POLISH WIND
ENERGY ASSOCIATION

Potential
of Offshore Wind in Poland

Comprehensive analysis of offshore wind development opportunities in Polish maritime areas

Report – Short version

11/2022

Potential of Offshore Wind in Poland

November 2022

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MSP revision procedure:

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Acknowledgements:

Thanks to DNV for providing a temporary licence for the WindFarmer: Analyst software on preferential, academic terms. This made it possible for the Report to use validated physical models and good practice in wind data analysis, farm aerodynamics modelling and annual energy production calculations.

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This report was supported by the European Climate Foundation. Responsibility for the information and views presented in this report rests with the authors. The European Climate Foundation is not responsible for the use of any content contained or expressed therein.

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Foreword

Dear Readers,

We are proud to present the report "Potential of Offshore Wind in Poland", outlining the opportunities for the Polish part of the Baltic Sea and the new potential areas for offshore wind projects. This publication, highly anticipated in the energy market, can encourage investors and the government administration to take a closer look at the enormous opportunities in the renewable energy sector that are right at our fingertips.

Electricity from Poland's first wind farm in the Baltic Sea will flow as early as 2026. There has never been such a dynamically developing renewable energy technology in Poland, or even worldwide. In the Polish part of the Baltic Sea, preparatory work is currently underway for the construction of the first wind farms; administrative procedures are also ongoing, aimed at granting further permits for the so-called Phase II projects. The strong interest in this sector clearly indicates that offshore wind could become a strategic component of Poland's energy security and independence in the next decade. The development of offshore wind will also strengthen the Polish economy, with a modern and strong supply chain.

The waters of the Baltic Sea have some of the best conditions for development of wind farm projects. We have very good wind and location conditions, with relatively shallow waters (the Baltic Sea is the shallowest sea in the world, with an average depth of around 55 m). The potential of offshore wind in the Baltic Sea is estimated at 93 GW. Poland, with its huge potential, has a chance to become the largest offshore wind market in the Baltic Sea region.

Poland's Energy Policy 2040 indicates the need for dynamic development of the MEW sector, as it is set to become one of the pillars of Poland's future energy system. According to PEP2040, installed capacity in offshore wind farms is expected to reach 11 GW by 2040.

However, according to experts, with the right planning and state support, we can achieve far better results, which is why the installed capacity potential has been reassessed as part of this Report.

The Report: "Potential of Offshore Wind in Poland", commissioned by the Polish Wind Energy Association and prepared by a consortium: KP Consulting, the UMG Maritime Institute and Ramboll, focuses on estimating the real potential in terms of installed capacity and energy production of the current areas allocated for development of offshore wind farms in the Polish part of the Baltic Sea (i.e. the areas identified in the Marine Spatial Plan and appendices to the Offshore Wind Act). The study also identifies new areas for potential projects.

The experience of countries such as the UK and the Netherlands, increasing and meeting their offshore wind targets for many years, shows that development of offshore wind can be a major development stimulus for the domestic economy while boosting Poland's independence and energy security.

This is extremely important; especially today, with the war in Ukraine and the Russian energy blackmail. The wind industry has an annual turnover of almost €60 billion, 65% of which contributes to the EU's economy. This means that for every €1,000 of revenue, €650 remains in the EU and contributes to GDP growth. By 2030, around 450,000 new jobs could be created in the wind power industry, including 250,000 in the onshore wind sector and ca. 200,000 in offshore wind. Poland could enjoy a large share of these benefits.

Cooperation of Polish companies with international corporations will be of great value to the implementation of offshore wind projects in Poland.

These companies have the knowledge and experience in development of offshore wind farms around the world and can help Polish investors exploit the potential that lies in the Baltic Sea. In addition, such cooperation is an opportunity to reduce the CAPEX of new projects in Poland.

Creating effective alliances with experienced foreign partners will help build a strong offshore wind sector in Poland, in a cost-optimised way and with support for the domestic industry.

Offshore wind is clearly an opportunity that we are facing. The legislative framework to be created and the involvement of stakeholders will determine whether the ambitious plans can be met and the huge potential of the Baltic Sea properly utilized.

Janusz Gajowiecki

President, Polish Wind Energy Association

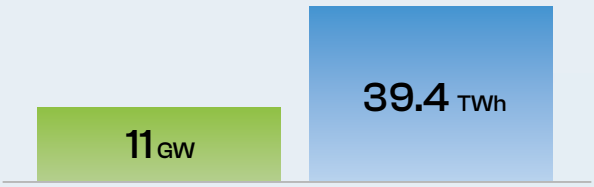
POLISH WIND ENERGY ASSOCIATION

List of abbreviations

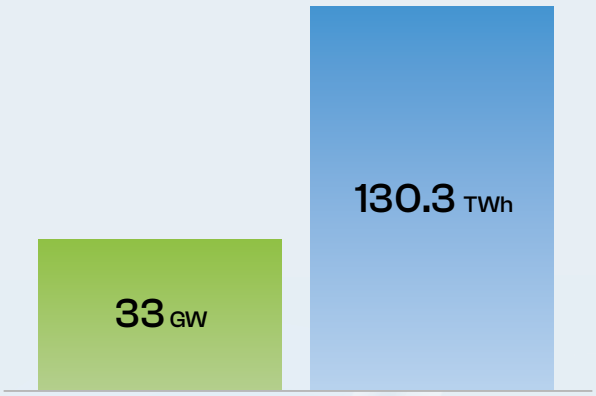
CAPEX	Capital expenditures
CO_2	Carbon dioxide
DTU	Danish University of Technology (Danish: Danmarks Tekniske Universitet)
EC	European Commission
EEZ	Exclusive economic zone
EIA	Environmental impact assessment
EIA Report	Environmental impact assessment report
ERO	Energy Regulatory Office
EU	European Union
GW	Gigawatt (unit of power)
GWEC	Global Wind Energy Council (GWEC)
HVAC	High-voltage AC line (High-Voltage Alternating Current)
HVDC	High-voltage DC line (High-Voltage Direct Current)
IEA	International Energy Agency (IEA)
LCOE	Levelised cost of energy
MA Act	Act of 21 March 1991 on maritime areas of the Republic of Poland and maritime administration (consolidated text: Dz. JoL 2020 item 2135, as amended)
MSP	Maritime Spatial Plan – spatial development plan for Polish maritime areas (scale 1: 200000, adopted by regulation of the Council of Ministers of 14 April 2021 on the adoption of a spatial development plan for internal marine waters, territorial sea and exclusive economic zone at a scale of 1:200 000 (JoL of 2021, item 935)
MW	Megawatt (unit of power)
MWh	Megawatt hour (unit of energy)
MW RP	Polish Navy
NATO	North Atlantic Treaty Organisation (NATO)
Natura 2000	Natura 2000 site – a Special Area of Conservation or a Special Bird Protection Area
NECP	National Energy and Climate Plan for 2021-2030
NEWA	New European Wind Atlas
Offshore Wind Act	Act of 17 December 2020 on the promotion of electricity generation in offshore wind farms (JoL 2021, item 234, as amended)

OLL	Offshore location licence (permit for the erection and use of artificial islands, structures and equipment in Polish maritime areas, as per the act of 21 March 1991 on maritime areas of the Republic of Poland and maritime administration (JoL 1991 no. 32, item 131 as amended)
OPEX	Operating expenditures
OW	Offshore wind
OWF	Offshore wind farm
PEP 2040	Poland's Energy Policy for 2040
Phase I	Planned OWFs referred to in Appendix 1 of the Offshore Wind Act
Phase II	Planned OWFs referred to in Appendix 2 of the Offshore Wind Act
Phase III	Planned OWFs in new Polish maritime areas (PMA) delineated on the basis of the analyses in this Report
PMA	Polish maritime areas as per the act of 21 March 1991 on maritime areas of the Republic of Poland and maritime administration (JoL 1991 no. 32, item 131 as amended)
PSE	Polskie Sieci Elektroenergetyczne S.A. (Polish TSO)
PWEA	Polish Wind Energy Association
Raport	This report "Potential of Offshore Wind in Poland"
RES	Renewable energy sources
TWh	Terawatt hour (unit of energy)

Capacity potential in the Polish part of the Baltic Sea



according to PEP 2040



according to the Report

Current areas – Phase I and II

15.3 GW 60.6 TWh

(5.9 GW, 22.7 TWh – PHASE I) (9.4 GW 38 TWh – PHASE II)

New areas – Phase III

17.7 GW 70.7 TWh

What is needed to utilize the potential of offshore wind?

- Updating the energy strategy and MSP
- Legislative support
- Grid connections
- Development of local supply chain to reduce costs and implement projects on time
- Cooperation of the Baltic Sea countries
- Offshore installation and service vessels
- Installation and service ports
- Local supply chain
- Administrative simplification

New areas for offshore wind development

20

18 exclusive economic zone
2 territorial sea

2,171.5 km²

total development area for new offshore wind farm sites

Legend

- potential development area (for area covered by Appendix 1 or 2 of the Offshore Wind Act)
- new potential offshore wind farm location area (exclusive economic zone)
- new potential offshore wind farm location area (territorial sea)

Key findings and recommendations

Why do we need offshore wind?

- Offshore wind is now a global trend and has a positive impact on the development of the local supply chain.
- OWFs have significant advantages that distinguish them from other RES sources, therefore the realisation of Phase I and Phase II potential should be considered as a starting point for their further development in Poland after 2030.
- Offshore wind farm projects with a capacity of 33 GW are estimated to generate more than 100,000 jobs and PLN 178 billion in gross value added in the development phase and PLN 46 billion per year in the operational phase (based on EY for PWEA, 2019).
- OWFs can be part of Poland's sustainable energy mix to support decarbonisation and reduce dependence on fossil fuel supplies.
- Offshore wind is the best available large-scale RES technology to reduce emissions and allow Poland to meet European climate targets - assuming an annual production of 130 TWh, the decrease in CO_2 emissions could amount to as much as approx. 102 million tonnes per year.
- Given the scale of planned OWF investments, Poland has a chance to become one of the largest offshore wind hubs in Europe – among the investments planned in Poland, it is worth mentioning, for example, Orlen Group's plans to build an installation port in Świnoujście, or the Danish company Vestas, set to open turbine components factory in Szczecin.
- Without offshore wind, Poland will not be able to develop hydrogen projects – offshore wind power is an efficient and optimal technology for green hydrogen production.

The total potential of offshore wind in the Polish part of the Baltic Sea is estimated at **33 GW**, with an expected average annual energy production of **130 TWh**.

The potential of OWFs in the areas currently allocated in the MSP for OWF development is estimated at the level of

15.3 GW

(Phase I – 5.9 GW, Phase II – 9.4 GW) and average annual energy production of ca.

60.6 TWh

(Phase I – 22.7 TWh, Phase II – 38 TWh), far exceeding the current assumptions of PEP2040 and the Offshore Wind Act.

In order to utilize the full potential of the MSP areas made available for Phase I and II of OW development, an update of the current PEP2040 and the Offshore Wind Act is required:

- Update of PEP2040 in terms of increased ambition and projected potential of offshore wind;
- Offshore Wind Act amendment in terms of additional auction volumes from the currently envisaged ca. 11 GW to the projected 15.3 GW.

What is needed to utilize the potential of offshore wind?

- Update of the energy strategy and MSP.
- Adaptation of legislative environment to enable implementation of Phase I and Phase II projects.
- Ensuring grid connection capacity for future projects.
- Simplification of administrative procedures, primarily with regard to permitting.
- Construction of at least one installation port and multiple service ports in Poland.
- Ensuring availability of installation and service vessels for offshore wind.
- Developing the local supply chain to reduce costs and deliver projects on time.
- Cooperation of Baltic Sea countries for the dynamic development of offshore wind.

The Report identifies 20 new areas (including 18 in the Exclusive Economic Zone and 2 in the territorial sea) where offshore wind development is possible. The potential of these sites amounts to

17.7 GW,

with an assumed energy production of

70.7 TWh.

To utilize the potential of these sites, it is necessary to:

- Carry out a revision of the spatial development plan (MSP) for Polish maritime areas at a scale of 1:200,000, adopted in 2021.
- Amend the Act on Maritime Areas of the Republic of Poland and Maritime Administration, to the extent allowing for development of OWF in territorial sea waters.
- Amend the Offshore Wind Act in terms of additional auction volumes.

1. Why Offshore Wind?

Ensuring stability and security of energy supply in Poland in the medium term is not possible without the construction of new generation units.

By 2040, offshore wind technology has the potential to become the dominant source of renewable energy in Poland's energy mix. If its total potential estimated in the Report were used, by 2040 offshore wind could cover up to 57% of Poland's total electricity demand (Table 1).

Forecasts carried out for the purposes of PEP2040 indicate that Poland's electricity consumption will increase by 22% between 2015 and 2030 and by 37% between 2015 and 2040, with net domestic electricity demand of more than 181 TWh in 2030 and more than 204 TWh in 2040.

Electricity consumption in 2021 was over 174 TWh, meaning that 96% of the government's projections for 2030 was achieved at the halfway point of the period. At the same time, PSE S.A. estimates that the increase in net baseload electricity demand could be 1.7% on average per year, and the increase in peak power demand could be 2.5%[1].

It is therefore necessary to carry out further analyses and update the energy policy to the growing energy demand and to take into account the trends in the development of the energy sector.

	2030	2035	2040
Energy demand in Poland – TWh[2]	~190	~ 210	~230
Report – Estimated electricity production from OWFs – TWh	22.7 TWh	60.6 TWh	130.3 TWh
Potential share of OW in electricity generation – %	12%	29%	57%

Table 1. Potential share of OW in electricity generation by 2040 (Source: own study based on "Development plan for meeting the current and future electricity demand for 2023-2032, PSE S.A.")

1 Development plan for meeting the current and future electricity demand for 2023-2032, PSE S.A.
2 PSE, Development plan for meeting the current and future electricity demand 2023-2032; Main document for stakeholder consultation, March 2022 (Significant energy demand growth scenario, p. 51)

The electricity sector in Poland is currently based in more than 80% on centrally dispatched conventional generating units, producing electricity mainly from coal. Approximately 270 MW of installed capacity in conventional thermal power plants was retired in 2021. The ERO forecasts the retirement of units with a total capacity of 18.8 GW based mainly on hard coal (12.8 GW) and lignite (5.3 GW)[3] by 2034.

Only about 17% of Poland's electricity comes from renewables, which is among the lowest in the EU; only the much smaller countries of Central and Eastern Europe have a lower RES share.. At the end of 2021, the installed capacity of all generation sources in Poland's electricity system amounted to approximately 56 GW, of which renewable sources accounted for approximately 30%. In 2021, 4.2 GW of new capacity was installed, including 3.7 GW in photovoltaic (PV) sources.

