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## **Executive Summery**

The development of offshore wind farms in Poland is progressing under a rapidly evolving regulatory framework. The Offshore Wind Act, enacted in 2021, has established a legal framework for the construction of offshore wind fields, enabling Poland to access European Union recovery funding. The country aims to generate 5.9 GW of electricity from offshore wind by 2030 and 11 GW by 2040. To achieve these targets, Poland has set requirements for local content, job creation, and training in the offshore wind sector. The permitting process involves thorough evaluation of technical capabilities, financial stability, and adherence to environmental and regulatory requirements. The maritime spatial planning process identifies suitable areas for offshore wind farm development while considering environmental impact, navigation safety, and conflicting uses of sea space. A cooperative contract scheme called Contract for Difference (CFD) provides revenue stability by guaranteeing a fixed price for the electricity produced by offshore wind farms, encouraging investment in renewable energy initiatives.

Investors in offshore wind projects in Poland have access to various public financing sources, including European Union funds, national support schemes, green investment banks, public-private partnerships, and international financial institutions. These financing options provide grants, loans, or guarantees to support infrastructure development and improve the economic viability of offshore wind projects. However, it is essential to consider future general legal regulations and stability, as the rules and requirements may change over time. By navigating the evolving regulatory landscape, leveraging public financing opportunities, and understanding the long-term goals of the Polish government, investors can contribute to the growth of the offshore wind industry in Poland and capitalize on the country's commitment to renewable energy.

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## I. General Legal of Offshore Wind Farm Development in Poland

Since the early 1990s, when the first power-generating wind turbine was installed at the hydroelectric power facility in Zarnowiec, now known as the Lisewo wind farm, wind energy has been expanding in Poland[1]. Over time, various kinds of legislation were issued by the Polish government to solve the energy deficit problem and contribute to reducing carbon emissions and massively transition energy from fossil to renewable energy. Currently, the Polish ruling party has moderated proposed legislation to loosen some of Europe's harshest rules on the development of wind farms, reversing a government proposal to more than double the current capacity. Poland must increase wind farm investment in order to access billions of euros in European Union recovery funding[2]. Poland's offshore wind regulatory framework is in its infancy but developing swiftly. The Offshore Wind Act, which was enacted in 2021, signified a major advancement by establishing a legal framework for the construction of offshore wind fields. A new regulation instituted a two-phase support system, comprised of a decision by the president of the Energy Regulatory Office regarding the maximum volume and price of electricity generated by an offshore wind farm, and an auction system[3].



**Regulatory Landscape of Wind Offshore Development in Poland.** Source:[3]

Following is a more in-depth explanation of the legislation currently being drafted and

implemented in Poland to expedite the implementation of offshore wind farms, particularly in the Baltic Sea region, as well as the key findings that must be considered prior to initiating the plan of development process, in this case a feasibility study.

## **1.1 Community Development and Local Content**

Based on the draft Polish Offshore Wind Sector Deal, which was approved between the Polish government and investors, which is called the "**Sector Deal**" agreement on 15 September 2021. The following matters concerning the use of local content have been agreed upon:

- **Implementation of the OWF support system**

Established in the Act of 17 December 2020 on the promotion of generation of electricity in offshore wind farms, of the estimated total maximum budget of EUR 22.5 billion.

- **Achievement of local content at the level of**

- a) For offshore wind farm (OWF) projects implemented under the first, pre-auction stage of the support system, at least 20-30% of the total value should be allocated to the preparatory, installation, and operational stages.
- b) For OWF projects implemented by 2030 under the second, auction stage of the support system, at least 45% of the total value should be allocated to the preparatory, installation, and operational stages.
- c) For OWF projects implemented after 2030, at least 50% of the total value should be allocated to the preparatory, installation, and operational stages.

These percentages represent the minimum requirements for investment allocation in each stage of OWF (Offshore Wind Farm) projects, emphasizing the importance of proper planning and execution throughout the development process.

- **Achievement of Employment:**

- a) By 2030, the aim is to achieve employment (direct and indirect) in the offshore

wind sector for at least 30,000 people.

