

Translation from Polish*[national emblem of Poland]***Regional Director for Environmental Protection in Gdańsk**

RDOS=Gd=WOO.4211.26.2015.KSZ.20

zpo

Gdańsk, 27 March 2017

**DECISION**

Pursuant to Article 75(1)(1)(c) in conjunction with Article 71(2)(1), Article 82(1)(2)(b), Article 82(1)(2)(c), Article 82(1)(4), Article 82(1)(5) of the Act dated 3 October 2008 on Provision of Information on Environment, Public Participation in Environmental Protection and Environmental Impact Assessments (consolidated text, Journal of Laws of 2016, item 353, as amended), § 2 sec. 1 points 5 and 6 of the Regulation of the Council of Ministers dated 9 November 2010 on Projects Likely to Have Significant Impact on Environment (Journal of Laws of 2016, item 71) in conjunction with Article 104 of the Act dated 14 June 1960 – the Code of Administrative Procedure (consolidated text, Journal of Laws of 2016, item 23, as amended),

having reviewed the motion of Polenergia Bałtyk II Sp. z o.o. submitted by Mr. Michał Kozłowski, President of the Management Board and Mr. Michał Michalski, Member of the Management Board, together with supplementations and explanations dated 21 June 2016, 30 August 2016, 28 September 2016 and 2 February 2017, in the case concerning the issuance of the decision on environmental constraints for the project entitled:

**“Development of the Offshore Wind Farm Polenergia Bałtyk II”**

Acting on the basis of:

- 1) report on the environmental impact (prepared by: SMDI Doradztwo Inwestycyjne Sp. z o.o., Warsaw, January 2015), together with explanations dated 21 June 2016, 30 August 2016, 28 September 2016, 2 February 2017;
- 2) approval of the Head of the Maritime Authority in Gdynia, ref. no.: INZ1.1-KW/AM-8103-22/16 dated 22 February 2016;
- 3) approval of the Head of the Maritime Authority in Słupsk, ref. no.: OW-B5-271/03-6/16 dated 22 February 2016;
- 4) opinion of the State Border Sanitary Inspector in Gdynia, ref. no.: SE.ZNS.80.4912.1.16 dated 1 March 2016;
- 5) applications and comments submitted in the proceedings conducted with public participation,

having conducted an environmental impact assessment,

**I adjudicate, as follows:**

- I. The following environmental constraints are hereby established for the project entitled **“Development of the Offshore Wind Farm Polenergia Bałtyk II”**:

**1. Type and location of development of the project**

The subject matter of the project involves the development of the Offshore Wind Farm (OWF) Polenergia Bałtyk II with the capacity of 1200 MW. The project shall be located in the southern part of the Baltic Sea, in the Polish exclusive economic zone (“EEZ”), within 37 km north from the coastline, at the level of Smołdzino Municipality (the Pomorskie Province). The total surface area of the OWF Polenergia Bałtyk II is ca. 122 km<sup>2</sup>. The geographical coordinates are presented in the table below:

**Table 1. Geographical coordinates of the project**

Point	WGS 84 DD°MM'SS.sss"	
	Latitude	Longitude
A	55°00'50,524"	16°58'30,687"
B	55°02'06,260"	16°51'35,533"

C	55°02'07,171"	16°50'52,962"
D	55°06'08,711"	16°46'23,733"
E	55°06'11,836"	16°46'19,179"
F	55°07'06,218"	16°44'36,995"
G	55°07'25,002"	16°47'08,284"
H	55°07'54,264"	16°50'28,666"
I	55°08'05,318"	16°53'34,432"
J	55°08'17,668"	16°55'19,642"
K	55°08'12,077"	16°56'59,967"

OWF Polenergia Bałtyk II shall consist of:

- 1) maximum 120 wind power plants ("**WPP**") whose basic components shall include: foundation, tower, nacelle with a power generator and a rotor;
- 2) maximum 6 internal offshore substations ("**OPS**"),
- 3) maximum 200 km sections of the offshore power and telecommunication cables connecting:
  - a. WPP with each other (in cable circuits),
  - b. WPP groups with external offshore substations,
  - c. Internal OPS with an external (forming a part of another project) offshore substation (option).

The investor holds a permit to erect and operate artificial islands, constructions and facilities in the Polish maritime territories (PSZW) for the project OWF Bałtyk Środkowy II – decision of the Minister of Transport, Development and Maritime Economy no. MFW/2/2013 dated 15 January 2013, amended by decision no. MFW/2a/13 dated 29 April 2013. In the course of administrative procedures aimed at the issuance of this decision on environmental constraints the name of the project in question has been changed from "**Bałtyk Środkowy II**" to "**Polenergia Bałtyk II**". The parameters, location and the entire submitted design documentation for the off-shore wind farm remain unchanged.

The surface area designated for the development of the OWF Polenergia Bałtyk II is, according to PSZW, ca. 122 km<sup>2</sup>. Elements of the offshore wind farm (OFW) cannot be located within the 500-meter buffer zone from the internal boundary of the area designated for development of the wind farm. Structural elements of the farm must be located within the so specified area, so it specifies the maximum external reach of the rotor, which additionally limits the area in which the foundations may be erected. The size of this restriction depends on the radius of the rotor. This means that the area in which, according to PSZW, elements of the farm may be located is the area specified in PSZW, reduced by the area of the buffer zone of the width of the rotor in a given variant of the project (the so called footprint area).

In addition, as a result of the performed analysis of the potential impact of the project on environment, additional restrictions in the use of the footprint area, in accordance with PSZW, were made:

- 1) in connection with the fact that the project may have a negative impact on sea birds, the southern part of the area, directly neighboring with Ławica Słupska, with the surface area of ca. 16.59 km<sup>2</sup> in the variant selected for development, and ca. 16.89 km<sup>2</sup> in the reasonable alternative variant, has been excluded from development with substations, maintaining an option to build other elements of the farm, e.g. cables or substations,
- 2) in view of the need to protect two ship wrecks discovered in the area of the project, ca. 0.3 – 1 km<sup>2</sup> of the surface area shall be excluded from any development.

In addition, as it follows from the provisions of the PSZW, the building design should provide for such a layout of structures and internal cables so that none of the planned structures or cables are located in the area closer than 2 sea miles from the existing sea lanes.