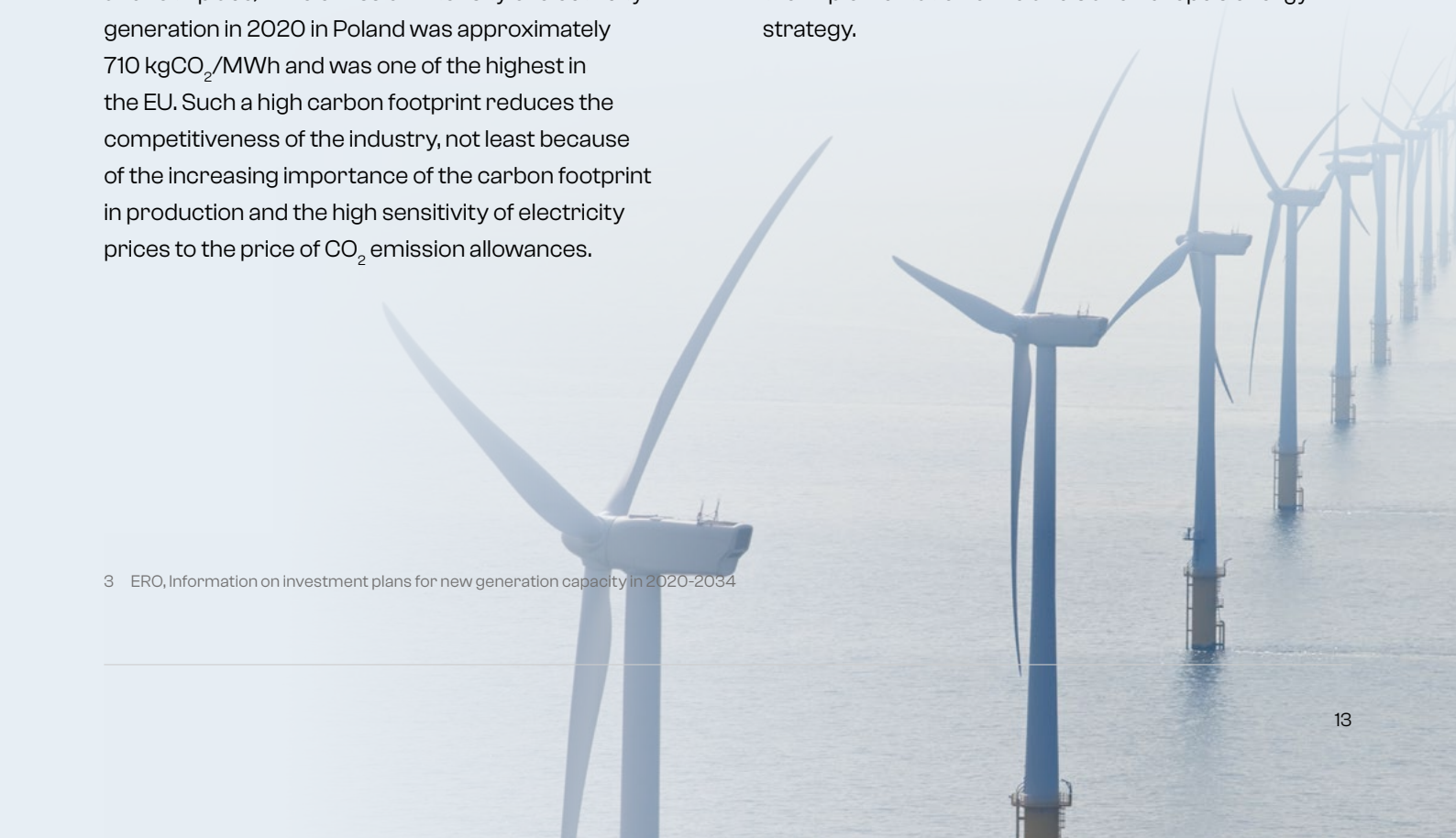
Poland's energy system is one of the most emission-intensive in Europe. Poland and Germany are responsible for approximately 53% of all emissions from the energy sector in the EU. Among the top 10 polluting plants in the EU (in the EU-ETS sector) there are as many as three Polish power plants (in 1st, 4th and 10th place). The emission intensity of electricity generation in 2020 in Poland was approximately 710 $kgCO_2$/MWh and was one of the highest in the EU. Such a high carbon footprint reduces the competitiveness of the industry, not least because of the increasing importance of the carbon footprint in production and the high sensitivity of electricity prices to the price of CO_2 emission allowances.

Taking into account the geopolitical situation, the specifics of the Polish energy system and the growing demand for energy, the Polish government recognized the need to update its energy policy and in May 2022 published the "Assumptions to the update of Poland's Energy Policy until 2040", in which it declares to aim for an approximately 50% share of RES in electricity production. Achieving this target may prove challenging, due to infrastructure constraints and the need to prepare the electricity grid for the connection of new renewable sources.

An additional challenge will be the low-carbon transformation of the energy system, especially in the context of the need to ensure a more just transition for coal regions. These factors mean that the scale of challenges in Poland is much greater than in other EU countries.

Offshore wind power is a technology that can provide a significant volume of generation capacity with good parameters related to the stability of energy production.

This report is the offshore wind industry's contribution to the discussion on how this technology can support the implementation of Poland's and Europe's energy strategy.



3 ERO, Information on investment plans for new generation capacity in 2020-2034

At the date of the Report's publication, OWF projects with a total capacity of approximately 8.4 GW are being developed in Polish maritime areas, including:

- Phase I projects with a total capacity of 5.9 GW (with the right to cover the negative balance granted by an ERO decision and commissioning dates planned by investors in 2025-2027),
- Phase II projects with a total capacity of 2.5 GW (which will be able to apply for the right to cover the negative balance in the auctions scheduled under the Act for 2025 and 2027).

There are also ongoing administrative procedures aimed at granting location permits for additional 11 sites designated in the MSP and identified in Appendix II of the Offshore Wind Act.

The main objective of the analytical part of the Report is to estimate the actual potential of offshore wind in Polish maritime areas and to assess the attractiveness of individual sites. In the authors' opinion, estimates of the achievable level of installed capacity and volume of energy production from offshore wind, based on a detailed analysis of available data, should be the starting point for modelling the role of offshore wind in the energy system and for long-term planning of this system's development in Poland.

The data presented in this Report is also important for maximising the social and economic benefits associated with the development of the Polish supply chain for OWF projects in the country.

The second part of the Report presents the factors perceived by investors as barriers to smooth preparation, development and operation of OWFs. Recommendations related to the main challenges for the sector were also made.

The report concludes with a brief summary of the benefits of offshore wind energy development in Polish maritime areas in economic and socio-economic terms.

2. Trends, geopolitical situation and regional cooperation

Offshore wind has become a global trend – in addition to China and Europe, projects are being developed in Japan, Taiwan, Vietnam, South Korea and the USA. Other countries, including India, Brazil, Colombia, Australia, New Zealand, Canada and the Philippines, also have ambitious plans in this area.

According to GWEC data, in 2021, the installed capacity of offshore wind farms worldwide reached 57 GW (for comparison, in the same year, the installed capacity of all generation sources in Poland amounted to ca. 56 GW). At the same time, 21.1 GW of new capacity was installed in the same year, with the vast majority in China (17.4 GW).

In 2022, due to the Russian invasion in Ukraine and the need to strengthen energy security as a result of the deepening Russian energy blackmail, many countries are committed to abandoning the use of energy resources originating from Russia. This policy results in increased targets for offshore wind and in measures to accelerate its development, e.g. by simplifying administrative processes.

This trend is particularly evident in Europe, whose economy is heavily dependent on Russian energy resources. The EU is the world's largest importer of energy resources[4]. Approximately 23% of the solid fossil fuels consumed by the EU[5], 90% of the natural gas consumed[6] and 85% of the oil and its derivatives consumed[7] come from outside the Community. In 2020, the EU imported about 46% of solid fossil fuels, 23% of crude oil and petroleum products and 38% of natural gas from Russia. 13 of the 27 EU Member States obtain more than 50% of their solid fossil fuels from this direction. With the war in Ukraine and the economic sanctions imposed on Russia, the reduction of dependency on the supplies particularly from this country has become more urgent than ever.

In response to these challenges and disturbances in the global energy market, in May 2022 the EC presented the REPowerEU plan, proposing an additional increase in the target share of RES in gross final energy consumption to 45% in 2030 (this target is 5 percentage points higher compared to the original proposals in "Fit for 55"). REPowerEU's aim is to accelerate the transition to clean, renewable energy and increase Europe's energy independence.

Renewables, as the cheapest and cleanest energy source, are expected to be the pillar of Europe's energy security and accelerate the energy transition. Offshore wind can play a leading role in this process.

The EC estimates that the potential for offshore wind in the Baltic Sea region is 93 GW by 2050[8]. Given the outcomes of the Report, a significant part of this volume can be developed in the Polish part of the Baltic Sea. Achieving such ambitious targets for offshore wind development in the Baltic Sea will require close cooperation in terms of distribution of potential capacities, development of integrated technical infrastructure, development of good practices or optimal solutions for monitoring and assessing the cumulative environmental impact of these projects, and simplification of decision-making and permitting procedures.

The importance and urgency of such cooperation is emphasized by EU member states from the Baltic Sea region, as expressed by the "Baltic Offshore Wind Declaration", signed in Szczecin on 30 September 2020 by the European Commission and ministers for energy from Poland, Denmark, Estonia, Finland, Lithuania, Latvia, Germany and Sweden, as well as the Marienborg Declaration signed by the same countries on 30 August 2022. The overarching goal for the signatories is to strengthen international cooperation and take joint action to build OWFs with a total capacity of 19.6 GW by 2030, approximately seven times the current installed capacity 2.8 GW.

4 Energy Transition. Challenges for Poland in the light of experiences from West European countries, PWN, Warsaw, 2021
5 Eurostat
6 Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions – REPowerEU: Joint European action towards safe, sustainable and affordable energy, Strasbourg 8 March 2022 resource.html (europa.eu)
7 Eurostat
8 Study on Baltic offshore wind energy cooperation under BEMIP, BEMIP Renewable Energy Working Group

3. Objective of the Report

The objective of the Report is to estimate the real potential of offshore wind capacity to be installed in Poland by:

- estimating the potential development area of the areas designated in Appendices I and II to the Offshore Wind Act and in the MSP,
- proposing new sites where OWF development is possible.

The report outlines new areas where offshore wind energy can be developed in a way that balances the different uses of marine resources, with a view to the future harmonious development of the entire economy.

In addition, the Report estimates the potential for energy production and includes a ranking of areas in terms of cost efficiency.

4. Scope of the Report

In the analytical section of the Report:

1. The planning and environmental constraints that condition the use of the maritime areas[9] allocated in the MSP for the location of facilities designed for generation and storage of renewable energy (Phase I and II) were analysed.

2. Taking into account the existing and planned use of PMAs by other sea users, and based on the existing MSP, additional sites were identified with potential for OWF development (so-called Phase III).

3. The potential of installed capacity and energy production (in TWh per year) of each area was estimated and the results are presented in an aggregated way.

4. An assessment of the attractiveness of potential new areas in technical and economic terms was carried out, taking into account environmental conditions, i.e. wind, depth, seabed slope or geotechnical conditions, the potential to use fixed-bottom foundation technology and floating foundations and technical analyses indicating the directions for proposed foundation types and sizes, electricity transmission technologies, the number of offshore transformer stations, the number of export cables and the approach to operation and maintenance.

5. A preliminary estimate of the total capital expenditure and LCOE for the areas under consideration was made, including estimates of CAPEX and OPEX, and a comparison of their attractiveness was prepared in graphical form (cost maps).

9 With reference to the MSP, the term „Area" means a designated area of the plan with a given primary function and „Site" means the part of the area designated for a given permitted function. In the remaining parts of Report, the terms „Area" and „Site" are used interchangeably, simply denoting a marine area.

5. Methodology and results of analytical works

Estimation of the development area for areas currently allocated for OW development (Phases I and II)

In the MSP there are 7 designated areas where functions related to renewable energy are allowed, with 21 areas designated for OWFs in the Offshore Wind Act (8 in Appendix no. 1 to the Offshore Wind Act – "Phase I" areas, 13 in Appendix 2 to the Offshore Wind Act – "Phase II" areas).

The total total surface of these areas is 2,310.81 km^2; however, not the entire area determined by the geographical coordinates (gross area) can be used for the location of wind turbines. The report includes estimates of their actual development area (net area). These were carried out on the basis of a multidimensional analysis.

The following factors were taken into account when estimating the development areas of sites allocated for renewable energy generation in the MSP:

- the MSP's provisions regarding spatial restrictions on development (e.g. ensuring distance from the Swedish Natura 2000 area),
- constraints arising from environmental considerations (e.g. from the provisions of the environmental impact forecast carried out for the Plan, environmental permits for the Phase I projects currently being prepared, in connection with existing area forms of nature conservation and valuable natural habitats),
- restrictions arising from other uses of the sea, including: transport, fishing, defence, mineral extraction from deposits,
- restrictions under separate regulations.

The greatest number of constraints was identified in areas along the Słupsk Bank, which had location permits issued prior to the commencement of work on the MSP, and where the biggest problem was the location on bird migration routes and proximity to valuable natural habitats.

The results of the analyses for Phase I and Phase II areas are presented by three geographical regions with a potential development area of respectively:

- Western Area (Pomeranian Bay): 401.88 km^2,
- Central Area (Słupsk Bank): 936.54 km^2,
- Northern Area (South Middle Bank area): 469.84 km^2.

In total, the estimated surface of potential development areas identified in the MSP is 1,808.26 km^2, or 78% of the total surface area.