- b) By 2040, the target is to increase employment (direct and indirect) in the offshore wind sector to at least 40,000 people.

These targets highlight the significance of job creation and the potential for substantial employment opportunities within the offshore wind industry.

- **Training and Education:**

- a) By 2030, the goal is to provide a comprehensive training and educational program that prepares at least 20,000 individuals for careers in the offshore wind sector.
- b) By 2040, the objective is to expand the training and educational offerings, enabling the preparation of at least 40,000 individuals to meet the growing demand for skilled professionals in the offshore wind industry.

These targets emphasize the importance of developing a skilled workforce through specialized training and educational initiatives, ensuring a competent and qualified workforce to support the long-term growth and sustainability of the offshore wind sector in Poland.

- **Providing facilities in the Polish seaports in order to implement the OWF projects in the form of port and access infrastructure that enables the construction and servicing of OWFs i.e.:**

- a) installation terminal in the Port of Gdynia to be operated from 2025 and a subsequent terminal to be constructed in 2026-2030
- b) at least two service ports enabling supporting the construction of OWF projects from 2026, and their maintenance afterwards.

- **Use of the capacity of the Polish shipbuilding industry to develop the OWF projects, including in particular in the scope of construction, reconstruction and repair of the specialist vessels for the purposes of construction and servicing the OWFs, starting. From the first stage of support (in 2021-2030).**

## **1.2 Offshore Wind Farm Target**

With a national objective to generate 5.9 GW by the end of 2030 and 11 GW of electricity from offshore wind technology by 2040, Poland has set sail for a sustainable future in an industry characterized by a balance of opportunities and challenges.[3].

The target model for offshore wind energy development in Poland concentrates on progressively increasing the proportion of local content in initiatives, building the capacity of the Polish industry, attracting global technology providers, and assuring open and equitable market access. This includes accomplishing at least 20% local content by 2030 and 50% by the end of the next decade, utilizing existing industry capacity, establishing national operators for installation and service fleets, and delivering essential constructional elements. The objective of the collaboration with foreign partners is to supply offshore transformer stations while luring technology providers to establish manufacturing facilities in Poland. Long-term financial support and export promotion are encouraged, and an open and non-discriminatory market environment is emphasized through prolonged technical dialogues and the maximization of regional content. These goals are intended to promote a competitive, sustainable, and domestically supported Polish offshore wind industry.

## **1.3 Environmental Impact Assessment**

A spatial development plan on a scale of 1:200,000 will soon be adopted to facilitate the awarding of new concessions for the construction of wind farms in the Baltic Sea. However, entities interested in offshore investments in Polish sea areas will need to navigate various procedures, particularly those concerning environmental protection. The construction and operation of offshore wind farms undergo extensive approval processes to address concerns about impacts on marine species, protected areas, habitats, and other environmental factors. Environmental impact assessment procedures are conducted to evaluate and minimize potential negative effects. These procedures analyze impacts on various elements, such as benthos, fish, birds, marine mammals, protected areas, and biotopes[4]. The environmental decision outlines conditions to minimize environmental deterioration, including ongoing monitoring and inspections.

The EIA report requires a team of specialists and coordination to ensure compliance with environmental regulations. Consulting companies can assist in fulfilling legal obligations and balancing investor interests with environmental protection. The permitting process involves meeting deadlines, providing complete documentation, and presenting a mature concept to the authority. Good communication and cooperation with the authorities are crucial for a successful project outcome.

#### **1.4 Transmission Grid Connection Procedure**

Based on a plan for developing the transmission system through 2032 presented by the operator of the Polish power grid (PSE) operator, the Ten-Year Network Development Program (TYNDP) started in 2023[5]. One of the critical areas of system transformation is offshore wind energy. Infrastructure investments to produce power from the Baltic Sea and transmit it to southern Poland came next.

Every two years, ENTSO-E publishes a community-wide 10-year network development plan as required by Regulation 714/2009. The TYNDP 2020, the most recent version of this plan, was released in September 2021. Establishing and ensuring the best possible operation of the internal energy market in support of Europe's ambitious energy and climate goals while maintaining supply security is the main goal of the projects included in the current TYNDP 2020.