In view of the above, the report on environmental impact of the project in question (hereinafter the "EI Report", assumes that:

- the total surface area of the farm is ca. 122 km<sup>2</sup>, however:
- the surface area of buffer zone no. 1 (500 meters) is ca. 23 km<sup>2</sup>,

- the surface area of buffer zone no. 2 (500 meters + the radius of the rotor) is from ca. 26.5 km<sup>2</sup> (500 meters + 100 meters in the alternative variant) to ca. 27.5 km<sup>2</sup> (500 meters + 125 meters – in the variant selected for development), consequently:
- the area which can actually be developed is ca. 94 – 95 km<sup>2</sup>, of which the area in which the power plant may be erected is ca. 77 – 78 km<sup>2</sup> (depending on the variant).

At the current stage of the project it is not possible to present the final placement of the project. It will be agreed at the building design stage. The placement the power plant shall be agreed assuming the maximum possible energy production, taking into account in particular the following factors:

- data concerning the structure of the seabed obtained as a result of geotechnical survey,
- results of wind measurements (available after the measurements of wind),
- measurements of the selected power plant model and types of foundations,
- the need to avoid the so-called wake effect.

OWF Polenergia Bałtyk II does not include the infrastructure serving the purpose of transmitting the power generated by the farm to the onshore grid. A separate project – offshore transmission infrastructure (“**OTI**”) will serve this particular purpose. It is the subject of a separate procedure for the issuance of the decision on environmental constraints. The said project will consist in the development and operation of a grid whose function will be to transmit the energy between the onshore substations, which constitute elements of the National Power System (“**NPS**”), and the offshore substations which constitute the elements technologically related with the offshore wind farms.

The parameters of the WPP will depend on the selected capacity (the bigger the capacity, the higher the tower and the bigger the wing span). Basic boundary parameters of the wind power plants planned to be installed in the OWF Polenergia Bałtyk II are presented in the table below:

**Table 2. Basic boundary technical parameters of wind power plants in the variant selected for development.**

Parameter	Variant selected for development
Maximum total height of the power plant (above sea level) [m]	300 m
Minimum clearance between the lower location of the wind and the sea level (construed as the average sea level) [m]	20 m
Maximum rotor diameter [m]	250 m
Maximum zone of a single rotor [m <sup>2</sup> ]	49 087 m <sup>2</sup>

One or several models of the power plant may be installed in the farm.

**Location of the WPP is currently unknown.** Particular locations will be agreed after geotechnical surveys of the seabed and wind measurements which will be made at the building design stage. Nevertheless it was decided that the number of power plants and the surface area will be reduced, maintaining the maximum capacity of the farm thanks to the power plant of greater unit capacity which is related to a certain increase of their construction. This is how the variant most advantageous to the environment was created. This variant assumes development of up to 120 wind power plants with a maximum rotor diameter of up to 250 meters, located in the area of 77 – 78 km<sup>2</sup>. Around 16.59 km<sup>2</sup> of the farm area has been excluded from development with wind farms, the said area being located in the immediate vicinity of the Natura 2000 Ławica Słupska area (the remaining elements of the farm infrastructure: offshore substations, cables may be located in this area).

Towers of the power plant will be built with the use of combined rings made of steel, concrete or reinforced concrete. Plastic material (fiberglass) will be the basic construction material of the wings. Towers of the power plant will be erected on foundations which will be laid on the seabed. Four types of foundations may currently be used, namely: monopile, gravity, lattice jacket or tripod foundations. The towers will be attached to the foundation with a steel sleeve, the so-called connection, raising ca. 10 meters above the water surface and around 10 meters under the water surface.

**A steel monopile** is made of steel, welded cylinders. The monopile usually protrudes 5 to 12.5 meters above sea level (construed as average sea level) and is linked to the tower with a transition piece/connector of various length, installed either outside (solution most frequently

used) or inside the monopile. There are also additional elements on the connector such as places for anchoring service ships, ladders, direct platform, working platform and elements of power infrastructure (flexible cable sheath, the so-called J-tubes, and power and telecommunication cables). The length of the monopiles is up to 120 meters. They are currently the most popular foundations used on the offshore wind farm. The reinforced concrete monopiles have also appeared on the market.

**A jacket foundation** is also built of four steel legs joined and strengthened with clamps made of cross-mounted pipes. The upper part contains a connector (a transition piece) allowing to connect the foundation and the tower of the power plant. The said foundations are usually affixed to the seabed with 4 piles with a diameter of 1.8 – 3 m and a maximum length of up to 70 meters. The surface part of the jacket foundation includes also additional elements such as places for anchoring service ships, ladder, direct platform, working platform and also elements of power infrastructure (J-tubes, cables).

**The structure of a tripod foundation** consists of three legs supporting one central leg which constitutes the basis for the connector and the tower. The tripod legs are equipped with sleeves for placing piles. The lower part of each foundation leg includes special mud mats which are to keep the structure in a correct position on the seabed and prevent the settling of the structure before its attachment to the seabed with three piles with the diameter of up to 2.5 meters and length of up to 60 meters. There are also additional elements on the foundation, such as J-tubes, places for anchoring service ships, a transition deck, a ladder, etc.

**A gravity foundation** is a reinforced concrete structure. It consists of a main corpus and a base. The base may be in the shape of a cone or may be flat (octagonal, hexagonal or circular, etc.) and it will have a maximum diameter of 50 meters. The gravity foundation is filled with ballast. During the installation of this foundation, cement is pumped below the basis of the foundation which is to ensure the permanent contact of the foundation with the load bearing structure.

A layer protecting against leaching may be used for all types of foundations (especially the gravity and monopile foundations, rarely for the other types of foundations) it is usually a layer of stones with the width ranging from a few to a dozen or so meters placed around the foundation. The wind power plants will be connected with the substations with 33 kV or 66 kV power cable network. It is planned that up to 200 km of cable sections will be laid inside the farm. Their final length will depend on the number and the manner of location of the power plants. The cables will be buried in the seabed at a depth of up to 3 m. If the technical conditions do not allow them to be buried, they are to be covered with a layer of stones or other specially adapted loads. Power generated by the power plants belonging to the OWF Polenergia Bałtyk II will be prepared on the farm for further transmission. For this purpose, within the boundaries of the farm the internal offshore substations (the "OPS") will be built, in the maximum amount of 6 units. Development of the substations shall enable reduction of the number of export cables transferring the power from the wind farm onshore, and shall significantly reduce the transmission losses.

