Energy in the Baltic Sea

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Along with the development of renewable energy sources (RES), the interest in using the wind energy potential in the Baltic Sea is growing. Regional cooperation in this field will be conducive to the implementation of EU climate policy and, through the development of electricity connections, will contribute to the development of a more competitive electricity market in the Baltic Sea region. This creates opportunities for Poland, whose investments in offshore wind energy will not only help reduce emissions but also enable the dynamic development of innovation in the renewable energy industry. At the same time, the development of offshore wind farms requires cooperation, for example, between Poland and the countries of the region.

Baltic Sea Offshore Wind Energy. The development of offshore wind energy (OWE) is essential for the EU to achieve climate neutrality. This is confirmed in the [EU strategy on offshore renewable energy adopted in November 2020](#). The plan assumes that installed generation capacity will increase from 12 GW to a minimum of 60 GW in 2030, and to 300 GW in 2050. In the opinion of the European Commission, OWE is to become a key element of the EU energy mix. It is estimated that it could meet up to 30% of the electricity demand in Europe in 2050 (currently it is about 15%).

The Baltic Sea installations account for only about 10% of energy from OWE produced in Europe (2019). For comparison, North Sea wind turbines provide about 77% and Irish Sea units about 13%. The OWE power potential in the Baltic basin is estimated at 93 GW, while currently, the countries in the Baltic region use about 2.2 GW. In this respect, Germany is the leader with just over 1 GW; Denmark's capacity is 0.87 GW; Sweden has almost 0.2 GW and Finland just under 0.07 GW. These countries are planning further investments, and their energy companies (e.g., Ørsted, RWE, Vattenfall) have significant technological potential.

According to estimates by industry representatives, by 2030 from 9 GW to 14 GW of OWE capacity will be built in the Baltic Sea. However, the profitability of wind power generation in the region varies. The most attractive locations are in the southern part of the Baltic Sea, which

does not freeze during the winter season and is close to the main centres of electricity demand. Up to 30% of the potential of the entire Baltic Sea is in Polish waters.

OWE Potential in Poland. The Polish government has ambitious plans for the development of the industry. Also, local residents' objections to building onshore wind farms is one of the reasons the government focuses on OWE. Currently, Poland does not have any Baltic Sea wind farms, but by 2040 it wants to install at least 11 GW of capacity (for comparison, the total capacity of domestic power plants is 41 GW). The growing involvement of both domestic companies (including Enea, Orlen, PGE, Polenergia, Tauron) and foreign entities (e.g., Ørsted, RWE, Vattenfall) will help in the development of Polish OWE.

The industry's problem for a long time has been the lack of sufficient regulations. In January, Poland's president signed the so-called "Offshore Act" to facilitate financial support for investments in OWE. To speed development, expansion of the national transmission network will also be important, as will a maritime spatial plan for the Polish area of the sea, a draft of which should be adopted by the Ministry of Infrastructure in the first quarter of this year. The plan will also help to protect, among others, the biodiversity of the sea, emphasised in the EU strategy on offshore renewable energy. As estimated by industry representatives, if Poland could expand its OWE capacity to 28 GW by 2050, it could cover up to 60% of its own electricity demand.

At the same time, the development of OWE is to help achieve EU climate goals. In 2020, the Member States were to ensure the share of RES in total energy production at the level of 20%, but Poland came in only around the 15% mark (and by 2030, it is to meet an even more ambitious goal of 32%). OWE is also associated with benefits for the national economy—according to government announcements, the construction of 10 GW of capacity may create about 60-80,000 new jobs.

The Significance of Regional Cooperation. For the EU's ambitious plans to succeed and effectively use the Baltic's wind potential, regional cooperation is essential. On 8 October 2020, Poland, Denmark, Germany, Lithuania, Latvia, Estonia, Finland, Sweden, and the EC signed a joint declaration on cooperation. According to this document, the countries of the Baltic Energy Market Interconnection Plan (BEMIP, the EU's [initiative for the development of the regional electric and gas markets](#)) should adapt—in the spring of 2021—a work programme for offshore wind development in line with EU guidelines.

Therefore, transborder cooperation will be important for this sector. That's why the EC emphasises, for example, the necessity to link all the wind farms with the grids of the different countries to ensure the flexibility of supplies, among others. It is estimated that of the €800 billion dedicated by the EU to offshore wind, as much as two-thirds will be used for the energy grid, including links between countries. The EU support could also take [the shape of a derogation from some EU legal requirements](#), with the Kriegers Flak Combined Grid Solution one such example. This German-Danish project is the first hybrid system in the world. It facilitates the supply of energy from offshore wind farms to both countries, which also allows them to exchange power. The investments in similar modern infrastructure will improve energy efficiency and play an important part in the energy system developed together with offshore wind energy.

The national strategies of each country also will contribute to the cooperation. Germany plans to develop 20 GW of wind offshore capacities by 2030 and Denmark will invest in 2 GW of new capacities around Bornholm island. Sweden estimates that in the coming years its offshore wind capacity will increase by 0.5 GW and Finland will invest in one farm that will have capacity of between 0.3 and 0.5 GW. Latvia and Estonia also focus on the sector,

planning to jointly build a 1 GW wind farm by 2030 in the Gulf of Riga, while Lithuania has plans to develop 0.7 GW by 2030. The successful development of wind farms in the southern Baltic will require especially the cooperation of Poland and Lithuania, Latvia and Estonia. [The Baltic States will be connected \(synchronised\) with the EU power grid via Poland](#). It means an additional challenge to ensure reserve capacities that balance the market, decreasing the risk of supply cuts.

Conclusions and Perspectives. EU climate policy and the growing role of renewables will mean that the Baltic Sea region will become more important for the development of offshore wind energy. The growing share of this source in power generation also means investments in grid infrastructure, necessary to trade power generated by offshore wind farms. Establishing a well-functioning regional energy market is becoming more important for the EU, as well as for the Baltic Sea countries. It also means the necessity of developing a smart grid and the digitalisation of the grid, allowing for more effective management of the power demand and supply. For this reason, cooperation to ensure cybersecurity for such grids is essential. The development of offshore wind farms creates opportunities for the green transition in other sectors. [New RES-based power capacities can be used, for example, to produce "green" hydrogen](#).

Lithuania, Latvia, and Estonia's energy systems will be synchronised with the EU's through the Polish grid. This requires modernisation, including in northern Poland where it will be important to ensure grid balancing (between supply and demand). It is worth remembering that cooperation on offshore production will not necessarily be limited to the BEMIP countries. Others, like Norway and the UK, are interested in investments in offshore wind and have experience in its development. Moreover, cooperation forums, such as the Three Seas Initiative (TSI), might [focus also on clean energy](#) and a modern grid, which in turn [helps to promote cooperation in these areas with the United States](#).

The Biden administration's interest in green energy will only increase, and the possible involvement of the U.S. in a Polish nuclear power plant investment could mean the Americans may be interested in developing the energy links in the region. The TSI could help promote cooperation in this area.