#### **1.5 Permit Licenses**

Poland's permit licensing procedures for offshore wind in the Baltic Sea involve a comprehensive evaluation of applicants' technical capabilities, financial stability, and adherence to environmental and regulatory requirements. The exact duration of the permitting process can vary depending on various factors such as the complexity of the project and the efficiency of the review process. Typically, the permitting process for offshore wind projects can take several years from the initial application to the issuance of the necessary permits. It involves conducting environmental impact assessments, consultations with relevant stakeholders, and ensuring compliance with all applicable laws and regulations. The duration of the process is aimed at ensuring thorough scrutiny and



consideration of all aspects related to the project's feasibility, environmental impact, and compliance.

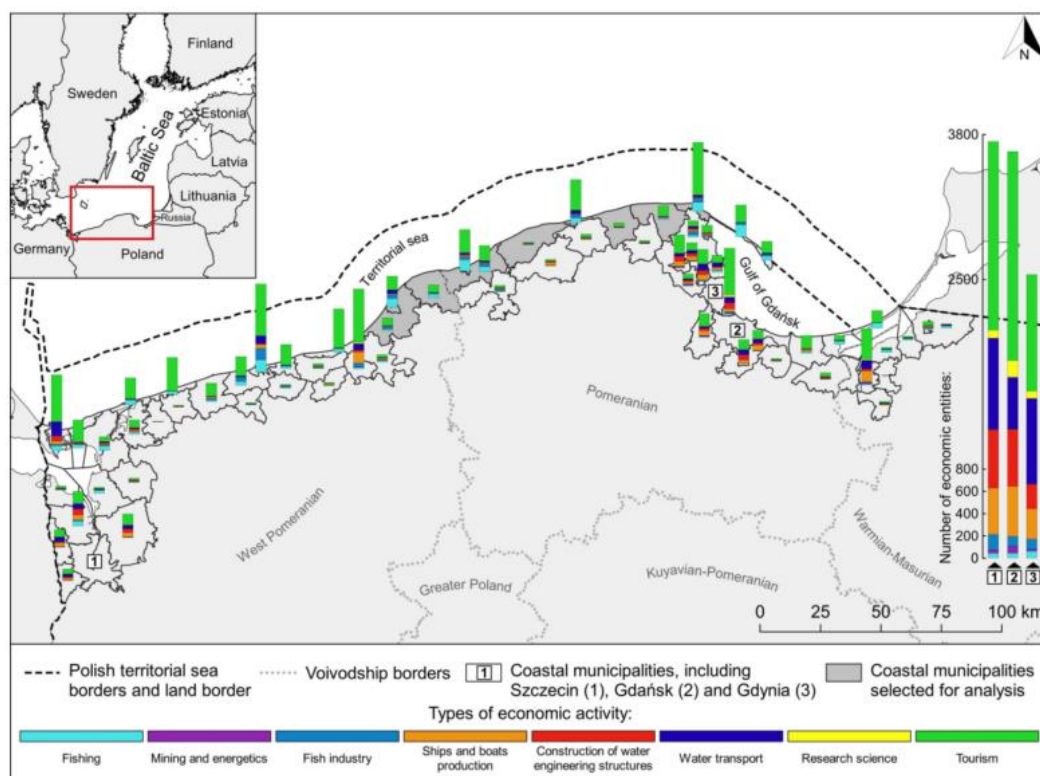
## **1.6 Maritime Spatial Planning (MSP)**

The maritime spatial planning process in Poland is divided into the following plans:

- Maritime Spatial Plan for Polish Sea Areas in scale of 1:200 000
- Maritime Spatial Plans for Szczeciński Lagoon and Kamieński Lagoon
- Maritime Spatial Plans for Vistula Lagoon
- Maritime Spatial Plans for port area waters

Detailed plans for selected areas covered by the Maritime Spatial Plan for Polish Sea Areas in scale of 1:200 000. On 14 April 2021, the Polish Government (council of Ministers) adopted a regulation on the Polish spatial development plan for internal sea waters, the territorial sea and the exclusive economic zone on a scale of 1: 200,000[6].