The following types of the OPS may be developed as part of the OWF Polenergia Bałtyk II:

- 1) transformer stations – receiving the alternate current (AC) from the wind power plants, then adjusting its voltage (33 or 66 kV) to an appropriately higher level, allowing its further transmission in the alternate current technology;
- 2) back-to-back stations – (AC/DC) – converting the alternate current (AC) into direct current (DC), allowing its further transmission in the direct current technology;
- 3) the ones which combine both functions.

At the current stage of the project no decision has been taken on whether the energy is to be sent to the onshore grid in DC or AC technology.

All internal offshore substations are to be located within the boundaries of the OWF Polenergia Bałtyk II. Their exact location is not known at the current stage of the project.

**Infrastructure for the transmission of energy to the onshore power grid** (i.e. export offshore and onshore cables, the onshore substation and possibly additional offshore substations) will be an autonomous and independent project consisting in the development of the offshore transmission infrastructure ("OTI"), falling under a separate environmental impact assessment procedure.

**The AC offshore transformer station** will be constructed on the basis of a platform based on the monopile, jacket, tripod or gravity foundations. The necessary power infrastructure and social facilities will be installed on the working platform. The typical capacity of the station is 150 to 350 MW. The typical parameters of the station of the aforesaid capacity is as follows: the area: 30 x 30

m, height: 15-20 meters, weight: 1000-1500 Mg.

The typical equipment of the OPS AC consists of the following elements: switchroom, power transformers, high voltage and medium voltage distribution substations, reactive power compensation chokes and capacitors, transformers or generator sets for back-up power supply, grounding system, internal installation panel, low voltage distribution devices for auxiliary equipment and protection, control and instrumentation systems, UPS uninterruptible power supply unit, SCADA system equipment, accommodation for service staff, leisure and employee lounge, material warehouse, workshop, marine, helicopter landing site, occupational health and safety and emergency equipment including Diesel generators, emergency lighting, lifeboats. The substation may also be used as a location of measuring and environment monitoring equipment e.g. meteorological data or wave information.

**The offshore back-to-back AC/DC (converter) station** will be constructed as an additional station, in addition to the aforesaid transformer stations, if the investor decides to apply transmission in direct current technology. It may be constructed as a separate facility or an additional element of the AC station. The AC/DC back-to-back station will be constructed on the basis of a platform based on the foundations such as monopile, jacket, tripod or gravity foundations. The necessary power infrastructure will be installed on the working platform, in particular equipment for the conversion of alternate current into direct current. The main components of the back-to-back station are converter transformer, converter thyristors, harmonic filters, capacitor batteries, reactive power compensation chokes, an external pumping station (cooling system). The typical transmission capacity of the station will be 600 to 900 MW. The working platform will be from 70 to 100 m long and from 40 to 60 m wide and up to 40 m high.

The OWF Polenergia Bałtyk II project will be implemented in stages which results primarily from the connection agreement concluded by the investor which enables the connection of 600 MW to the National Power System by 2025 in the area of the OWF Polenergia Bałtyk II. It is possible to acquire additional connection capacity and develop the OWF Polenergia Bałtyk II after 2025, however, it is contingent upon carrying out wind measurements, geotechnical surveys of the seabed and obtaining financing for the project.

Development of the first stage of the OWF Polenergia Bałtyk II has been planned for the years 2023-2026 and the second stage – after receipt by the investor of additional connection capacity. As the offshore wind power industry is developing very dynamically and each year new models of WPP and other equipment appear, the project may include models which are currently not available on the market. For these reasons an environmental impact assessment has been made on the basis of a technical parameters envelope which specified the most far reaching environmental impact scenarios for particular technological solutions. Consequently, the final technical parameters for particular farm equipment cannot be specified at the stage of decision on environmental constraints but only in the building permit. Nevertheless the authority responsible for the issuance of the building permit will be bound by the content of this decision on environmental constraints.

**2. Conditions of land use at the stage of development, operation or use of the project, with particular focus on the need to protect valuable qualities of environment, natural resources and heritage as well as the reduction of nuisance levels for the adjacent area:**

- 2.1 For the adopted technologies of carrying out the construction works (including transport), prepare and implement the procedures for dealing with movement of possible contaminants. This applies in particular to protection against contamination with solid and liquid waste. The farm should be equipped with measures to combat possible oil spills;.
- 2.2. Taking into account the environmental conditions of the area, rule out during implementation of the project the option that some contaminants may enter the aquatic environment.
- 2.3. Specify the technology for the performance of the building works in a manner allowing to avoid contamination of the marine environment with solid and liquid waste and, immediately and on an ongoing basis, remove from the water surface any pollution caused by the performed work. (pursuant to § 6 sections 1 and 2 of the Regulations of the Council of Ministers of 3 December 2002 on Organization and Manner of Combating Threats and Pollution at Sea (Journal of Laws of 2015, item 358) –

- combating pollution in Polish maritime areas is performed only by mechanical means. The head of the competent maritime authority may grant approval for the use of means other than mechanical means when combating pollution).
- 2.4. Organize and operate the facility for collection of waste and materials in such a manner so as to ensure the economical use of the land and minimal conversion of its surface.
  - 2.5. Carry out appropriate waste and wastewater management, including:
    - 2.5.1. organizing work in such a manner so as to minimize the volume of generated waste;
    - 2.5.2. selectively storing the generated waste at designated locations and in the manner not posing a threat to the marine environment and then transport the said waste to the land and manage it in accordance with the binding provisions;
    - 2.5.3. draining the domestic sewage into leak tight sewage tanks and then hand them over to the authorized recipient.
  - 2.6. If the presence of contaminants is detected during the earthworks, samples of soil should be examined in accordance with the methodology specified in the provisions on soil and soil quality standards, and in the case of exceeding these standards, earth masses treated as waste shall be remediated in accordance with the provisions on waste, outside the location of the project development.
  - 2.7. Construction works should be organized with due account taken of the requirements of maritime traffic safety and the necessity of undisturbed navigation.
  - 2.8. Construction works must be carried out with regularly inspected equipment and machinery in good state of repair.
  - 2.9. All contaminants from the units carrying out the construction works to be transferred to the port reception facilities.
  - 2.10. Works should be organized in such a manner so as to allow smooth workflow and proper protection against the possible contamination of surface water should be taken.
  - 2.11. Perform construction works in weather conditions which allow for the precise performance of the said works in accordance with the selected technology.
  - 2.12. The output that may be produced during the installation of individual elements of the farm on the seabed should be used for installing and securing the gravity foundations, left on the seabed within the boundaries of the farm or placed in a dump site designated by the Director of the Maritime Office in Słupsk or the Head of the Maritime Office in Gdynia.
  - 2.13. Comply with the OHS procedures established for the OWF Polenergia Bałtyk II in the course of construction works, including the marking of the onshore site compound and preventing of unauthorized access.
  - 2.14. Supply the onshore site compound, including temporary storage areas for building materials and components of the farm prior to their installation in the offshore area, with the following:
    - 2.14.1. sorbents or other agents to combat incidental leakages of petroleum-derived substances;
    - 2.14.2. sanitary facilities and social rooms for employees and ensure the regular collection of waste by the authorized operators;
  - 2.15. Construction materials and elements of farm objects should be delivered to the onshore site compound in batches whose size is necessary for carrying out the construction works and if possible avoid the long-term storage of such materials.
  - 2.16. Designate hard surfaced and sealed places for storing waste on the onshore site compound.
  - 2.17. All waste generated in the onshore site compound should be selectively collected and kept in containers or in separate areas which are easily accessible for waste collecting entities. Store hazardous waste in airtight, sealed and labelled containers.