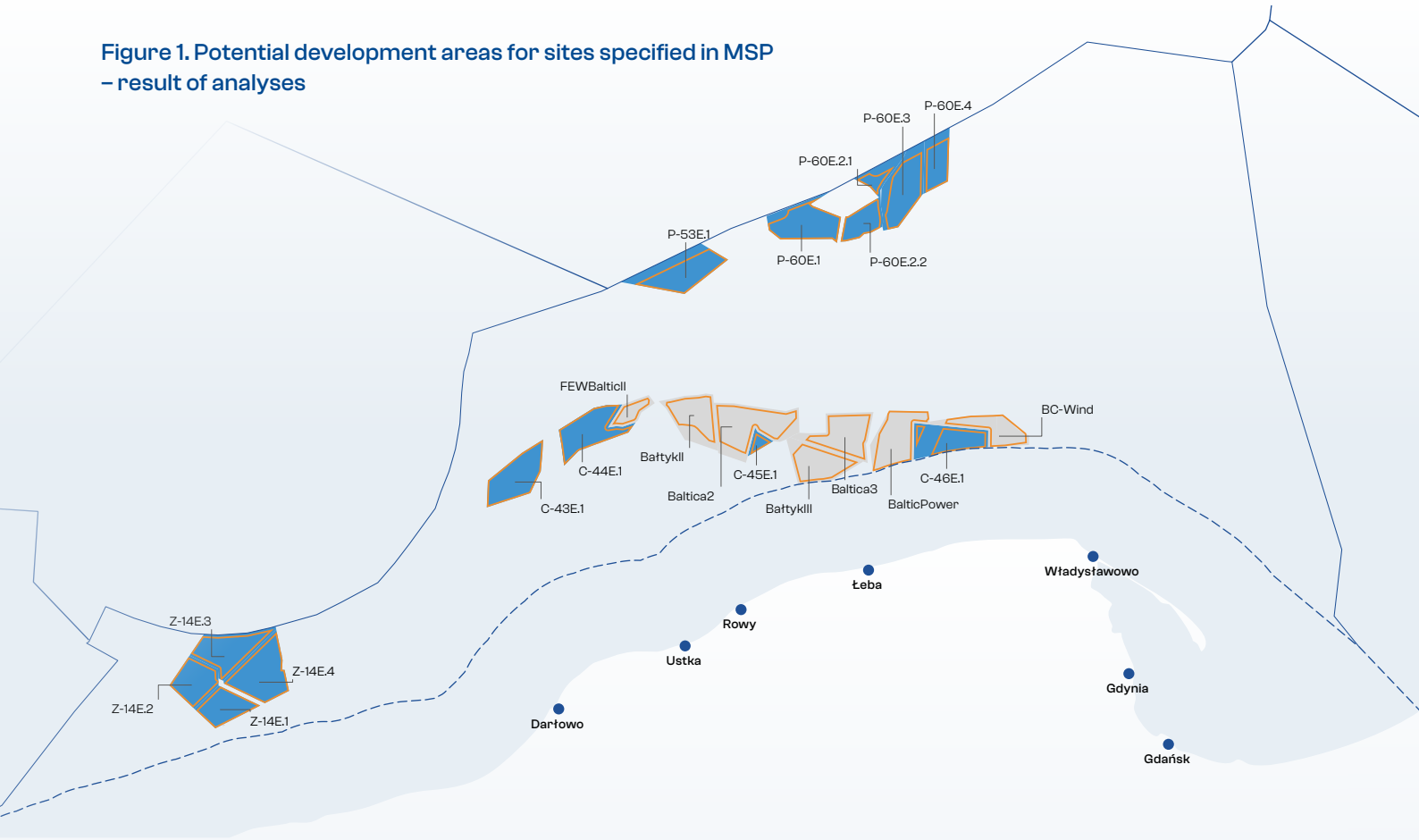
As a result of the analyses, the probable development area of each site was determined and the real potential of each site was estimated. Few constraints have been identified for the current Phase I and Phase II areas, as they have been designated after several years of planning analyses based on best available data and extensive sector analyses at the time.

Conflict analyses between stakeholders were also taken into account in the preparatory phase of the MSP, and the document was subjected to public consultation and agreed with numerous administrative bodies. The sites designated in the MSP have the lowest identified risk of spatial conflicts.

A visualisation of the results of the analysis of probable development areas is shown below (Figure 1).

However, it should be noted that the final size of the development area will largely result from the provisions of environmental permits for the individual projects. Additional risks of further restrictions, currently difficult to quantify, also arise from the from the incomplete availability of data on the designation or use of maritime areas for defence purposes.

Figure 1. Potential development areas for sites specified in MSP – result of analyses



Legend

- potential development area (for area covered by Appendix no. 1 or 2 of the Offshore Wind Act, MSP)
- area included in Appendix no. 1 of the Offshore Wind Act (Phase I)
- area included in Appendix no. 2 of the Offshore Act (Phase II)

Planning and environmental analysis – methodology for designating potential new bodies of water dedicated for offshore wind

In order to estimate the total potential of offshore wind in Poland, spatial analyses were carried out of the current uses and environmental conditions , covering the whole of PMAs. As a result, new sites that could be designated for RES development were identified and proposed, divided into sites located within the boundaries of the territorial sea (currently excluded from the possibility of OW development under the MA Act) and areas located in the exclusive economic zone.

The analysis was based on the provisions of the MSP, publicly available environmental data and documents on current and planned uses of maritime areas[10].

The methodology adopted for the designation of new sites within the MSP took into account, among other things:

- exclusion of areas of the highest natural and environmental value, the Słupsk Trough area, which is an area of importance for the entire Baltic Sea, and areas protected under the Natura 2000 network,
- exclusion of sites designated in the MSP as priority areas for transport with a recommended 2 NM safety buffer, Polish Navy training grounds with permanent or temporary closure status and exclusion of mining areas,
- application of a buffer of 13 km from the coastline to reduce the impact of OWFs on the coastal landscape.

10 Spatial analyses did not include physical or oceanographic parameters such as wind speed, depth, currents or wave action, as these parameters had already been analysed, among others, during the process of drawing up the MSP

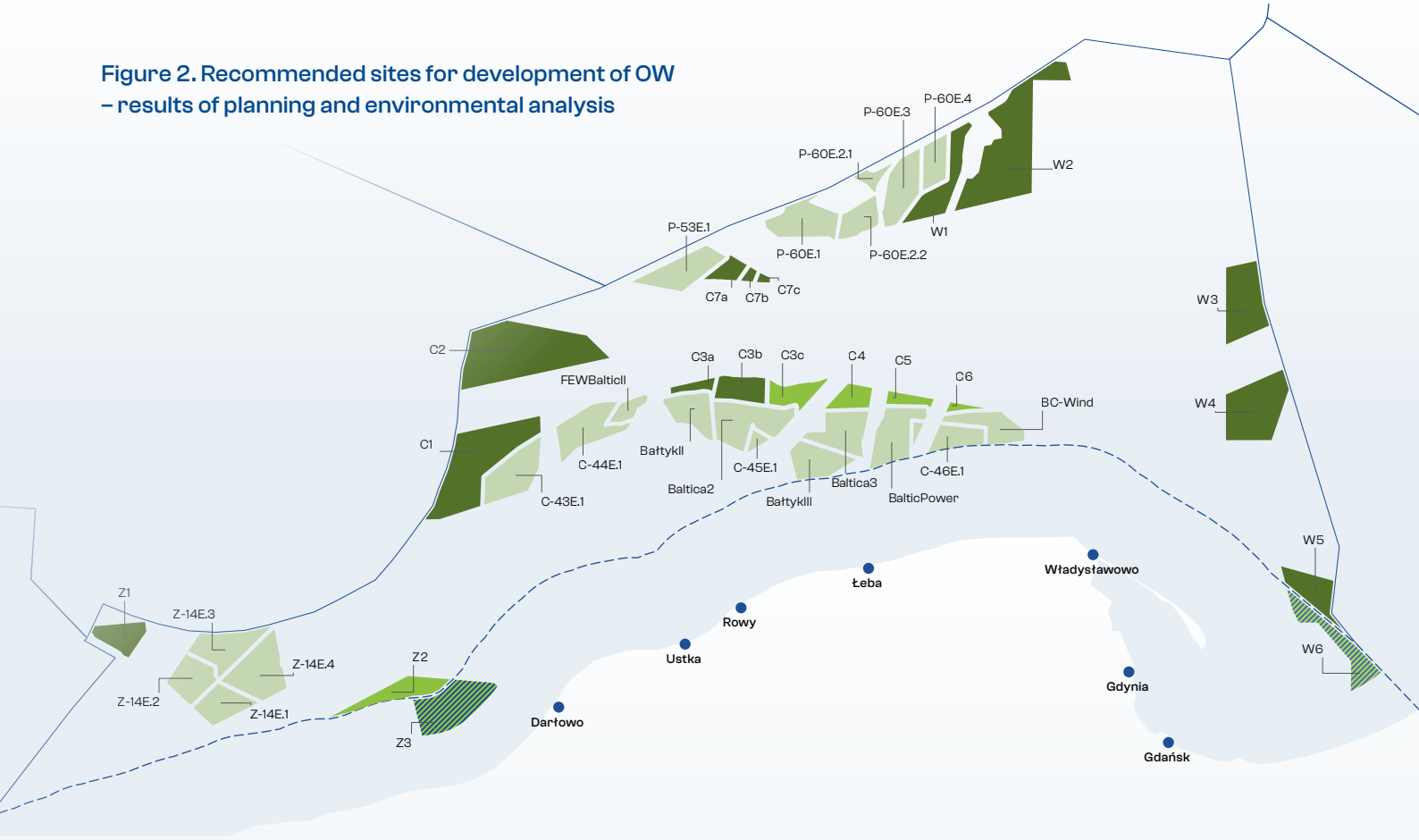
As part of the work on the Report, 20 new sites (including 18 in the Exclusive Economic Zone and 2 in the territorial sea) were identified that have the potential to be used for OW development (Figure 2). The results of the work were aggregated at the level of separate geographical areas and the development area of the recommended new sites was determined:
Western Area: **305.2 km²**, Central Area: **900.9 km²**, Eastern Area: **965.4 km²**.

The total development area of the new OWF sites identified in the Report is **2,171.5 km²**.

It should be emphasised that the identified new potential sites are the result of expert selection, based on the assumptions described above and on publicly available data and literature.

The preparation of the Report also did not involve stakeholder consultation or consultation or agreement with public authorities.

Figure 2. Recommended sites for development of OW – results of planning and environmental analysis



Legend

- potential development area (for area covered by Appendix no. 1 or 2 of the Offshore Wind Act, MSP)
- new potential OWF site (exclusive economic zone)
- new potential OWF site (territorial sea)
- new potential OWF site taking into account military activities (Polish Navy training grounds)

Characteristics of new Phase III sites

Western Area

In the western part of PMAs, 3 potential sites have been identified, including one in the territorial sea:

1. These sites have the advantage of favourable location at relatively shallow depths (up to 60 m), at a relatively short distance from the shore, especially sites Z2 and Z3.

2. Site Z1 is located a short distance from the border of the Exclusive Economic Zone of Germany and Denmark, approximately 2 km from a Natura 2000 site on the German side.

3. In addition, it should be pointed out that the Danish development plan envisages covering part of the water body near the border with nature conservation, but at this stage its exact location and the restrictions that will apply to it are not yet known, so it has not been included in the spatial analyses.

4. Sites Z1 and Z3 are located on the periphery of the Kołobrzeg-Bornholm fishing area, which was identified during the MSP development phase as one of the fishing areas with high economic performance, so it is important for fisheries. In addition, these areas are used for coastal fishing, hence the use of these sites will require consultation with the fisheries sector on the rules of shared use.

5. Site Z3 is one of two sites proposed within the territorial sea. In addition to the provisions of the MA Act (prohibiting the erection of OWFs in the territorial sea), it is important to point out potential additional impediments to their use for OWFs, which include: short distance from the shore (13 km), which may cause disturbance to the landscape, the immediate vicinity of the Polish Navy training ground and the Pomeranian Bay (Zatoka Pomorska) Natura 2000 site[11].

Central Area

In the central part of Polish maritime areas, 11 new sites, varying in surface area, have been identified:

1. Five smaller sites (C3a, C3b and C7a-c) were created as a result of intersection of larger bodies of water with the decisions issued for the laying of connection infrastructure for projects located at the Middle Bank.

2. When delimiting sites C4, C5, and C6 (also characterised by a small area) the following factors were taken into account:

   - the conditions contained in the environmental decisions issued for Phase I projects, i.e. both the alignment and the width of bird migration corridors,
   - the importance of the Słupsk Trough as an important fishing ground and an area of natural value,
   - the location of areas designated in the MSP for transport purposes, together with the recommended buffer,
   - location of areas designated in the MSP for defence purposes (Polish Navy training grounds).

11 A buffer of 2 km from the Natura 2000 site was not applied in the designation of this site, assuming that in this case the guideline is to maintain a constant distance from the coastline.

3. In the case of four sites (C3c, C4, C5 and C6), the principle of avoiding military training areas has been consciously disregarded (these areas are partly or fully located within the boundaries of the Navy's P-18 and P-19 training areas – at their southern periphery), as they are attractive for offshore wind due to technical issues and economics. The authors of the Report made the initial assumption that it would be possible to develop rules for shared use or modification of areas intended for military purposes in such a way that their energy generation potential could be utilized. The proximity of Phase I and Phase II areas is, on the one hand, an advantage (e.g. synergy in the use of transmission infrastructure corridors), but, on the other hand, it can be a source of constraints – especially due to the potential accumulation of negative environmental impacts, as well as impacts on other users. These issues should be subject to further detailed analysis.

4. In the central part, two larger sites (C1 and C2) located at the border with the Danish Exclusive Economic Zone have also been designated, which are in principle free of significant conflicts. However, these are deep water sites, which may affect the economic viability of projects. On the other hand, locating OWFs in these sites may have a smaller impact on the natural environment. It should be noted, however, that both areas are used to some extent for NATO military exercises, so in-depth analyses are needed here too.

Eastern Area

In the eastern and northern part of Polish maritime areas, 6 potential sites have been proposed, characterized by relatively larger surface areas and depths. These are sites located on the slope of the Middle Bank or in the Gdańsk Basin. The sites in the Gdańsk Basin are located directly on the border with Russian maritime areas. In the current geopolitical situation, this may pose a risk and exclude these sites as potential locations for power generation project; however, assuming a strategic and forward-looking nature of the report, no critical value was assigned to this parameter. These sites are located outside the training grounds, in an area that is potentially of low importance for avifauna migration, in relatively close proximity to the shore or potential installation and service ports on the Bay of Gdańsk. The sites are located at the periphery of the Gdańsk Basin fishing area, which was identified at the stage of work on the MSP as one of the high-performing, economically important fisheries. The authors of the Report have made the initial assumption that would be possible to develop rules for shared use of these areas with the fishing industry.

Assessment of installed capacity and electricity production potential of Phase I, II and III areas

Potential assessment methodology

The aim of the Report is not to evaluate individual locations for OWFs, but to assess the potential of this technology in Polish maritime areas. For each of the areas allocated in the MSP for renewable energy generation, a reference OWF project was designed and its average annual energy production estimated. The results of the work were aggregated to the level of clusters (groups of farms). The results for the areas from the MSP were presented in such a way that it is not possible to draw precise (quantitative) conclusions from them for individual sites, but only aggregate conclusions for specific groups of farms. Generalised assumptions have been made based on the authors' knowledge and experience, and they may differ from the technical assumptions that have been or will be made for individual projects.