The main maritime spatial planning regulation for wind farms in Poland is the "Maritime Spatial Development Plan for Offshore Wind Farms" (Plan Rozwoju Przestrzennego Morskich Farm Wiatrowych). This plan provides the regulatory framework and guidelines for the development and management of offshore wind farms in Polish sea areas. The plan aims to identify suitable areas for offshore wind farm development, taking into consideration various factors such as environmental impact, navigation safety, and conflicting uses of the sea space. It outlines the criteria and procedures for the assessment, designation, and licensing of offshore wind farm projects.

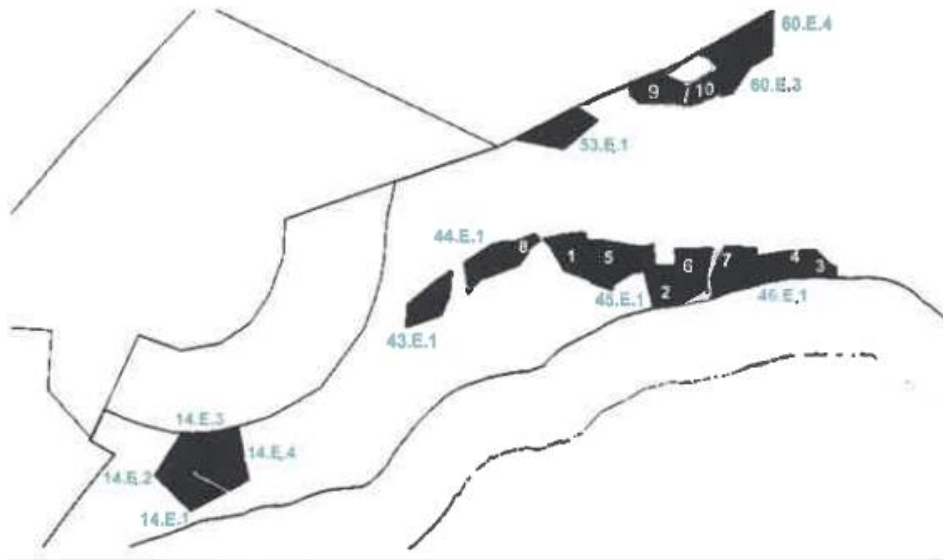


Maritime Spatial Planning of Polish's Sea Area. Source:[7]



Maritime Spatial Planning Geography Point of View. Source:[6]

In 2012/2013, permits for construction and use artificial islands, structure and devices in polish maritime areas (the so-called "location permits" or PSZW) were issued for several locations in the Baltics Sea. In most of these locations, preparations for the constructions of offshore wind farms are underway and it is expected that in the coming months, location permits will be issued for additional locations (according to the regulations, 11 additional locations are available).



**Situation Map of Issued and Potential OWF permits in the Polish Exclusive Economic Zones in The Baltic Sea.** Source: Polish Offshore Act Regulatory Framework

Issued concessions for offshore wind farms			
1	Baltyk II	Polenergia + Equinor	800 MW
2	Baltyk III	Polenergia + Equinor	800 MW
3	B-Wind*	OceanWinds	200 MW
4	C-Wind*	OceanWinds	200 MW
5	Baltica 2	PGE + Orsted	1500 MW
6	Baltica 3	PGE + Orsted	1045 MW
7	Baltic Power	PKN ORLEN + NPI	1200 MW
8	Baltic II	RWE	350 MW
9	Baltyk I	Polenergia + Equinor	1560 MW
10	Baltica 1	PGE + Orsted	900 MW

**The List of Companies Have Applied the Location Permits.** Source: Polish Offshore Act Regulatory Framework

## 1.7 Contract Agreement Scheme

Poland has now implemented a co-operative contract husk with an investor called Contract for Difference. Contract for Difference (CFD) agreements provide revenue stability and encourage investment in renewable energy initiatives, such as offshore wind turbines. In Poland, the CFD accord is a specific scheme supporting the development of offshore wind farms.