- 2.18. Provide accommodation for service crews at sea during periods of intensive work.
- 2.19. Install additional radio/radar stations for efficient operation of all communication and technical observation systems outside the 2 km zone.
- 2.20. Use ship radars only under X-band (reduction of false radar echoes).
- 2.21. Develop rescue plans for the scenarios of accidents and emergencies agreed for the OWF Polenergia Bałtyk II, taking into account environmental protection requirements and this decision.
- 2.22. Switch off the radio communication and radiolocation equipment while working on antennas and transmitters, due to the transmitting power of this equipment.
- 2.23. Design the location or locations for the installation of the in-house radio communication and radiolocation equipment so that work can be carried out without the need to shut them down or apply other additional procedures that can reduce operational efficiency.
- 2.24. Ensure that the equipment is operated by persons trained in the use of the equipment, in general and specific occupational health and safety rules and under the permanent supervision of an occupational doctor.
- 2.25. During the construction, operation and decommissioning use only ships which meet the national pollution emission standards, or emission standards resulting from international agreements signed by Poland and the consequences of international standards. Vessels operating in the investment area should, to the extent possible, use the established or customary shipping routes.
- 2.26. Only technically efficient machines and vessels of the lowest possible emission of pollution, ensuring lack of leakage of the petroleum derived substances may be used. Prevent leakages of petroleum derived substances and in the event of emergency, secure the place against the dissemination of contamination and ensure its quick removal.
- 2.27. The transport of construction components and building materials in the waters administered by the Director of the Maritime Office in Gdynia to be carried out under conditions ensuring safety of the transported elements and materials, in accordance with the applicable regulations on safety of navigation and technical requirements.
- 2.28. Special protection measures should be taken in the event of leakages of oil or petroleum derived products preventing ingress of harmful substances into the marine environment.
- 2.29. When carrying out the works, consideration should be given to measures ensuring safety of water traffic in order to minimize the risk of collision with other vessels.
- 2.30. Minimize possible acoustic nuisance during the conducted works through the use of equipment and machines which comply with the Polish Standards, work to be carried out with properly silenced, technically efficient equipment with low emission of pollutants to the air. Technologies used to carry out the building works should be the least acoustically onerous.
- 2.31. When carrying out construction works – the conversion and use of natural elements is to be allowed only to the extent necessary in connection with the realization of the investment.
- 2.32. Implementation of the project should meet the requirements of environmental protection of marine waters in the context of the requirements arising out of the Water Framework Directive and the Marine Strategy Directive.
- 2.33. Provide archaeological surveillance during soil stripping in the area of archaeological sites.
- 2.34. Inspection of the seabed should be carried out in order to precisely determine the location of the facilities which could pose a threat to other users of the marine area and notify relevant authorities of the existing threat.

- 2.35. After completion of the work, all contamination of the seabed which occurred during the construction should be removed.
- 2.36. After the exploitation of the farm in question is completed, remove all of its components. Part of the foundation structures may be left if they constitute a habitat for valuable communities of marine organisms. The scope of the elements left behind should be agreed with the authorities competent for environmental protection and maritime economy.
- 2.37. Upon completion of decommissioning work, carry out inspections of the seabed to ensure that all farm components have been disposed of in accordance with the requirements of the United Nations Convention on the Law of the Sea.
3. **Environmental protection requirements necessary to be included in the construction project:**
  - 3.1. Design a maximum of 120 power plants with a minimum clearance between the lower rotor wing and the sea surface (medium sea level) of not less than 20 m, a rotor diameter of not more than 250 m, and a total height of the entire structure not more than 300 m above sea level.
  - 3.2. Design a maximum of 6 internal offshore substations and a maximum of 200 km of internal sections of power and telecommunication cables.
  - 3.3. Adopt a maximum power plant density of 1.56 items /km<sup>2</sup>
  - 3.4. Adopt a maximum zone for a single rotor of not more than 49 087 m<sup>2</sup> and a total maximum zone for all rotors not more than 5 890 440 m<sup>2</sup>.
  - 3.5. Adopt in the design the selected type of the foundation from among the following types: monopile, gravity, jacket or tripod foundations. Justify in detail the selected foundation.
  - 3.6. Maximum surface area of the seabed occupied by one foundation (without a possible protective layer against leaching) cannot exceed 1 964 m<sup>2</sup> and a total maximum surface area of the seabed taken by all foundations cannot exceed 247 464 m<sup>2</sup>.
  - 3.7. Design the layout of the power plant in such a manner so that they are not located in the most shallow (southern) part of the basin designated for the project which is a gathering place for very large flocks of long-tailed ducks. Exclude the 2km area from the border of the Natura 2000 Ławica Słupska area (in the eastern part of the farm area) from the location of the wind turbines, by extending the excluded area westward – width of 4 km.
  - 3.8. The elements of the OWF Polenergia Bałtyk II may not be located in the buffer zone of 500 meters from the internal border of the area designated for the development of the farm (according to the recommendation of the permit to erect and use artificial islands, constructions and equipment in the Polish maritime areas for the project entitled: "Offshore Wind Farm Bałtyk Środkowy II", decision of the Minister of Transport, Construction and Maritime Economy of 15 January 2012, ref. no. MFW/2/2013, amended by decision no. MFW/2a/13 dated 29 April 2013). All structural elements of the farm must be included within the boundaries of such designated area, thus the said area determines the maximum external reach of the rotor, which additionally limits the area in which foundations can be laid.
  - 3.9. The building design should provide for such a setup arrangement for the structures and internal cables so that none of the planned structures or cables is located in the area closer than 2 sea miles from the existing sea lanes (according to the recommendation of the permit to erect and use artificial islands, constructions and equipment in the Polish maritime areas for the project entitled: "Offshore Wind Farm Bałtyk Środkowy II", decision of the Minister of Transport, Construction and Maritime Economy of 15 January 2012, ref. no. MFW/2/2013, amended by decision no. MFW/2a/13 dated 29 April 2013).