Estimation of wind resource

A key aspect in forecasting the annual energy production of OWFs and in their design process is the estimation of wind resource. In the Report, due to the impossibility of making precise wind measurements at each location, we were limited to high quality numerical weather data from The New European Wind Atlas (NEWA) acting as ‚virtual measurement points' at future wind farm locations.

As part of the analysis, NEWA results were compared with the only high quality, publicly available wind measurements in the vicinity of Polish maritime areas – the FINO2 measurement mast located in the German part of the Baltic Sea. The result of this comparison (validation) was a correction to make the NEWA model results more realistic in the Southern Baltic Sea area. For the Report, a map of multi-year average wind speeds at an altitude of 150 m above sea level was used (layer: mesoscale climate mean) as well as a series of 30-minute resolution measurements at selected points close to the clusters[12].

Reference turbine model

For the purposes of the Report, a so-called reference model of a 15 MW offshore wind turbine, developed in 2020 by NREL and DTU researchers on behalf of the IEA, was adopted. This turbine was used as a baseline model for all Phase I and II areas, i.e. the areas designated in the MSP. The use of a reference turbine model allows meaningful results to be obtained, which – due to its high similarity to commercially available models – are representative for the industry, without favouring any single manufacturer.

For the purposes of estimating the annual energy production of new sites identified in the Report, approximate characteristics of the larger turbines were prepared based on extrapolation of the NREL 15 MW turbine's characteristics to a rated capacity of 20 MW, while maintaining its basic parameters such as lift-to-drag ratio, a three-bladed rotor with a horizontal axis of rotation, etc.

12For each of these points, signals for wind speed and direction, temperature, air density and a parameter characterising the stability of the atmospheric boundary layer were taken for each of these points. Validation of the NEWA model against measurements on the FINO-2 mast consisted of comparing, using the directional linear correlation method, concurrent series of wind speeds and directions: the model series at 100 m above sea level (NEWA) and measurement from the highest level on the FINO2 mast (101 m above sea level). In order to make these validations meaningful, sampling periods of both series (30 mins) were standardised, and the FINO2 data range was extracted for the period before the construction of offshore wind farms in the vicinity of the mast. This ensures that the measurements lack the disturbances associated with the turbines' wake.

Method for estimating installed capacity and annual energy production potential

As a necessary step to determine the potential of each of the analysed sites, reference turbine layouts were prepared using QGIS and DNV WindFarmer: Analyst software packages.

The starting point for further analysis was the development area of the given site as determined by the planning and environmental analysis and the characteristics of turbines adopted for analysis. Subsequently, a reference turbine layout was used, meeting planning, technical and environmental constraints. For the purposes of the Report, a regular topology of turbine layout (gridded layout) was assumed for all sites. In selecting the turbine grid parameters[13] for each individual site, the prevailing wind direction at the location and the shape of the development area were taken into account. For each site, the geometry of turbine layout was adjusted so that the number of turbines was as high as possible while taking into account other constraints such as turbulence levels or a relatively attractive level of capacity factor (ensuring good economics of the project).

With regard to the density of turbine deployment (derived from the distances between turbines), minimum distances between turbines of 8x5D were assumed for all Phase II areas, i.e. respectively:

- approx. 7.5 MW/km^2 for the total area delimited in the MSP
- approx. 8.4 MW/km^2 for the estimated development area[14].

Similar density assumptions were made for most of the new sites, excluding those with a small area or a particular shape or orientation relative to the prevailing wind direction.

For Phase I, it was decided to make different assumptions depending on the site (values in the range of 5-12x5D), such that the resulting installed capacity coincides with the available public announcements of individual investors (contained in connection agreements, environmental decisions, etc.).

Productivity estimation method

For the reference wind farms designed for each individual site, the expected average multi-year annual energy production level was determined, taking into account
a number of factors in the analysis, the most significant of which are the aerodynamic (wake) losses.
The calculations were carried out in two variants:

1. only for the current areas allocated in the MSP for Phase I and Phase II development, and
2. all current as well as proposed new sites.

The starting point for analysing the annual energy production of reference farms were the multi-year wind statistics, turbine characteristics and their distribution within each site[15].

The calculations were carried out in as much detail as possible, in accordance with good industry practice, individually for each of the locations. In order to simplify the estimates presented and due to currently ongoing procedures for granting location permits, it has been decided not to present partial results for individual Phase I and Phase II projects, only the net annual energy production of the farms aggregated to specific areas constituting groups of several OWFs. On the other hand, for the newly identified Phase III sites, the values for each OWF were also presented separately.

13 Angle between grid axes, distances between turbines, start of grid.
14 This assumption was made after a sensitivity study of parameters such as turbulence intensity and capacity factor for deployment density, which included seven variants for turbine deployment in each of the four sub-areas of wind farms envisaged in the Pomeranian Bay.
15 For onshore wind farms in Poland, this value ranges between ca. 25% (older farms) and ca. 35% (newer farms).

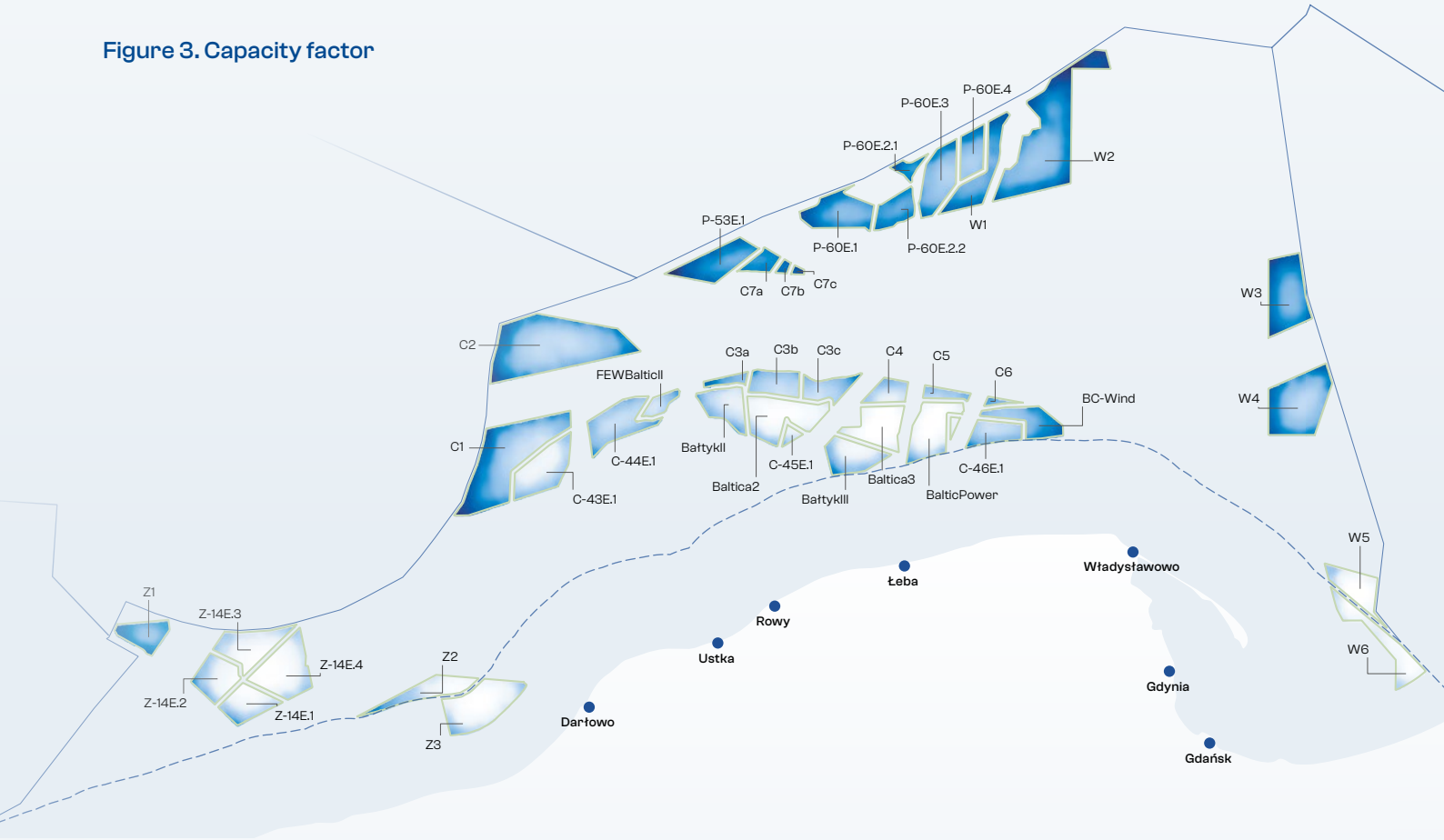
Capacity factor

A popular measure of annual energy production in the energy industry is the capacity factor. It is calculated by dividing the annual energy production from a specific installation by the theoretical maximum energy output (for a perfect situation when the source would be operating at rated capacity all the time). Windward turbines (located closer to the outer boundaries of the site, towards the prevailing westerly wind direction) are characterised by better annual energy production.

You can also see the wake loss from neighbouring farms and the impact of changing wind speeds, different deployment densities and turbine types.

The capacity factor for the current areas allocated in the MSP for OWF development varies between 42.7% and 47.4%, while for new sites it ranges from 42.5% and 48.9%, depending on the shape and vicinity of the site, wind speeds, etc. (Figure 3). The more favourable wind conditions in the northern part of the EEZ allow for higher capacity factors of OWFs planned there.

Figure 3. Capacity factor



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average multi-year capacity factor [%] (derivative of: wind resources, shape and vicinity of sites, density of distribution in a given site, and turbine characteristics)

40.1 % 45.0 % 50.1 %

Analysis results – installed capacity and annual energy production potential of Phase I and II areas

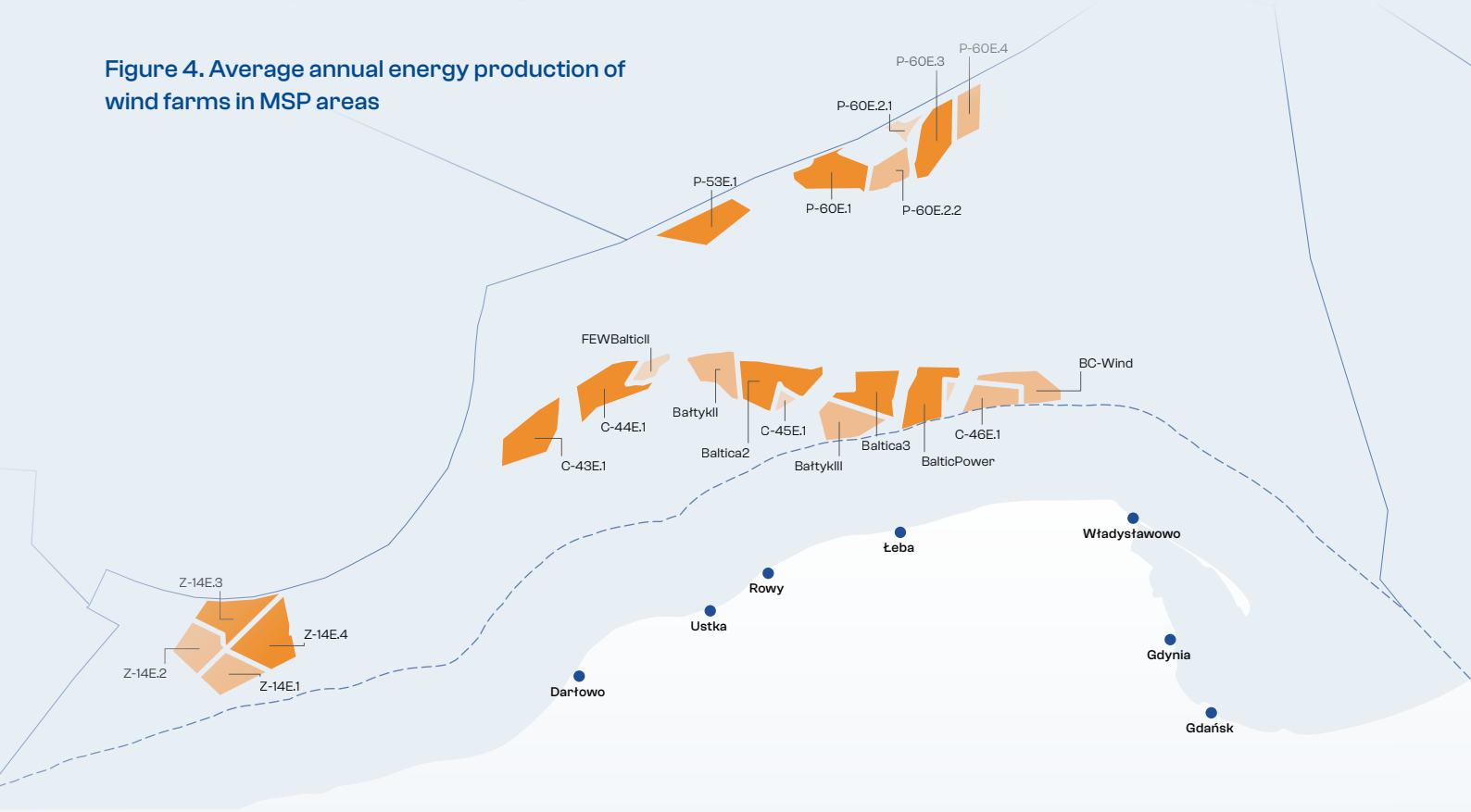
As a result of the analysis, it was estimated that the installed capacity potential of the Phase I and Phase II areas, which are included in Annexes 1 and 2 of the Offshore Wind Act and included in the in the MSP, is 15.3 GW (Table 2), whereas OWF annual energy production (Table 2, Figure 4) varies across different areas[16].

All the areas designated in the MSP, if developed in a manner similar to that proposed in the Report, have the potential to meet electricity demand at the level of ca. 60.6 TWh/year. This represents approximately 1/3 of Poland's 2021 demand of 180.3 TWh. Therefore it can be concluded that offshore wind has the potential to become one of the pillars of Poland's energy transition.