Under the CFD program, the Polish government guarantees a fixed price for the electricity produced by an offshore wind farm for a specified time period. Typically, this fixed price, also known as the strike price, is greater than the current market pricing for electricity. The difference between the strike price and the market price is the premise of the contract, and the government compensates the project developer for this difference through payments. Typically, the duration of the CFD agreement is between 15 and 20 years. During this time, the government pays the wind farm operator based on the agreed-upon strike price, regardless of the actual market price of electricity. This revenue stability offers investors greater assurance and facilitates project financing.

The CFD scheme encourages the development of renewable energy by providing offshore wind projects with a predictable and alluring revenue stream. It helps mitigate the higher initial costs of building and operating offshore wind farms relative to conventional energy sources. The CFD scheme reduces the financial risk for project developers and encourages investment in the renewable energy sector by providing a stable income.

The government determines the strike price, contract terms, and eligibility requirements for the CFD scheme for offshore wind farms in Poland. Depending on the specific round of auctions or tenders held by the Polish government, these particulars may alter. To assess the economic viability of offshore wind farms and plan investments accordingly, investors and developers must remain abreast of the most recent regulations and guidelines issued by the Polish government concerning the CFD scheme for offshore wind farms.

## **II. Future General Legal Regulation**

General legal stability and predictability of the legal framework for offshore wind energy development are crucial indicators for investors. A stable regulatory environment reduces risks and uncertainties associated with policy changes. Based on Polish Offshore act Regulatory Framework released from Ministry of State Assets Department of Fuel and Energy Companies, the Sector Deal Agreement is undefined period of time which means there is still a lot of expensive work to be completed as the initial OWF construction work progresses. This once happened as a reaction to the rule that the distance between wind farms and residents' housing was 10 times the diameter of the blades in 2016 and has now been abolished. This is a challenge for every investor in running their business in the future and being able to accurately predict the rules that are likely to change. And in the future there will be many more location permits that will be given and auctioned off by the government with the aim of pursuing the energy demand targets of offshore wind farms and the ease of obtaining permits and licenses, judging by the existing trends.

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### **III. Public Financing Sources**

Investors in the offshore wind farm project in Poland have access to a variety of public financing options to support their investments. Here are some frequent alternatives:

1. **European Union Funds:**

Poland has access to EU funds for the promotion of renewable energy initiatives as a member of the European Union. Investors may investigate programs including the European Regional Development Fund (ERDF), the European Structural and Investment Funds (ESIF), and the Connecting Europe Facility (CEF). These institutions may provide grants, loans, or guarantees to support infrastructure development, including offshore wind projects.

2. **National Support Schemes:**

The Polish government has implemented programs to encourage renewable energy project development. Programs such as feed-in tariffs, auction systems, and renewable energy certificates, which provide long-term contracts or incentives for electricity generated by offshore wind farms, are available to investors. These initiatives can improve the economic viability of the enterprise by assuring stable revenue streams.

3. **Green Investment Banks:**

Public financing for offshore wind projects can be provided by green investment banks or institutions dedicated to financing renewable energy in Poland and other European nations. These banks may provide loans, equity investments, or other financial instruments to support the development of wind farms, as they are specialized in financing renewable energy initiatives.

4. **Public-Private Partnerships (PPPs):**

Through PPP arrangements, investors can contemplate partnering with public entities, such as local administrations or state-owned companies. This partnership can provide access to public funding, infrastructure assistance, and regulatory support. PPPs can also help mitigate risks and improve the bankability of a project.

5. European Investment Bank (EIB) and International Financial Institutions:

Sustainable energy initiatives may be financed by the European Investment Bank and other international institutions. These institutions provide long-term financing, guarantees, or equity investments to support renewable energy projects. Through these institutions, investors can investigate potential access to funds.

6. Regional or Local Development Agencies:

Regional or local development agencies in Poland may offer grants or funding programs to support renewable energy projects. These agencies seek to promote economic growth and sustainability in their respective regions and can offer investors financial assistance or advisory services.