- 3.10. Establish protection zones around the wrecks discovered in the area of the OWF Polenergia Bałtyk II i.e. a steamboat marked with symbol BS2\_120 – geographical coordinates X: 362064.43, Y: 805963.23 and a wooden sailboat marked with symbol BS2\_156, geographical coordinates: X: 365481.39, Y: 807308.25, establish protection zones and exclude the location of any elements of the farm, including its foundation and cables, in this particular zone. The zones should be established before commencing geotechnical surveys of the seabed in agreement with the Head of a relevant Maritime Authority and then they should be maintained at the stage of construction, exploitation and decommissioning.
- 3.11. Equip offshore substations with oil trays with a capacity of approx. 110% of the amount of oil in transformers, which can accommodate a total leakage in the event of their unsealing.
- 3.12. The time schedule of the construction works and guidelines for the coordination of works should specify the order of works, taking into account the need to minimize the time caused by emissions, the number and multiplicity of interference in environmental resources and minimize the risk of environmental damage.
- 3.13. When designing strength integrity of particular facilities of the power plant, clearance between the sea level and the wing tip (in its lower position), defrosting systems of power plant wings and lightning protection systems, it is necessary to take into account the increasing number of extreme weather events, including the increase in wind speed, sea level fluctuations, the increase in storm days and changes of sea currents. Materials and technical solutions which are to be used should reduce the likelihood of construction accidents and catastrophes, thereby reducing the exposure of people and the environment to their consequences.
- 3.14. The design should provide for a system of short-term wind turbine shutdowns in particularly difficult weather conditions, causing limited visibility during the period of the most intense migration of birds, i. e. from 15 March to 30 April and from 1 September to 15 October. The system is to ensure the constant observation and recording of the stream of birds migrating through the farm area and the immediate shutdown of turbines on the route of the planned flight of registered birds through the farm.

**4. Requirements for counteracting the effects of industrial accidents**

Not specified – the project does not qualify as a plant which could pose a threat of serious accidents, within the meaning of the Act of 27 April 2001 – the Environmental Law (i.e. Journal of Laws of 2017, item 519). Consequently, there is no need to specify the requirements for counteracting their effects.

**5. Cross-border impact requirements for projects for which the cross-border environmental impact procedure has been carried out:**

Not specified – the project will not cause the cross-border environmental impact, provided that the recommended mitigation measures, in particular with respect to the underwater noise abatement, are taken.

**II. The following obligations are hereby imposed on the applicant:**

**1. Obligations of the applicant with regard to actions minimizing and mitigating negative environmental impact:**

**A) reduced noise pollution from piling:**

- a) To design and implement technical solutions in the form of an air curtain or other technology, so as to minimize the impact of underwater noise on fish and marine

mammals, and to guarantee a reduction in noise pollution level so that - at the border of the nearest Natura 2000 marine mammal protection area, i.e. Ostoja Słowiańska PLH220023, it is not greater than 171 dB re 1  $\mu\text{Pa}^2\text{-s}$  (SEL, in water). If the aforesaid noise pollution threshold is overstepped, pile driving must be suspended until additional mitigation measures have been put in place to bring the noise pollution below the stipulated level. Any incidental overstepping of this level should be reported to the Regional Director for Environmental Protection in Gdańsk within 7 days of the date of its occurrence. The application should indicate the mitigation measures implemented by the Applicant and confirm their effectiveness.

- b) To ensure that the construction process is properly organized in such a way so as to ensure that breaks in the piling process of not less than four days are made at least once every two months, with the proviso that these breaks may also result from weather conditions.
- c) To plan the schedule of works in such a way that the activities causing the greatest impact on the natural environment (i.e. the driving of foundation piles) are carried out in the period from 1 May to 30 September.
- d) To apply the procedure for a gradual commencement of piling ("soft start").

**B) reduced impact on birds:**

- a) To permit the development of a maximum of 120 power plants with a minimum clearance between the lower rotor wing and the sea surface (medium sea level) of not less than 20 m, a rotor diameter of not more than 250 m, and a total height of not more than 300 m above sea level;
- b) To adopt, in the execution design, a schedule of construction providing for new power plants being developed next to each other, starting from one place, so that the area designated for the investment can be gradually filled with structures, expanding the area of the farm to include neighboring power plants.
- c) To plan the schedule of works so that the activities causing the greatest environmental impact (i.e. the installation of foundation piles) are performed between the months of May and September, when the bird count in this area is the lowest, subject to potential limitations as regards nighttime site lighting in connection with bird migrations in autumn.
- d) In the periods of bird migration, i.e. from 1 July to 15 November and from 1 March to 15 May, limit the use of strong light sources (e. g. headlights) in vessels and farm structures at night time and do not direct light upwards. Small, weak and pulsating light sources are to be used. In foggy weather conditions, switch from continuous to long interval pulse lighting. The solutions used must not breach regulations applicable to air traffic and tall structure marking.
- e) Rotor blade tips to be painted bright colors, in accordance with applicable regulations on marking aircraft obstacles.
- f) When there are large congregations of long-tailed ducks on the Słupsk Bank (from 1 November to 30 April) no vessels will be allowed in the Natura 2000 Ławica Słupska (Słupsk Bank) area in connection with the construction, demolition or operation of Polenergia Bałtyk II.

**C) cultural heritage protection:**

- a) If new archaeological sites which have not yet been identified are discovered during geotechnical surveys or construction works, they must not be tampered

with or damaged as a result of the performed works and the relevant administrative authorities must be notified of the said discovery.