Market phase	OWF group	Installed capacity potential [GW]	Average annual energy production [TWh/year]	Total development area [km²]
Phase I	FEW Baltic II, Bałtyk II, Baltica2, Bałtyk III, Baltica3, Baltic Power, BC-Wind	5.9	22.7	310.1
Phase II	Central Area (C) – Słupsk Bank: C-43.E.1, C-44.E.1, C-45.E.1, C-46.E.1	2.5	10.2	626.5
	Northern Area (P) – Southern Middle Bank: P-53.E.1, P-60.E.1, P-60.E.2, P-60.E.3, P-60.E.4	3.7	15.4	469.8
	Western Area (Z) – Zatoka Pomorska: Z-14.E.1, Z-14.E.2, Z-14.E.3, Z-14.E.4	3.2	12.4	401.9
Total		15.3	60.6	1,808.3

Table 2. Installed capacity potential of individual wind farm groups (Source: own elaboration)

Figure 4. Average annual energy production of wind farms in MSP areas



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site productivity [TWh]

0,3 - 1,3 | 1,4 - 3 | 3,1 - 6

16 The resulting annual energy production is influenced by a number of factors, including wind resources, turbine technology, the shape and surface of the development area and its orientation relative to the prevailing wind directions, proximity of other farms and the density of turbines in the site.

Analysis results – installed capacity potential and annual energy production of Phase III areas

The installed capacity potential of the Phase III areas, i.e. the new sites identified in the Report and not included in the MSP, was estimated at 17.7 GW (Table 3).

Area	Installed capacity potential [GW]	Average annual energy production [TWh]	Area [km²]
C1	2.1	8.6	276.1
C2	2.7	10.9	360.2
C3a	0.2	0.7	19.5
C3b	0.5	2.0	65.6
C3c	0.5	1.8	56.8
C4	0.4	1.7	45.3
C5	0.3	1.0	25.1
C6	0.1	0.6	9.2
C7a	0.4	1.5	31.1
C7b	0.1	0.4	7.2
C7c	0.1	0.3	4.8
W1	0.8	3.2	101.3
W2	2.6	10.6	343.1
W3	1.2	5.0	153.6
W4	1.5	6.0	190.4
W5	0.7	2.5	78.0
W6	1.0	3.8	99.0
Z1	0.6	2.6	67.1
Z2	0.7	2.8	82.4
Z3	1.2	4.7	155.7
Total	17.7	70.7	2,171.5

Table 3. Installed capacity potential, average annual energy production and surface area of Phase III sites (Source: own elaboration)

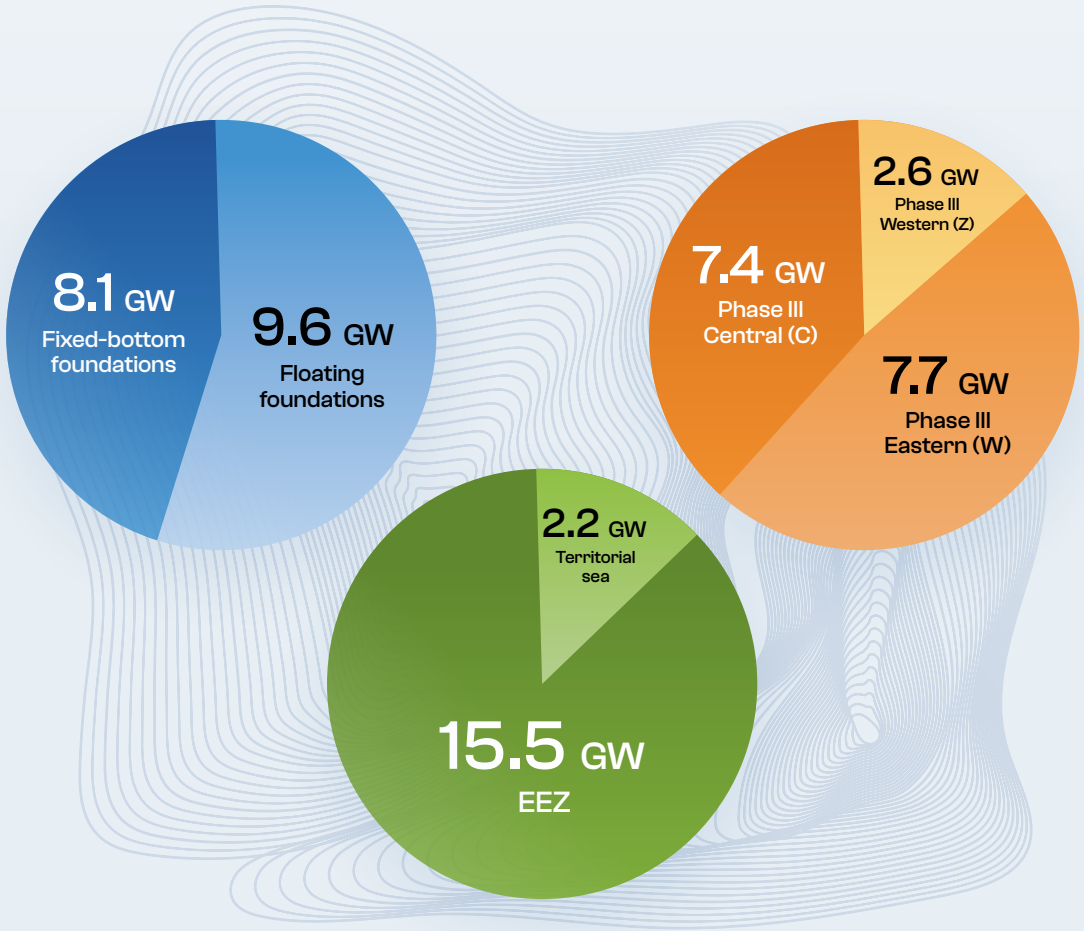
Capacity of new sites

The potential of new sites identified in the Report is greater than the combined potential of the Phase I and Phase II areas and amounts to 17.7 GW. Sites in the Eastern Area have a potential capacity of 7.7 GW.

The capacity available from the Central Area is estimated at 7.4 GW. The potential for projects in the Western Area is estimated at 2.6 GW (Figure 5).

Two of the new sites, with a total capacity of2.2 GW, are located in the territorial sea, while the remaining 15.5 GW are in the exclusive economic zone.
Due to water depth, it is expected that floating foundations will be used for 6 sites[17], with traditional (fixed-bottom) foundations used for the remaining 13 sites[18].

Figure 5. Installed capacity potential of proposed new sites



17 W2, W3, W4, W5, W6, C2
18 Monopiles: Z1, Z2, Z3, C3a+C3b, C3c, C4, C5 and C6; jackets: W1, C7a+C7b+C7c, C1.

Productivity of new sites

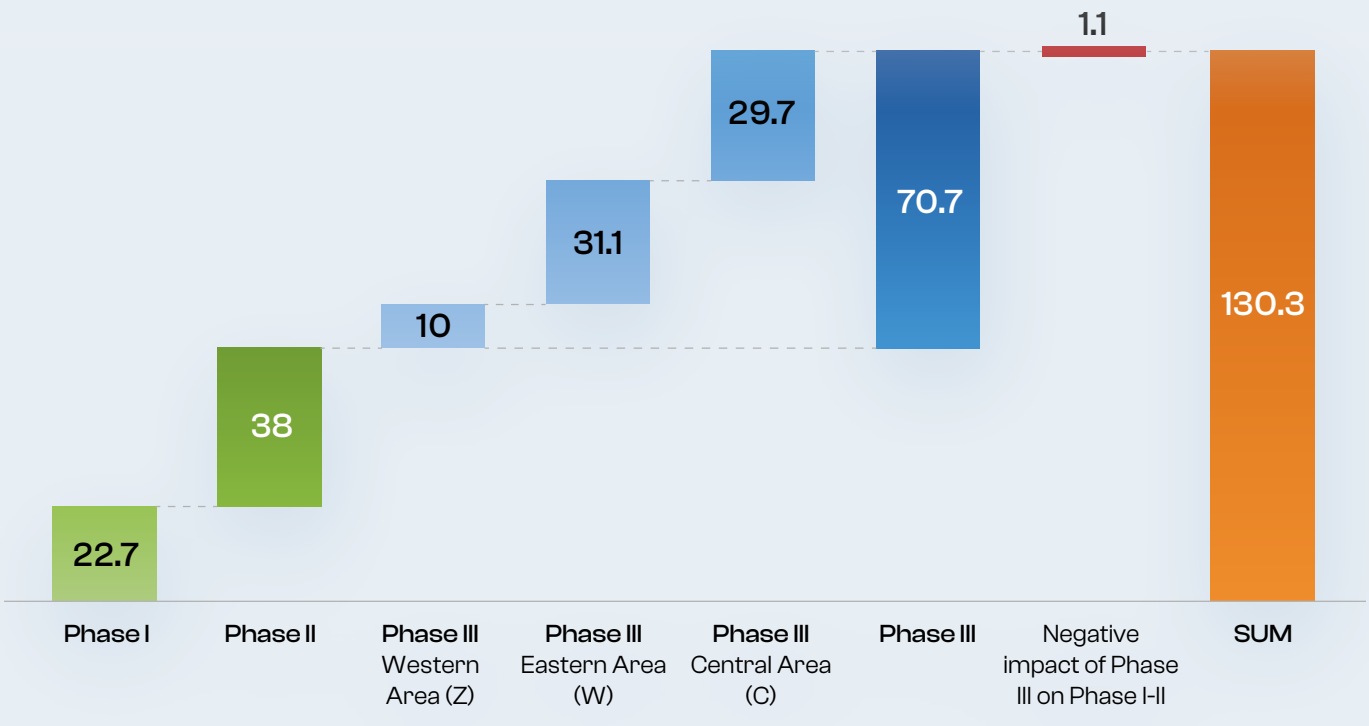
The annual energy production of the areas proposed for future OWE development is estimated at 70.7 TWh/year. The estimated total annual energy production of all areas is 130.3 TWh/year, which is about 70% of the national annual electricity demand, based on 2021 consumption (Figure 6).

The total estimated offshore wind capacity potential in Poland, including Phase I and Phase II areas, as well as the new identified sites (Phase III), **amounts to 33 GW**.

The total average annual energy production is estimated at

130.3 TWh

Figure 6. Total annual energy production of projects in Phases I - III



Cost and LCOE analysis

Assumptions

In addition to the issues of power availability, which can be solved by offshore wind development, the question of the cost of energy generated from OWFs remains very important from the end user's perspective. An attempt to answer the question of cost is to estimate the levelized cost of energy (LCOE), i.e. the average unit cost of electricity generation measured as a megawatt-hour (MWh) value. LCOE takes into account the expenses incurred in preparation and construction, as well as the costs of operating, maintaining and decommissioning an OWF (CAPEX and OPEX).

LCOE levels were estimated individually for each site. The main purpose of LCOE estimation is to compare the attractiveness of different sites with each other. The level of LCOE in the Report is simplified – a number of simplifications have been used in the calculations to ensure transparency and comparability of the results obtained[19]. In order to ensure transparency, tax issues have not been included in the estimates and the value has been estimated in real prices for 2022.

It should be stressed that the Report is not intended to indicate the exact values of the CAPEX, OPEX and LCOE for individual Phase I, II and III sites. The LCOE estimate is intended to serve as a preliminary comparison of the attractiveness of areas, which can be useful during the discussion about the possible inclusion of these areas in the update of the MSP or in the process of preparing auctions for these sites.

The estimated values are subject to considerable uncertainty due to the current geopolitical and economic situation (energy crisis, translating into the price of commodities and materials, lack of availability of resources and materials, supply chain problems, currency market situation, etc.). The actual LCOE should also take into account a detailed site-specific analysis based on detailed environmental, geological and other studies.

19 The calculation uses a number of simplifications, with production estimated based on the analysis of capacity potential and CAPEX and OPEX estimates. In the case of OPEX, the additional cost of insurance and a budget reserve are included

LCOE for Offshore Wind Phases I and II

The offshore wind sites currently mapped in the MSP are characterised by fairly good location parameters, i.e. located in relatively shallow waters, not far from the shore, with good wind conditions. As a result, in most cases it is possible to apply the most proven and available technologies currently used in the offshore wind sector, i.e. the use of the most efficient wind turbines, HVAC (alternating current) power connection technology and monopile foundations, which are currently optimal from the cost perspective.

LCOE characteristics of projects in current OW sites:

- areas in Phase I of the support scheme stand out with the expected lowest average LCOE due to the location of these projects relatively close to shore (30-50 km), in shallow waters (30-50 m) allowing for cost-optimised and proven technological solutions,
- areas for Phase II of the support scheme are characterised by a slightly higher average LCOE for projects located at the northern boundary of the EEZ (at the Middle Bank) due to higher connection costs related to the distance of these projects from the shore at approximately 80-90 km, and for sites P-53.E.1 and P-60.E.4 due to their location with much greater average depths (40-60 m).

LCOE for Phase III OWFs

The new sites proposed for OWF development are characterised by much more diverse and complex site conditions than the areas already designated in the MSP, including a greater range of depths. For this reason, the Report proposes the use of floating foundations for projects located in the eastern or north-eastern part of the Polish maritime areas, jacket foundations for projects in the northern part of the EEZ (C1 and W1) and monopiles, mainly in the Western and Central Area.

The lowest LCOE was estimated for sites located in the Western Area (Z1, Z2 and Z3). These sites are characterised by the most favourable conditions, due to their location close to the shore, in shallow waters.

The LCOE level for the sites in the central part of PMAs, i.e. C3, C5, C6 and C7, has been estimated assuming the clustering of the individual locations due to the fact that these sites are smaller compared to the neighbouring areas designated in the MSP. Sites with such small capacities analysed independently would not make economic sense.