## **IV. Project Economic Viability**

Assessing the economic viability of a Polish offshore wind farm project necessitates a comprehensive analysis of numerous factors. Here are some recommended techniques to consider:

- **Financial Modeler Analysis**

Developing a comprehensive economic model that includes the project's capital costs, operational expenses, revenue projections, and financing structure. This model must account for turbine capacity, installation and maintenance costs, power purchase agreements, grid connection fees, and anticipated electricity prices.

- **Cost-Benefit Analysis**

To compare the anticipated costs and benefits of the project over its lifetime. This analysis should consider the economic, environmental, and social impacts of the endeavor. Consider elements such as job creation, reductions in carbon emissions, energy security, and prospective tourism and recreation benefits.

- **Levelized Cost of Energy (LCOE)**

Calculating the LCOE, which represents the average cost of electricity generation over the lifetime of the undertaking. This metric enables the competitiveness of the undertaking to be compared to other energy sources. Consider capital expenditures, operational expenses, maintenance costs, and anticipated energy production.

- **Project Risk Analysis**

Analyze the risks associated with the project, such as construction delays, interruptions in the supply chain, fluctuations in electricity prices, regulatory changes, and environmental impact uncertainties. Conduct a sensitivity analysis to evaluate the project's resistance to various risk scenarios and to identify potential risk mitigation strategies.

- **Market Analysis**

Analyze the market conditions and regulatory structure for offshore wind energy in Poland. Evaluate the existing policy incentives, support mechanisms, and market trends for the future. Consider government subsidies, renewable energy goals, grid capacity, and market



competition.

- Participants Rapprochement

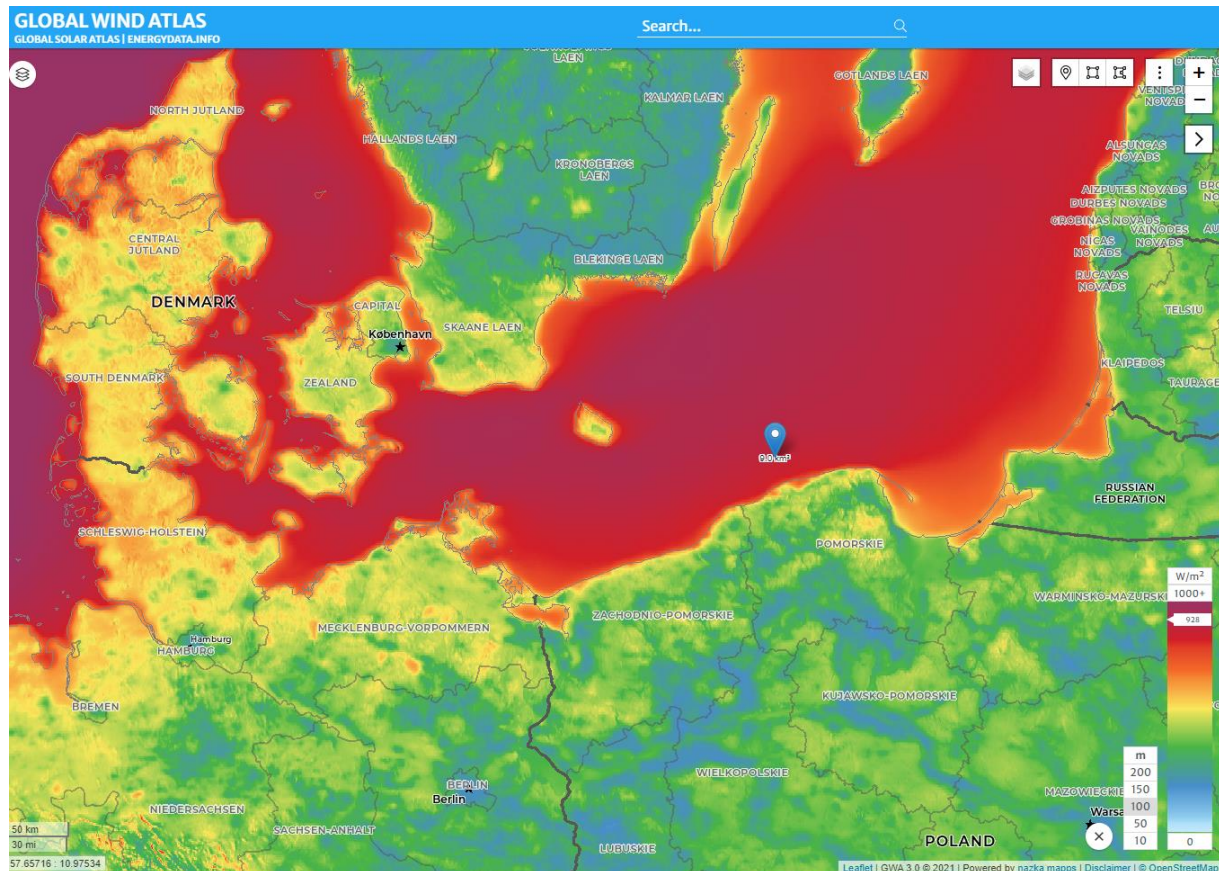
Engage pertinent stakeholders, such as local communities, government agencies, industry experts, and prospective investors. With agencies, industry experts, and potential investors, collect feedback, resolve concerns, and ensure alignment with the project's aims and objectives. Collect feedback, address concerns, and ensure project goals and objectives are met. This procedure can provide valuable insight into the economic viability and social acceptability of the undertaking.