**D) Hypothetical discovery of traces/remnants of military operations:**

- a) To develop and implement procedures aimed at preventing accidents caused by unexploded bombs, in particular those involving chemical warfare agents, at every stage of project implementation. The procedures should include the ongoing identification of such items in the course of geotechnical surveys and construction works, first aid if required in the event of contamination, communication and notification procedures, and finally the removal of contaminants from the vessel. To a limited extent, to develop and implement the same procedures for situations involving accidental removal of conventional military facilities. Considering that it may be impossible to identify the type of the weapon removed from the sea, all precautions should be taken as in the case of chemical weapons. The removal of an item should be reported to the Maritime Office in Słupsk and the relevant naval services.

**E) environmental safety in the case of unscheduled events:**

**E.1 at the stage of development and decommissioning:**

- a) To gradually and temporarily close the water region covered by the construction / decommissioning works for vessels uninvolved in the construction/ decommissioning of the OWF.
- b) To implement an alert system for vessels uninvolved in the construction / liquidation of the OWF.
- c) To identify safety zones by way of navigation warnings issued by the National Coordinator (KKON, currently: the Navy Hydrographic Office in Gdynia), taking into account the regulation of the Director of the Maritime Office concerning safety zones, issued pursuant to the Act of 21 March 1991 on Maritime Areas of the Republic of Poland and the Maritime Administration (Journal of Laws of 2016, item 2145, as amended).
- d) To indicate fairways for vessels involved in the construction/decommissioning of the OWF in order to minimize potential interactions between the traffic of the vessels operating the farm and external vessels, as well as to control access (e. g. through designation of an entry to the area) and vessel traffic within the area of the OWF.
- e) To determine the maximum permitted speed for vessels within the OWF area and their respective minimum distance from each other (depending on their type and size, meteorological conditions and risk factors).
- f) To introduce a requirement providing for a minimum of 2 persons to be present on the navigational bridge of a vessel involved in the construction/ decommissioning of the OWF in order to reduce the risk of a navigational error.
- g) To equip at least one vessel operating in the area of construction/ decommissioning of the OWF with flexible dams and packaged sorbents - in order to limit the spread of oil spills and to eliminate minor leaks, as well as a device for mechanical collecting of pollution from the water surface (e.g. a skimmer) together with a container(s) for the collected oil.

- h) To develop procedures for the transport/translocation and storage of substances likely to contaminate the marine environment.
- i) To establish an effective communication system between the OWF, the Contract Engineer and the Services responsible for navigational safety and prevention of threats and pollution at sea, in order to react quickly to emergency situations (as defined in the plan and accepted by all participants, i.e. maritime administration, Maritime Search and Rescue Service (Polish: MSPiR), Contract Engineer, investor and other entities).
- j) To provide regular training and training for employees and subcontractors, covering, among others, the prevention and removal of oil spills.
- k) To inform the crews of small vessels about the dangers resulting from waves caused by large ships and the associated impacts, which may result in the collision of such vessels with the offshore wind farm.
- l) To use vessels whose hulls are not covered with anti-fouling paint containing TBT.
- m) To update the initial plan developed for the needs of the OWF Polenergia Bałtyk II to counteract risks and pollution during the construction and decommissioning of the farm. The update should take place before the start of construction or decommissioning of the farm, respectively.

#### **E.2. at the stage of operation**

- a) To provide a tight turbine casing to prevent oil leaks.
- b) To equip offshore substations with oil trays with a capacity of approx. 110% of the quantity of oil in transformers, which can fully absorb any potential leakage.
- c) To put a system in place to monitor the operation of the installation and the condition of the facilities, to react in advance to any possible damage to the installation and to make it possible to change operating parameters or to switch off a device before a serious accident occurs, resulting, among others, in an oil release.
- d) To identify safety zones by way of navigation warnings issued by the National Coordinator (KKON, currently: the Navy Hydrographic Office in Gdynia), taking into account the regulation of the Director of the Maritime Office concerning such zones issued pursuant to the Act of 21 March 1991 on Maritime Areas of the Republic of Poland and the Maritime Administration (Journal of Laws of 2016, item 2145, as amended).
- e) To determine maximum permitted speed limits for vessels in the area of the offshore wind farm.
- f) To introduce a requirement providing for a minimum of 2 persons to be present on the navigational bridge of a vessel operating within the area of the offshore wind farm in order to reduce the risk of a navigational error.
- g) To equip the OWF with flexible dams and packaged sorbents as well as a small/medium size mechanical device (e.g. a skimmer) together with a container(s) for the collected oil - in order to limit the spread of oil spills and to eliminate minor leaks (located in one of the offshore transformer stations).
- h) To establish 24-hour supervision and monitoring of the operation of the OWF by the OWF Operational Centre.
- i) To develop and implement procedures for the transfer and storage of substances likely to contaminate the marine environment.

- j) To establish a system of effective communication between the OWF – Operational Center of OWF – Services responsible for safety of water transport and prevention of threats and pollution at sea, in order to quickly respond to emergencies.
- k) To conduct regular training and training for employees and subcontractors in, among others, proper operation of the OWF and prevention and elimination of oil spills.
- l) To use vessels whose hulls are not covered with anti-fouling paint containing TBT.
- m) To update the initial plan developed for the needs of the OWF Polenergia Bałtyk II to counteract risks and pollution during the construction and decommissioning of the farm. The update should take place before the commissioning of the farm.

**F. navigation safety:**

- a) To use adequate navigational markings of the wind farm area.
- b) To establish and maintain appropriately marked safety zones at all stages of operation including, in particular, decommissioning.
- c) The project site where construction/decommissioning works will be carried out to be closed to navigation, and mark the entire site of the Polenergia Bałtyk II farm together with the surrounding safety zone as a hazardous area to be avoided.
- d) To introduce an absolute shipping ban in a safety zone of min. 50 m, staked out around each Polenergia Bałtyk II OWF facility.
- e) To introduce direct navigation supervision during the phases of construction and decommissioning, and to monitor the Polenergia Bałtyk II OWF area during the operational phase using navigation monitoring vessels, closed circuit television (CCTV), Automatic Reporting System (AIS) and radars.
- f) To provide navigation support in the form of AIS transponders, RACON radar transponders, navigation lights and fog sirens on key turbines.
- g) To launch a navigation service for all vessels in the vicinity of the Polenergia Bałtyk II OWF whereby they will be advised they are sailing near a closed area.
- h) To develop rescue plans and train crews of the vessels participating in the construction and operation of the Polenergia Bałtyk II OWF.
- i) To regularly update and verify rescue plans by organizing alarm drills.
- j) To provide permanent communication lines between the Polenergia Bałtyk II OWF and the onshore monitoring center and the Słupsk Traffic Control and Maritime Search Service (MSPiR, SAR).
- k) To develop a plan for the safe construction, operation and decommissioning of the Polenergia Bałtyk II OWF.