They have been grouped on the basis of geographical proximity, assuming a minimum project capacity of 400 MW, in the following way:

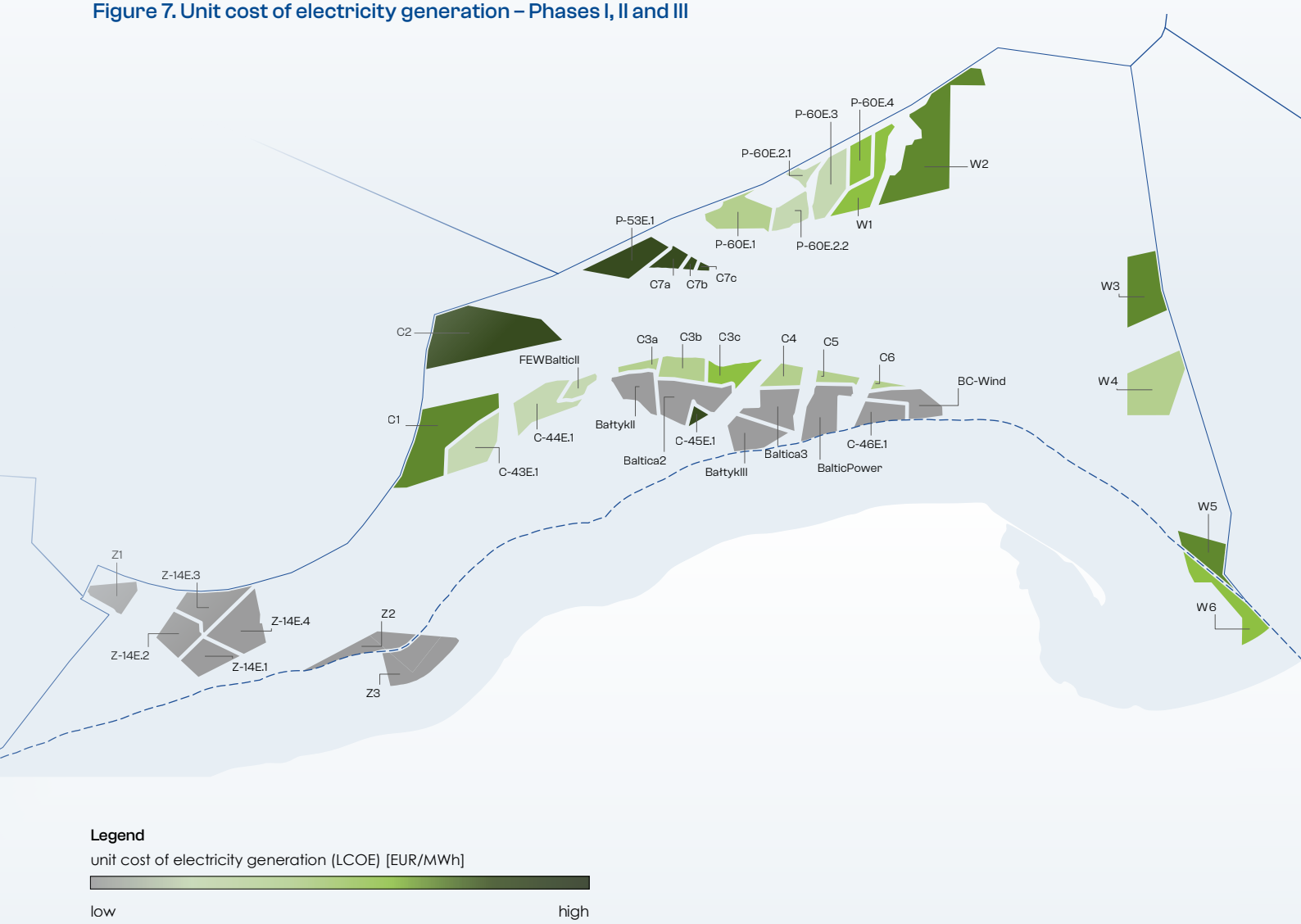
Site C3a (180 MW) + C3b (520 MW) with a total capacity of **700 MW**,
Site C5 (260 MW) + C6 (140 MW) with a total capacity of **400 MW**,
Site C7a (360 MW) + C7b (100 MW) + C7c (80 MW) with a total capacity of **540 MW**.

The estimated LCOE for sites where floating foundations are proposed (C2, W2, W3, W4, W5, W6) is relatively high. However, it must be stressed that these estimates are subject to a higher level of uncertainty and are less representative than for projects using the more widespread (and currently cheaper) monopile technology.

It is expected that the development of floating foundation technology in the near future will result in the start of their mass production and a significant decrease in cost.

Unit cost of electricity generation estimated for Phase I, II and III areas (Figure 7).

Figure 7. Unit cost of electricity generation – Phases I, II and III



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unit cost of electricity generation (LCOE) [EUR/MWh]

low high

Assessment of the attractiveness of the new sites identified in the Report (Phase III)

Table 4 provides an expert, synthetic assessment of the attractiveness of new sites identified in the Report. The parameters assessed were quantified, taking into account:

- planning and regulatory considerations:
  the relatively lowest intensity of conflicts and the biggest problems were identified, e.g. the need to amend laws, location within the boundaries of Polish Navy training ground, possible interactions between sea users,

- environmental considerations:
  being aware of the value of marine areas, the greatest risks were identified, e.g. high probability of avifauna migrating in a given space, or the cumulative impact which is difficult to assess for sites located close to each other,

- technical and location considerations:
  key considerations included water depth necessitating the use of specific technologies and the distance from land, which translates into the length and therefore cost of grid connection,

- LCOE value:
  the estimated LCOE values of the different areas were grouped into three levels: low, medium and high.

Site	Capacity Annual energy production	Planning and regulatory context (key constraints)	Environmental and landscape conditions (key constraint)	Technical and location conditions (key parameters)[20,21]	LCOE	Site attractiveness (total score of parameters)
Z2	720 MW 2.8 TWh/year	Fishing	No significant impacts, although possible migration of avifauna	Monopile (dia. 44 m) HVAC – 31 km	Low	11
Z1	620 MW 2.6 TWh/year	No significant restrictions	Proximity to N2000 areas, potential avifauna migrations	Monopile (dia. 31 m) HVAC > 117 m	Low	10
Z3	1240 MW 4.7 TWh/year	MA Act, Fishing	Adverse impacts on coastal landscape, proximity to N2000, potential migrations of avifauna	Monopille (dia. 28 m) HVAC- 31 km	Low	9
C3a + C3b	700 MW 2.8 TWh/year	No significant restrictions	Proximity of Phase I = cumulative impacts, avifauna migrations	Monopile (dia. 44 m) HVAC – 102 km	Medium	8
W1	780 MW 3.2 TWh/year	No significant restrictions	Proximity of Phase I = cumulative impact, bank slope, porpoise, avifauna migrations	Jacket (61 m) HVAC -109 km	Medium	8
W3	1200 MW 5.0 TWh/year	Fisheries, PL/RUS border	No significant restrictions	Floating (dia. 85 m) HVAC -101 km	Medium	8
W4	1480 MW 6.0 TWh/year	Fisheries, PL/RUS border	No significant restrictions	Floating (dia. 92 m) HVAC -86 km	Medium	8
C4	440 MW 1.7 TWh/year	Polish Navy training ground	Proximity of Phase I =cumulative impacts, avifauna migrations	Monopile (dia. 45 m) HVAC -63 km	Medium	7
C5 + C6	400 MW 1.6 TWh/year	Polish Navy training ground	Proximity of Phase I =cumulative impacts, avifauna migrations	Monopile (dia. 43 m) HVAC -62 km	Medium	7
C3c	460 MW 1.8 TWh/year	Polish Navy training ground	Proximity of Phase I =cumulative impacts, avifauna migrations	Monopile (dia. 55 m) HVAC -95 km	Medium	7
C7a + C7b + C7c	540 MW 2.3 TWh/year	Potentially important for NATO	Potential presence of harbour porpoise	Jacket (dia. 59 m) HVAC -181 km	High	7
C1	2140 MW 8.6 TWh/year	Fisheries, potentially important for NATO, Proximity of Polish Navy training ground	Proximity of Phase I = cumulative impact, cod spawning ground	Jacket (dia. 68 m) HVDC – 127 km	High	7
C2	2700 MW 10,9 TWh/year	Potentially important for NATO	Cod spawning ground	Floating (dia. 72 m) HVDC -115 km	High	7
W5	680 MW 2.5 TWh/year	Fisheries, PL/RUS border, proximity of training ground	No significant restrictions	Floating (dia. 97 m) HVAC -51 km	High	7
W2	2580 MW 10.6 TWh/year	Polish Navy training ground	Proximity of Phase I =cumulative impacts, bank slope, porpoise, avifauna migrations	Floating (dia. 69m) HVDC -124km	High	6
W6	1000 MW 3.8 TWh/year	UOM, fishing, proximity of training ground	Landscape	Floating (dia. 85 m) HVAC -51km	High	5

Table 4. Summary - assessment of attractiveness of identified new sites for OW (Source: own elaboration)

- green - most favourable conditions - 3 points
- orange - 2 points
- red - 1 point

20 Average value – refers to the average depth of a given site
21 HVAC, HVDC – values refer to the total length of grid connection (offshore and onshore part)

Most attractive sites

On the basis of the analyses described in the Report, sites located in the Western Area around the Pomeranian Bay can be identified as the most attractive, with the following features

- relatively shallow depth and distance from the shore (especially Z2 and Z3),
- relatively low risk of environmental and planning/ regulatory constraints (except Z3),
- low LCOE,
- for Z3, the regulatory and planning issues (the need to change the MA Act and the interaction with fisheries) are offset by very good technical conditions and low LCOE.

Areas of considerable attractiveness are the sites to the north of the Słupsk Bank (C3a and C3b) and W1 at Southern Middle Bank, where rather problematic environmental conditions are counterbalanced by the lack of spatial conflicts with other users and by good technical conditions.

Higher scores are also given to the sites in the eastern part – W3 and W4 – where it is likely that regulatory, planning or environmental considerations are less important and do not create barriers; however technical conditions and a fairly high LCOE slightly reduce their attractiveness.

Areas of medium attractiveness

Areas of medium attractiveness include the remaining locations in the Central Area, where each of the parameters examined is at an intermediate or lower level. They are characterised by significant planning challenges (e.g. proximity to Polish Navy training grounds), environmental or technological (significant depths at some locations). They also show a rather high LCOE in some cases, which is mainly due to the small size of the sites.

The site in the eastern part of W5 also deserves a similar assessment – which, although not characterised by conflicts with other users (mainly with fishing), the large depths and high LCOE result in lower attractiveness of this site.

Least attractive areas

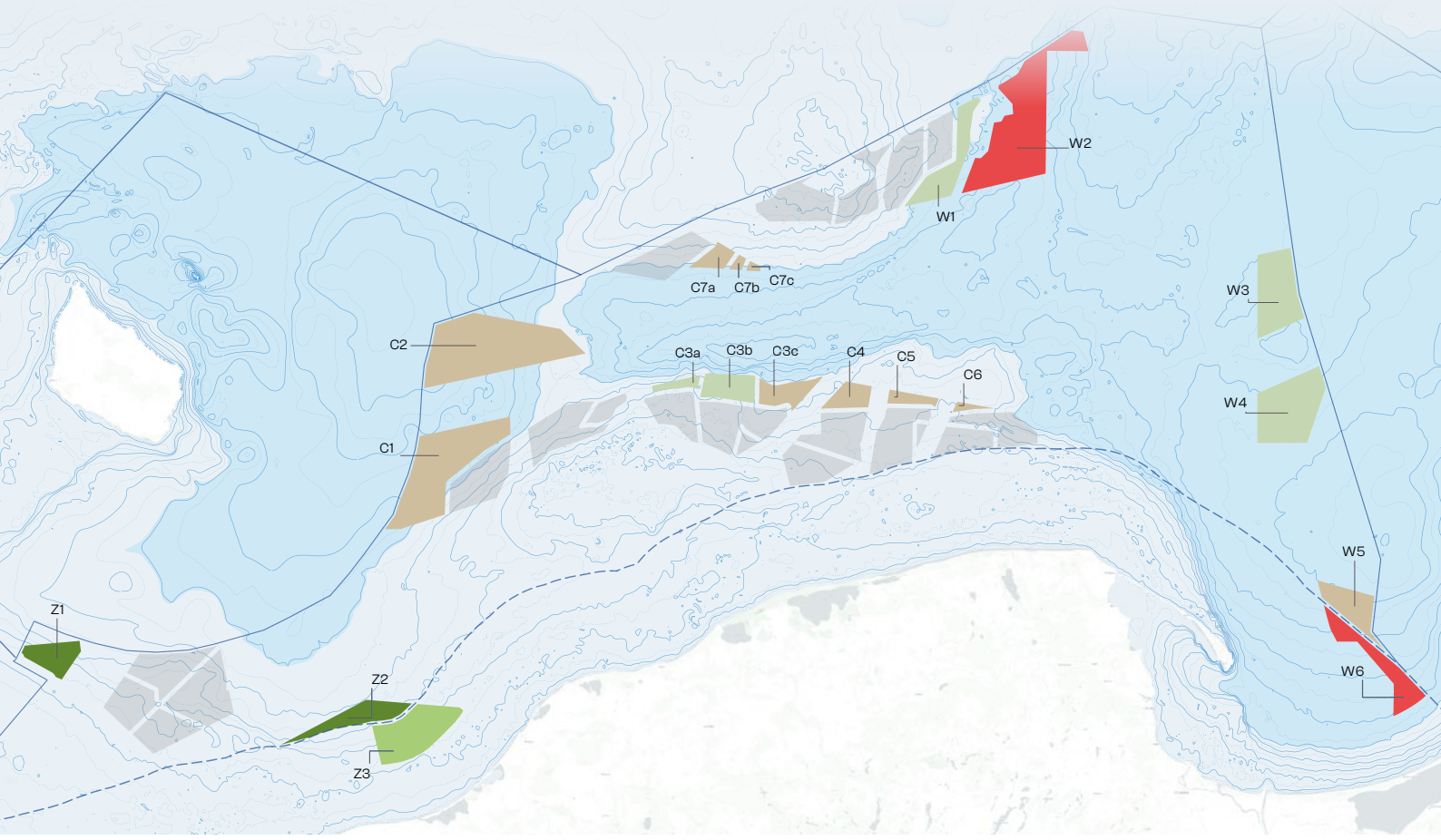
The least attractive sites, according to authors' assessment, include two areas:

- W2 – where the assessment is influenced by both technical, environmental and economic considerations, and
- W6 – the second of the sites identified in the territorial sea characterised by low regulatory and planning attractiveness and large depths, which significantly reduces technical attractiveness.

It should also be noted that sites C2, W2, W3, W4, W5 and W6, for which floating foundation technology is proposed, have the greatest potential to increase in attractiveness with the expected decrease in costs in the near future and reduction of technology risks.

Based on the work and analysis carried out, a result map has been drawn up (Figure 8).

Figure 8. Attractiveness of offshore wind sites recommended in the Report



Legend

potential development area (for area covered by Appendix no. 1 or 2 of the Offshore Wind Act, MSP)

level of attractiveness of new sites for offshore wind

low — high

depth [m]

0 - 60

below 60

6. How to use the full potential of offshore wind in Poland

The potential of offshore wind estimated in the Report would make it possible to provide the Polish economy with significantly more zero-carbon energy than under PEP2040 (130.3 TWh estimated against 39.4TWh projected in PEP2040). In order to fully utilize the existing potential of offshore wind, in the opinion of the Report's authors, action is required in three key areas:

- regulatory, legislative and administrative improvements and local supply chain support,
- removal of infrastructural barriers to the development of offshore wind,
- international cooperation of the Baltic Sea countries.

Strategic environment update, new regulations and administrative streamlining

The acceleration and further development of offshore wind in Poland will depend on the amendment of regulations and strategic documents defining the main objectives and opportunities for offshore wind development in Poland, in particular:

- PEP2040,
- Offshore Wind Act and Maritime Areas Act,
- MSP.