- External Expertise

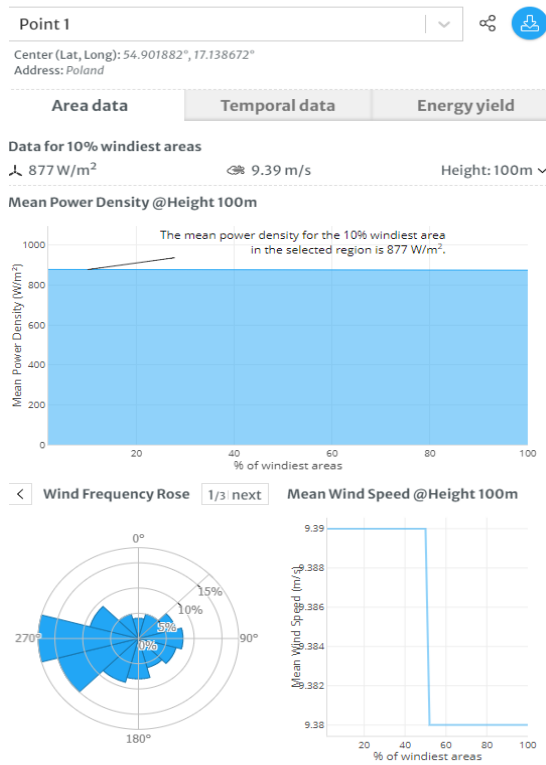
Request input from specialized consultants or offshore wind energy project experts. They can provide technical knowledge and market insights to validate the economic viability assessment of the project.

## V. Technical Analysis Review

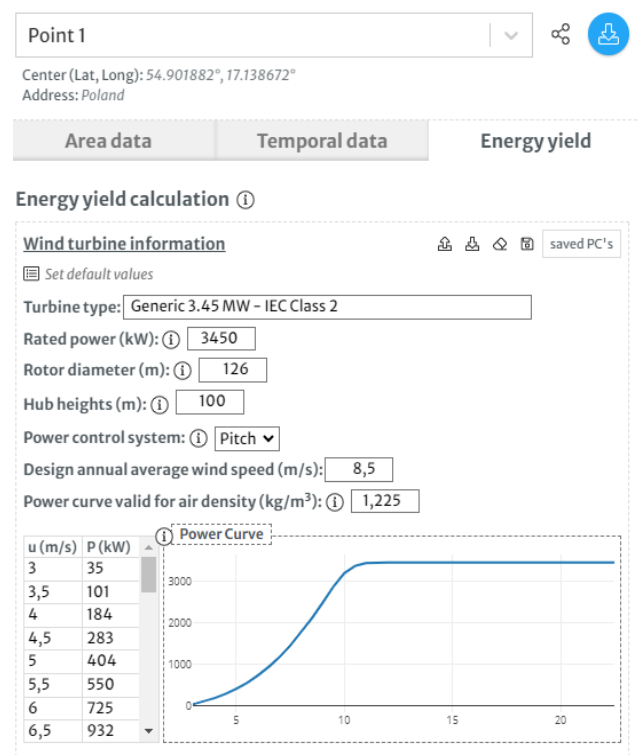
The capacity factors of onshore and offshore wind turbines are used to evaluate their productivity. In Poland, the capacity factor of onshore wind turbines is estimated to be 25.5% in 2021 and 30.1% in 2022. The simulation estimates a capacity factor of 55.6% for planned offshore wind generation under the wind speed conditions of 2022. In addition, the study examines the Polish power system's peak load demand for 2022[8]. Recent developments show that up to 33 GW of Poland can be extracted from potential offshore wind farms in the Baltic Sea[9]. If analyzed from the average wind speed near the offshore area of Gdansk and its surroundings, it can be observed as follows for specific area by using real time data monitoring platform.