**G. Landscape protection:**

- a) Turbine rotors to be painted with a standard paint color RAL7035 customarily used for offshore wind farms or any other color selected in such a way so as to minimize the contrast between the turbines and the background regardless of visibility conditions, thereby contributing to the

reduction of the impact on the marine landscape, subject to the need to use the legally required air traffic marking system.

## **2. Applicant's obligation to monitor the environmental impact of the project:**

- 2.1.** Environmental monitoring (including as regards the impact of the project on the targets, subjects and areas protected under the "Natura 2000" programme and their integrity) at the stage of construction, operation and liquidation of the wind farm in line with the general scope, time schedule and methods set out in points 2.4., 2.5. and 2.6 below.
- 2.2.** Reporting to the Director General for Environmental Protection in Gdańsk the results of the monitoring efforts, and suggesting prevention and/or mitigation measures, if necessary, such reports to be in the form of:

- 2.2.1. Periodic reports – to be submitted annually within 3 months of the end of the given year of research;
- 2.2.2. Final reports (prepared to sum up the entire research cycle) – to be submitted within 6 months of the end of research regarding the applicable environmental resource.

If an adverse negative impact on the given environmental resource is indicated in a periodic or the final report or if other material environmental hazards are identified, the monitoring report ought to suggest prevention or mitigation measures, and a method for their implementation and follow-up.

- 2.3.** Final monitoring reports in respect of the given environmental resource ought to be drafted in such a manner as to consist of two parts: one setting out results of the research conducted after the project has been completed, and the other juxtapose these results with the findings made in the report used as the basis for the present decision and the findings made herein, so that it can be used as a post-execution analysis.

## **2.4. Scope of monitoring at the construction stage:**

- 2.4.1. Hydrological and hydro-chemical conditions:** On-going monitoring of hydrological conditions of the project area and day-to-day analysis of these conditions to be made in the course of the construction of each facility on the wind farm. The scope of research to include: surface water waves, water flows across the entire cross-section of the water column and sea water turbidity.
- 2.4.2. Benthos:** Monitoring the taxonomic composition, population and biomass of the macrozoobenthos at the stage of the construction phase, no later than one month after the foundation has been laid, using the HELCOM COMBINE 2014 methodology, in 30 stations (for 5 wind turbines, at a distance of 20 m, 50m and 100 m away from the structure on the axis of the sea current and a reference profile).
- 2.4.3. Sea mammals:** Porpoises to be monitored using C-POD click detectors in a similar manner to that used before the investment was commenced. Construction site noise pollution to be measured during noise intensive works (e.g. while piles are being driven into the seabed). Operating noise must be measured for three different noise spectra (low, medium and high), depending on the wind force classification.

- 2.4.3.1. Passive acoustic monitoring of porpoises in the vicinity of the OWF in the same locations as during the pre-investment monitoring (55°03'12.43217 N,

16°52'21.26416 E; 55°06'44.29745 N, 16°47'51.05783 E, 55°06'30.08819 N, 16°55'40.99386 E), at least 3 porpoise click detectors (C-POD) to be used. Additionally, there more C-POD devices to be installed in two different reference locations located at least 20 km away from the source of impact (i.e. within the reach of behavioral reaction to the pile driving activity).

- 2.4.3.2. At the construction phase, the measurements to be taken by means of calibrated underwater microphones (hydrophones) with a frequency of 10-20kHz.
- 2.4.3.3. The hydrophone to be located on the border of the Ostoja Słowińska Natura 2000 area, i.e. the area of sea mammal protection closest to the BS II OWF. Additionally, noise readings to be taken at a distance of 750 m and 5000 m from the foundations.
- 2.4.3.4. Underwater noise measurements during the construction phase must be conducted at the time of pile driving activity.
- 2.4.3.5. Porpoise monitoring ought to begin no later than 6 months before the construction begins and continue throughout the project construction phase.
- 2.4.3.6. Additionally, the impact of the noise pollution generated in the construction phase on grey seals along the coastline, within the boundaries of the Natura 2000 area.

## **2.5. The scope of monitoring at the stage of project operation:**

- 2.5.1. Periodic monitoring must be conducted to research gradual formation of plant and animal habitats at the OWF site against the background of neighboring areas. The monitoring activity must be performed using standard multi-panel research fishing nets used in the pre-investment research phase. In the first year following the completion of the construction phase, 2,000 meters of fishing nets ought to be put up inside the OWF in the space of one year, in 4 different seasons (spring, summer, autumn and winter), with the proviso that fishing nets need to be put up two times in each season. At the same time, an identical set of research tools must be put up for comparative analysis purposes at a distance of up to 20 km away from the project site, in an area with similar bathymetry. The research must be repeated 3 and 6 years after the structure has been put in place. Additionally, in the same locations and in the same time intervals samples of ichthyoplankton ought to be taken in accordance with the guidelines of the Food and Agriculture Organization of the United Nations (Smith and Richardson, 1977). This is one of the recommended methodologies for ichthyoplankton extraction to be used by member states affiliated with the ICES (international Council for the Exploration of the Sea).
- 2.5.2. Noise background ought to be monitored when the farm is in operation. The data to be collected on a random basis, from different turbines forming the OWF. The noise emitted by one working wind turbine ought to be conducted once for three different wind speeds (sea force scale) – 2, 4 and 6 Bft.
- 2.5.3. **Sea bottom and seabed sediments.** Regular technical inspections and audits of foundations and cables must be conducted. A ROV vehicle fitted with an underwater CCTV system ought to be used during inspections so as to inspect the erosion of the sea bottom in the project vicinity and detect any potential damage to cables. Detection devices ought to be used to find cable locations.

The inspections ought to be conducted in the 6<sup>th</sup> and 12<sup>th</sup> months after the construction phase has been completed (preferably after the spring and autumn seasons due to the increased dynamics of the natural environment, the vertical mixing

of water strata, and storm surges) and subsequently, depending on the environment dynamics, once every 2 or 5 years throughout the entire operational life of the Polenergia Bałtyk II OWF.