It is also necessary to remove existing loopholes in the legislation relevant to the development of Phase I and II projects (mainly implementing regulations). Further streamlining of administrative processes (digitisation and competence improvements).

PEP2040 update

An update of the current PEP2040, as well as an increase in the share of RES in the Polish NECP, seems inevitable. Due to the implementation of the EU Green Deal policy, the so-called ‚Fit for 55' package and the REPowerEU plan, it is expected that the share of renewables in the total energy consumption as well as in electricity production will have to increase significantly compared to the current levels set out in PEP2040 and the Polish NECP. Despite the lack of binding RES share targets at the individual country level, according to the European Commission's announcement, all member states will have to increase their contributions to meet the EU's 2030 target.

	PEP2040	NECP	Fit for 55 + REPowerEU[22]
Greenhouse gas reductions compared to 1990.	ca. 30%	-	55%
RES share in gross final energy consumption	23%	21-23%	40-45%
Electricity sector	32%	32%	65%

Table 5. Summary of GHG reduction targets and RES share in PEP2040, NECP and EU regulation proposals for 2030 (Source: Own elaboration based on data from PEP2040, NECP, RES Directive)

22 Data based on amendment-renewable-energy-directive-2030-climate-target-with-annexes_en.pdf (europa.eu)

The PEP2040 update was announced by the Polish government, which adopted its assumptions in late March 2022. In the area of RES, the PEP update assumptions include, among other things:

- acceleration of RES deployment in all sectors, ensuring improved security and energy independence for the country,
- increasing the share of RES in Poland's total electricity production to 50% in 2040 from ca. 40% under the current PEP2040,
- increasing technology diversification and expanding capacity based on domestic sources,
- development of energy storage networks and technologies; in the long term, a special role in energy storage will be played by hydrogen, especially hydrogen produced from electricity from renewables, ensuring that excess renewable generation is utilized,
- increased financial support will be increased in schemes promoting energy self-sufficiency of households.

Poland's Energy Policy until 2040 is a strategic document. Its update is the first and indispensable component enabling a series of actions towards the full exploitation of the potential of offshore wind in Poland. The PEP2040 update will provide the foundation to justify the possibility and/or necessity of legislative changes, as well as changes in policies or programmes relevant to investment processes, also for the offshore wind sector, i.e. amendment of the MSP, amendment of the Offshore Wind Act or update of the Transmission Grid Development Plan.

MSP amendment

The work on the Report identified sites in Polish maritime areas, characterised by relatively low levels of conflict and thus the greatest potential for optimal use of the available marine [offshore wind] resources.

In order to utilize the potential of these sites for offshore wind, an amendment to the Polish MSP (the Spatial Management Plan for Polish maritime areas at a scale of 1:200,000, adopted in 2021) is required.

According to the Maritime Areas Act, the MSP should be reviewed at least once every 10 years. Article 37(i) of the Act provides for an active role of the Director of the Maritime Office in this process (inter alia, preparation of a report on maritime spatial development on the basis of information provided by the bodies participating in the development of the plan including location permits) and the decisive role of the minister competent for maritime affairs (among other things, defining the scope of revisions).

On the other hand, Article 37(i)(5) of the Maritime Areas Act provides that if, as a result of a change in the law, there is a need to amend the MSP – in which case the procedure for its revision should be initiated immediately – the process should be started within 6 months of the amendment / revision.

The plan should be amended in the manner in which it was adopted, i.e. the draft amendment to the plan will, among other things, be subject to consultation, opinion, strategic environmental assessment and public consultation, as well as undergo the legislative procedure set out for regulation of the Council of Ministers.

Referring to discussions held during the consultations of the first MSP, it can be presumed that once the identified change in development is of a local nature (covering one/some sites), then it will be possible to proceed with a plan amendment only with regard to the specific activity or site. It should be assumed, however, that the change in the state's strategic priorities and the need to identify new areas for wind power in the plan will require an amendment to the entire MSP (a description of the MSP revision procedure is attached as Appendix 1 to this Report).

The Polish Wind Energy Association hopes that this Report will contribute to the discussion on the initiation of an MSP update and on how to carry it out. Perhaps a solution that can be considered is to use the procedure stipulated in Article 37(i) of the Maritime Areas Act.

Offshore Wind Act amendment

The Offshore Wind Act regulates the legal framework for the development of OWFs in Polish maritime areas and is expected to enable projects with a total installed capacity of around 11 GW. The model of the support system envisaged in the Offshore Wind Act is based on a two-sided contract for difference (CfD), with a split into two phases.

Based on the results of the analyses presented in the Report, it seems reasonable to increase the volumes planned for the 2025 and 2027 auctions from 5 GW to at least 8-9 GW for the areas allocated for offshore wind power in the MSP.

Aiming to utilize the full potential of the offshore wind presented in the Report requires a discussion on the shape of the future support scheme and the method of granting location permits for newly designated sites after the update of the MSP.

Missing legislation

It is necessary to finalise legislation that ensures the transparency of the entire investment process and to create regulations for the operation phase of the farms. It is also essential to ensure that existing legislation can be adapted to the specific characteristics of OWF projects.

Streamlining administrative processes and arrangements

Currently, the average development time for an OWF project is estimated to be up to 10 years or more. In Poland, after a significant legislative acceleration in 2021, the process of issuing location permits for 11 Phase II sites is still underway since November 2021.

The first applications for decisions were submitted by investors in November and December 2021. The award process has now taken nearly 12 months. According to the applicants' estimates, it will take another few months to obtain final decisions, and the procedure could be completed in Q3 2023. The lack of decisions jeopardises the investors' ability to prepare for the auction set for 2025.

Streamlining administrative processes for offshore wind is essential to realise the increasingly ambitious renewables targets set by Poland and the EU, e.g. under the REPowerEU plan. Further development of the SIPAM Spatial Information System can help improve the handling of applications and approvals, with further digitisation of processes and services.

It is also necessary to integrate the competences of the administration towards a one-stop-shop model. This includes identification of an administrative body equipped with the authority to resolve stakeholder conflicts over shared sea use by setting priorities that take into account strategic state interests and macro-level socio-economic benefits.

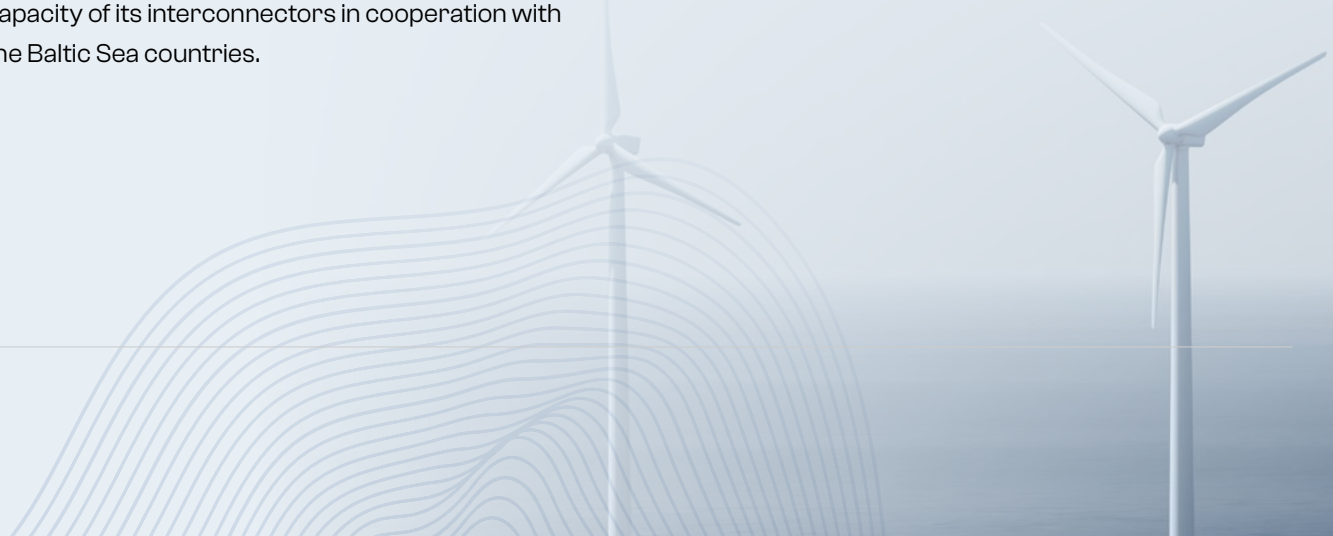
Local supply chain

In order to exploit the full potential of offshore wind with the highest possible share of local content and lowest possible electricity prices for consumers, the development of domestic supply chain will be crucial. In order to meet this goal, it is essential for the administration to provide a long-term perspective, stable legislation and clear objectives in both the short and long term. One of the elements ensuring a long-term, stable perspective for Polish companies planning their development in the area of supplies and services for offshore wind projects is the presentation of a credible long-term plan for the construction of further OWFs, beyond those covered by Phase I.

Infrastructure barriers to utilisation of offshore wind potential in Poland

With a potential of 33 GW in installed capacity, Poland may become a leader in offshore wind in the Baltic Sea. To fully realise this potential, it is essential to remove the main infrastructure barriers that may prove critical to investment processes.

1. Lack of connection capacities – significant investments are needed in the transmission infrastructure necessary to connect the OWFs to the grid – both in the near and long term. The lack of grid connection points and capacities to meet the demand of investors preparing projects for the auctions designated in the Offshore Wind Act can paralyse the energy transition process using offshore wind. Poland also needs to strengthen the capacity of its interconnectors in cooperation with the Baltic Sea countries.
2. Lack of infrastructure investment for at least one installation port and multiple service ports – possibility to use national installation and service ports in the investment process will help reduce the costs of project implementation and, consequently, the cost of electricity for consumers. In addition, the implementation of these projects will be a catalyst for dynamic and stable development of a national supply chain for the offshore wind sector with a dominant position in the Baltic Sea Region and a very strong position on a European scale. In addition to the announced and already commenced investments in installation and service terminals, it is important to emphasise the need for investment in transport access infrastructure from hinterland.
3. Risk of limited fleet availability for OWF construction – as indicated by PWEA, the insufficient number of vessels for OWF installation and maintenance may become a bottleneck in the development of offshore wind in Poland.



7. Benefits of utilizing the actual potential of offshore win in Poland

This Report does not estimate the benefits that may result from utilizing the actual potential of offshore wind in Poland. Nevertheless, it seems advisable to indicate them (without specifying their level) in view of the enormous potential of offshore wind to generate them.

Energy security and improving the competitiveness of the Polish economy

The use of Poland's offshore wind potential, as estimated in the Report, will strengthen the country's energy security and support economic development by improving the competitiveness of the economy and low prices of electricity produced by OWFs. At the same time, the dynamic development of offshore wind is an opportunity to create new sectors of modern economy in Poland, providing thousands of innovative, well-paid jobs.

Decarbonization of Polish economy

Offshore wind can become a key element in the decarbonisation of the national economy, while supporting the development of its future-oriented industries. By using the potential of offshore wind, Poland will be able to electrify certain sectors of the economy, such as transport, for example. It also seems crucial to use possible energy surplus to develop modern energy storage technologies.

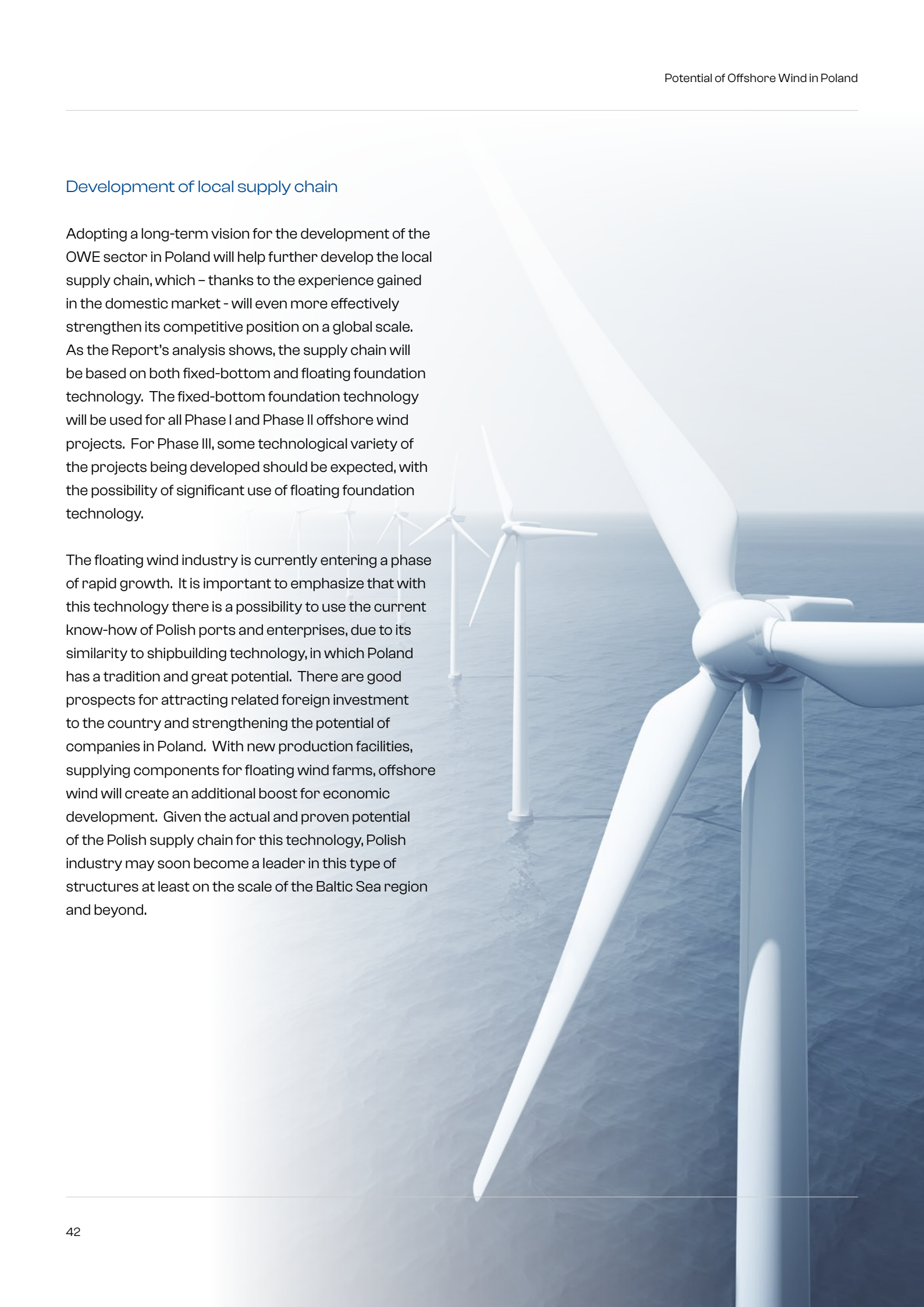
Innovation

The development of offshore wind ensures that Poland's hydrogen potential is realised. Large-scale use of "green hydrogen" in energy, transport and industry will be possible in Poland primarily on the assumption that RES, primarily offshore wind, will be used for hydrogen production, due to its huge potential and the technical possibility to couple these sectors. Thus, an overriding condition for the development of an economy based on green hydrogen is access to have adequate installed capacity in renewables.