**Screening Location by using Global Wind Atlas GIS and Mapping. Source:[10]**



a)



b)

a). Wind Speed at Point 1 b). Energy Yield. Source:[10]

As test data at Point 1 around the Baltic Sea, a wind speed of 9.39 m/s is obtained, which is where this speed is measured at a height of 100 meters above sea level. Where the annual average wind speed is at least 9 miles per hour (mph) or 4 meters per second (m/s) for tiny wind turbines, and 13 mph (5.8 m/s) for utility-scale turbines, are suitable locations for wind turbines[11]. And if analyzed further, from the environmental conditions that have been obtained, a recommendation is given for a Wind Turbine specification in the form of Turbine type data, estimated power rate, rotor diameter, hub height, type of power control system, design annual power speed, and a valid power curve with high air density to calculate energy yield.

In addition, the study investigates the quantitative impact on the national power grid of deploying 6 GW of offshore wind turbine capacity. This analysis offers valuable insights into the potential contribution of offshore wind energy to meeting Poland's energy demands and enhancing the country's overall power system.

## **VI. Conclusion and Recommendation**

The offshore wind energy sector in Poland is experiencing significant development and growth, driven by favorable legislation and government initiatives. The legal framework for offshore wind farm development in Poland has evolved over the years, with the recent enactment of the Offshore Wind Act in 2021 providing a solid foundation for the industry. The Act establishes a support system and auction mechanism for offshore wind projects, creating opportunities for investment and facilitating the achievement of renewable energy targets, below some important key Findings:

- Poland has made significant progress in developing its offshore wind energy sector, with the enactment of the Offshore Wind Act in 2021 and the establishment of a legal framework for offshore wind farm construction.
- The country has set ambitious targets to generate 5.9 GW of electricity from offshore wind by 2030 and 11 GW by 2040, highlighting its commitment to renewable energy.
- The Polish government has emphasized the importance of local content, job creation, and training in the offshore wind industry, with targets set for employment and workforce development.
- Environmental impact assessments and permitting procedures play a crucial role in ensuring compliance with environmental regulations and minimizing negative effects on marine ecosystems.
- The development of the transmission grid and permit licensing procedures are key considerations in the implementation of offshore wind projects in Poland.
- Maritime spatial planning is being undertaken to identify suitable areas for offshore wind farm development and manage conflicting uses of sea space.
- The implementation of a cooperative contract scheme, such as the Contract for Difference (CFD) program, provides revenue stability and encourages investment in offshore wind projects by guaranteeing a fixed price for electricity production.
- Investors in Poland's offshore wind sector have access to various public financing sources, including EU funds, national support schemes, green investment banks, and public-private partnerships.

- The future legal regulation of the offshore wind industry in Poland remains a key consideration for investors, as stable and predictable regulatory frameworks are essential for reducing risks and uncertainties.
- Overall, Poland is making significant strides in developing its offshore wind energy sector, and with the right regulatory support, public financing, and commitment to local content, it has the potential to become a competitive and sustainable player in the offshore wind industry.

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