Development of local supply chain

Adopting a long-term vision for the development of the OWE sector in Poland will help further develop the local supply chain, which – thanks to the experience gained in the domestic market - will even more effectively strengthen its competitive position on a global scale. As the Report's analysis shows, the supply chain will be based on both fixed-bottom and floating foundation technology. The fixed-bottom foundation technology will be used for all Phase I and Phase II offshore wind projects. For Phase III, some technological variety of the projects being developed should be expected, with the possibility of significant use of floating foundation technology.

The floating wind industry is currently entering a phase of rapid growth. It is important to emphasize that with this technology there is a possibility to use the current know-how of Polish ports and enterprises, due to its similarity to shipbuilding technology, in which Poland has a tradition and great potential. There are good prospects for attracting related foreign investment to the country and strengthening the potential of companies in Poland. With new production facilities, supplying components for floating wind farms, offshore wind will create an additional boost for economic development. Given the actual and proven potential of the Polish supply chain for this technology, Polish industry may soon become a leader in this type of structures at least on the scale of the Baltic Sea region and beyond.



8. Concluding remark on the analytical part

The results of the analyses presented in the Report are subject to uncertainty, resulting from the assumptions made.

It is important to note that these assumptions have been made to the best of the authors' knowledge and experience; however, they do not result from detailed environmental, geological, wind, etc. studies carried out for individual sites. They were based on the authors' market knowledge and expertise and publicly available sources (such as issued OLLs, EIA reports, NEWA wind atlas, etc.).

The analytical section of the Report describes the assumptions made in detail, and the level of detail in the calculations is closely linked to the level of detail in the technical assumptions, which were intended to enable comparison and further analysis of the data.

Due to the early stage of development of the projects analysed (or, in the case of new designated sites, lack of any measurement data), the detailed costs for individual sites are not available. The CAPEX results are intended to allow for comparisons between different sites, but not to select a technical concept for specific projects. In order to keep the number of scenarios at a manageable level, a single generic scenario was assumed for each site based on available data and expert knowledge. An absolute indication of LCOE would require a more in-depth study, and the modelling in this report was intended to show a ranking of the attractiveness of the different areas, which may be relevant in the process of a possible update of the PEP2040 or MSP.

The authors emphasise that both CAPEX, OPEX and LCOE are influenced by a number of factors that cannot be perfectly modelled at this level of analysis detail.

The authors also note that the primary objective of this Report is to indicate the real potential of offshore wind in Poland, and that the actual possibilities of utilising these sites, both in terms of installed capacity and annual energy production potential, as well as costs, could be clearly identified after detailed site-specific studies have been carried out.

Conclusion

Harnessing the potential of offshore wind as a large-scale renewable energy source will not only contribute to Poland's increased independence and energy security, but also to decarbonization of specific sectors of the economy or industrial use of green hydrogen. In addition, effective planning of maritime areas and full utilisation of the capacities of Polish service providers will mean that the local supply chain for offshore farms can reach a share of up to 65 per cent, which is undoubtedly an opportunity for the Polish economy.

Projects with a total capacity of approximately 8.4 GW are currently being developed in Polish maritime areas, including 5.9 GW of Phase I projects and 2.5 GW in Phase II projects. Meanwhile, a detailed analysis of the values determining the achievable level of installed capacity and energy production in Poland indicates that offshore wind in Poland has a potential of 33 GW, with an expected average annual energy production of 130 TWh.

The report also estimates the capacity that can be obtained from the 21 sites with a total area of approximately 1,808.26 km^2 specified in the MSP and the Offshore Wind Act, where wind farms are planned. Analysis of these areas, taking into account existing and potential planning and environmental constraints, provides an estimate of an installed capacity potential of 15.3 GW – far exceeding the current PEP2040 and Offshore Wind Act assumptions. Provided they are developed in a manner similar to that proposed in the Report, they have the potential to meet electricity demand of approximately 60.6 TWh/year. This represents approximately 1/3 of Poland's 2021 demand of 180.3 TWh.

The work on the Report identified 20 new sites with a total area of 2,171.5 km^2 (including 18 in the exclusive economic zone and 2 in the territorial sea) that can be potentially used for offshore wind. Their total capacity is 17.7 GW, with an average annual energy production of 70.7 TWh/year. On this basis, it is safe to say that offshore wind has a chance to become one of the pillars of Poland's energy transition.

Development of offshore wind presents an opportunity to develop the local supply chain and to build a new, innovative sector of the economy. According to expert analysis, local content should be based primarily on fixed-bottom foundation technology. This technology will be used for all Phase I and Phase II offshore wind farm projects, and for part of Phase III projects. The total estimated capacity of projects with this type of foundations is 23 GW. In turn, the floating wind industry is entering a phase of dynamic development and should be expected to be used for some of Phase III sites.

The Report indicates that in Phase III, wind farms with a total capacity of approx. 10 GW could be built. There are good prospects for attracting foreign investment to Poland related to with the construction of floating foundations, for which Polish companies could become a manufacturing hub. The realisation of the estimated potential of offshore wind will create and sustain thousands of innovative, well-paid jobs and ensure long-term development of the local supply chain, which will undoubtedly boost Poland's economic development. It should also be mentioned that the development of offshore wind would improve the competitiveness of industry and lower electricity prices, while taking care of the climate by being zero-carbon.

In order to utilize the full potential of offshore wind in the Polish part of the Baltic Sea, legislative changes are necessary with regard to PEP2040, the Offshore Wind Act and the MSP. These documents regulate the scope and dynamics of offshore wind development in the coming decades; however, they currently do not take into account the full potential that could be available for energy production in the Baltic Sea. The inclusion of sites identified in the Report (Phase III) in the MSP will require a discussion on the shape of current legislation and a possibly quick revision of current strategy documents. It will be necessary to update PEP2040, amend the Offshore Wind Act with regard to additional auction volumes, and amend the Polish Maritime Spatial Plan adopted in 2021.

In addition to regulatory changes, an important condition for dynamic development of offshore wind is to remove of a number of infrastructural and administrative barriers.

The main challenge is the construction and modernisation of transmission infrastructure required to connect wind farms in the Baltic Sea to the grid. Poland also needs to strengthen the capacity of interconnectors to the Baltic Sea countries. Another barrier is related to the lengthy and complicated procedures for granting decisions and permits for the erection of installations.

The lack of infrastructure investments for the construction of the installation port and service ports generates additional costs for project implementation.

There is a risk of limited installation fleet availability – the insufficient number of vessels may become a bottleneck in the development of offshore wind farms in Poland.

Despite multiple challenges, investments in offshore wind in Poland are today's national interest in the context of ensuring our country's energy security and independence.

The experience gained over the past year in implementing such large and complex investment projects has shown that there are areas requiring optimisation so that the first Polish wind farms in the Baltic can be built in a efficient manner. The dynamic changes in the markets show that urgent changes are needed. With the experience from investments carried out to date, the wind industry recognises the need for modifications in the area of legal regulations and permitting, to shorten the development of offshore wind projects, and thus contribute to diversification of energy sources in Poland.

This will make offshore wind one of the key pillars of the Polish energy sector, and Poland can become a leader in offshore wind development in the Baltic Sea region and in Europe – the only thing that needs to be done is to use this enormous potential appropriately.

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Appendix 1: MSP revision procedure

The current spatial development plan for Polish maritime areas was adopted by the Regulation of the Council of Ministers of 14 April 2021 on the adoption of the spatial development plan for internal marine waters, territorial sea and exclusive economic zone at a scale of 1:200 000 (Journal of Laws 2021, item 935; "MSP"). The MSP states that the erection of offshore wind farms is only permitted in areas with a primary function of renewable energy generation (see § 6(1) of Appendix No. 1 to the MSP, entitled "Text part of the plan regarding general arrangements indicating decisions applicable to a part or the entire area covered by the plan, decisions concerning the arrangement of public purpose investments and directions for the development of transport and technical infrastructure").

Only seven sites (water bodies) with a total area of 2,300 km^2 were designated for renewable energy in the plan, representing approximately 8% of the area covered by the MSP (with a total of 29,900 km^2)[1].

The government's strategic documents on offshore wind energy ("OW") include the National Energy and Climate Plan 2021-2030, which assumes the installation of approximately 3.8 GW of OW capacity by 2030, and ca. 8 GW by 2040, and the PEP 2040, with a potential of 11 GW of installed capacity in offshore wind farms by 2040 in the Polish exclusive economic zone. These assumptions differ significantly from the potential of Polish maritime areas identified by the wind energy industry and estimated at 28 GW[2]. Unlocking the perceived potential of installed capacity in offshore wind farms located in the Baltic Sea will require the adoption of an appropriate revision of the existing MSP and the creation of new sites dedicated to offshore wind.

The procedure for drawing up, revising and amending spatial development plans for the areas of internal sea waters, territorial sea and the exclusive economic zone is regulated by the provisions of the Act of 21 March 1991 on maritime areas of the Republic of Poland and maritime administration (JoL with 2022 item. 457, "Maritime Areas Act, MA Act"). The draft plan shall be prepared by the territorially competent director of the maritime office (Article 37b(1) of the MA Act).

In the case of the current MSP, prior to the drafting of the plan, it was decided to prepare one common document for the key part of the Polish maritime areas under the competence of three directors of maritime offices, in order to ensure consistency of planning provisions over the entire area covered by the plan, covering more than 97% of Polish maritime areas. The Director of the Maritime Office in Gdynia was appointed as the project leader on the basis of a partnership agreement dated 20 May 2015 between the directors of the Maritime Offices in Gdynia, Szczecin and Słupsk.

As stipulated in the Maritime Areas Act, the amendment of the provisions of the plan follows the same procedure as for the adoption of the plan. The adopted plan is subject to mandatory periodic review at least once every 10 years (Art. 37i(1) of the MA Act). As mentioned in the report of the Supreme Audit Office ("NIK") on the development of OW[3], the failure to sufficiently address the demand to expand the areas available for OW in the MSP is identified as one of the main barriers to OWF development in terms of the regulatory environment. Thus, as the NIK assumes, this leads to a necessary revision of the MSP in 2-3 years and, in principle, the adoption of a revision of the plan every 5 years, rather than every 10 years as envisaged by the MA Act.

1 See: Najwyższa Izba Kontroli - Delegatura w Gdańsku, Informacja o wynikach kontroli - Rozwój morskiej energetyki wiatrowej, LGD.430.001.2022, nr ewid. 13/2022/P/21/065/LGD, p. 110.

2 See: Wind Europe, Our energy, our future. How offshore wind will help Europe go carbon-neutral, November 2019, pp. 6, 63.

3 See: Najwyższa Izba Kontroli - Delegatura w Gdańsku, Informacja o wynikach kontroli..., op. cit., p. 142

The assessment of the up-to-date character of the MSP is made by the director of the maritime office, after obtaining information from the bodies issuing opinions approvals on changes in the spatial development of the area covered by the plan and making an analysis of the issued offshore location licences, as well as permits/ agreements concerning the laying of cables in maritime areas (Art. 37i par. 2 and 3 of the MA Act).

These analyses will result in the development of a report on the state of development of maritime areas, which, together with an assessment of the validity of the existing plan shall be forwarded by the director of the maritime office to the ministers in charge of: maritime economy, water management, regional development, construction, spatial planning and housing. On the basis of the report, the minister in charge of maritime affairs decides whether to proceed with the plan amendment and the scope of the necessary changes, which triggers a re-run of the procedure for adopting the plan amendment, in accordance with the procedure for adopting the plan indicated in Article 37e of the Maritime Areas Act. If, on the other hand, the need to amend the plan arises as a result of a change in legislation, the activities referred to in Article 37e of the MA Act shall be implemented accordingly to the extent necessary to make such amendments, and the commencement of the plan amendment shall take place no later than 6 months from the date of entry into force of the amended law.

The detailed procedure for drawing up the plan is set out in Article 37e of the MA Act. According to this Article, this procedure is initiated by the publication by the territorially competent director of the maritime office of the information on the initiation of the draft plan (plan amendment) and the opportunity to submit comments and motions to the project, together with the form, place and deadline (no less than 60 days) for their submission. Notice of the commencement of work shall also be given to the institutions and authorities competent to approve and give an opinion on the draft plan.

The authority is required to consider the submitted comments and motions, deciding how they should be taken into account in the project. In addition, it shall draw up a list of comments and motions submitted to the draft plan, and in turn publishes this list for public access. It shall also request the competent authorities to agree on the scope and degree of specificity of the information required in the environmental impact assessment to be prepared for the plan. Subsequently – it draws up a draft plan taking into account, in particular, alternative siting of the selected projects with justification their siting and the environmental impact assessment for this draft.

The prepared draft plan (plan amendment) is subject to the opinion of a number of authorities, including: the provincial historical monument conservation officer, the director of the Regional Water Management Board of the State Water Management Authority "Wody Polskie" (Polish Water), the minister responsible for health, the authorities competent for strategic environmental impact assessment.

The authority in the relevant scopes of competence and impact of the findings of the draft plan agrees the draft with the heads (mayors or presidents) of towns located in the immediate vicinity of the area covered by the project, regional directors of environmental protection, the Minister of National Defence and the ministers responsible for: economy, climate, energy, fisheries, environment, water management, internal affairs, tourism, communications, transport, culture and protection of national heritage, marshals of voivodeship, directors of national parks and entities managing sea ports of primary importance for the national economy. Opinions and approvals should be submitted within a maximum of 45 days of the draft plan being made available.

Subsequently, the draft plan (plan amendment) together with the environmental impact assessment are subject to a renewed procedure for submitting proposals and opinions through public consultation. The authority shall introduce the amendments resulting from the comments and proposals considered, the opinions and approvals obtained and the environmental impact forecast, and then renew the agreements with the competent authorities.

POLISH WIND
ENERGY ASSOCIATION

PSEW

Potential of Offshore Wind in Poland

Comprehensive analysis of offshore wind development opportunities in Polish maritime areas

Report – short version

Warsaw, November 2022