Bathymetric tests must be conducted for areas in the direct vicinity of the foundations for each seabed type (P1, P2, P3, P4, P5 and P6) to determine the pace and scale of sediments washout depending on seabed type. The inspections ought to be conducted twice - 6 and 12 months after the construction phase has been completed. As an alternative to ROV vehicle inspections and bathymetric tests, the washout rate may be monitored on an on-going basis by means of devices mounted on the foundations.

**2.5.4. Hydrological and hydro-chemical conditions:** Ongoing monitoring of hydrological conditions at the project site must be conducted and the results must be analyzed during the construction of individual structures making up the wind farm. The scope of research ought to include: surface waves, water flows across the entire cross-section of the water column and water turbidity.

**2.5.5. Benthos:** Macrozoobenthos research initiated to the construction phase to continue.

2.5.5.1. Maintain the monitoring of flora, epiphytes and other organisms colonizing the wind farm structures, including taxonomic composition, biomass, lowest depth and thickness of the epiphytic layer, length of bivalve mollusks. The monitoring to be conducted once a year in the project operation phase (May – June) for at least 5 years. Samples to be extracted by means of DAK frames by divers from 5 piles at three different depth zones, film footage and photographic documentation to be prepared, too. Additionally, phytobenthos ought to be analyzed using the Kruk-Dowgiałło et al. methodology (2010). HELCOM COMBINE methodology to be used to analyze the macrozoobenthos.

2.5.5.2. Monitoring the taxonomic composition, population and biomass of the macrozoobenthos at least once a year (May) using the HELCOM COMBINE 2014 methodology, in 30 stations (for 5 wind turbines, at a distance of 20 m, 50m and 100 m away from the structure on the axis of the sea current and a reference profile).

**2.5.6. Sea mammals:** For 24 months from the wind farm startup date, porpoise monitoring shall be continued using the same methods as during the construction phase.

**2.5.7. Birds.** Sea bird flights to be monitored by radar and by way of daylight counting birds in the direct vicinity of the wind farm.

2.5.7.1. In the bird migration season, bird research ought to be conducted from early July to mid-November and from 1 March to 15 May by means of radar devices. In winter, the frequency of bird flights over the wind farm to be monitored. Radar registration to be combined with human observation (including identification of bird species) at daytime and by listening in and identifying noises of night-flying birds.

2.5.7.2. Observation sessions to be carried out from aboard a vessel anchored on a site affording an unobstructed view of the wind farm from the direction on the route chosen by a majority of migrating birds in the migration season.

2.5.7.3. In each migration season (autumnal from 1 July to 15 November, and spring migration from 1 March to 15 May), the number of days with 24h monitoring



sessions must not be less than 20, in each month 2-5 day long observation sessions ought to be spaced in at least 10 day intervals.

- 2.5.7.4. The route of the research boat cruise to be set in such a manner to ensure that a 5 km zone around the borders of the OWF is included in the count, so that the data collected in this research can be compared with the data collected in the pre-investment monitoring phase and, on this basis, changes in bird concentrations at various distances from the wind farm are assessed. The research must be conducted primarily in the period with highest bird concentrations in the south Baltic sea area (from 1 October to 1 May), a frequency of no fewer than one boat cruise per month (with no less than two-week intervals) must be observed, whereas in summer (June to September) two research boat cruises will suffice, one in mid-August and one in mid-September.
- 2.5.7.5. In parallel with sea bird counting in the vicinity of the wind farm, bird counts ought to be organized on the Słupsk Bank, because the investment project is likely to affect the local avifauna. The timing of research cruises on the Słupsk Bank ought to be synchronized so that the counts in both areas are conducted at the same time.
- 2.5.7.6. As an alternative solution, the wind farm may be equipped with a system ensuring on-going observation and registration of the bird stream migrating across the project site in the migration seasons throughout the operational life of the project.
- 2.5.8. **Bats:** Bat monitoring to be conducted in close vicinity of the wind turbines in compliance with the methodology chosen for the research (Kapel et al., 2011). The research to be conducted in the first 5 years of the operational life of the wind farm (at least three seasons to be included in the research). Research in the first 2 years is mandatory, whereas the last 3<sup>rd</sup> seasonal research may be conducted at a later date (however, no later than during the first 5 years of the project operation).
- 2.5.9. **Fishing industry:** After the third year of operation of the Polenergia Bałtyk II OWF, data on fishing fleet operations provided by fishing administration authorities ought to be analyzed to assess the actual impact of the Polenergia Bałtyk II OWF on commercial fishing.

## **2.6. Scope of monitoring at the stage of decommissioning:**

- 2.6.1. **Sea bottom and seabed sediments.** Bathymetric survey and side scan sonar readings must be procured to determine which foundation remnants will remain uncovered and which will be buried under the seabed once the near-bottom environment resumes stability (possible navigational perils). Measurements to be taken 1 and 5 years after the wind farm was liquidated.

Seabed sediments must be tested for metal content (Pb, Cu, Zn, Ni, Cd, Cr, As, Hg, Al), mineral oils, biogenic substances  $N_{og}$  and  $P_{og}$  as well as TOC, WWA, PCB and TBT.

The research must be performed in the Polenergia Bałtyk II OWF area and in background reference points located around the investment.

5 reference points and ca. 20 measurement points must be set (assuming a measurement grid of 1 point per ca. 5 km<sup>2</sup>).

The research must be conducted in the 1<sup>st</sup> and 2<sup>nd</sup> year after the wind farm has been decommissioned. Biogenic substance content to be measured in winter, the season with the highest biogene content.

**2.6.2. Benthos:** The taxonomic composition, population and biomass of the macrozoobenthos at least once a year (May) using the HELCOM COMBINE 2014 methodology, in 30 stations (for 5 wind turbines, at a distance of 20 m, 50m and 100 m away from the structure on the axis of the sea current and a reference profile).

**2.6.3. Cultural heritage:** If new potential archeological artefacts are discovered, which could be part of identified wrecks, areas with sediment washouts must be surveyed with a view to revisiting and updating the list of areas barred from anchorage and other forms of use.

### **III. No need to establish a restricted use area**

Wind power plants have not been listed in the catalogue of projects for which a restricted use area may be created. That said, the project will also comprise seabed power lines and substations, for which this type of area may be created. However, it is not expected that any standards of environmental quality may not be met by these facilities, and thus it is not necessary to create a restricted use area for the project.

### **IV. a new environmental impact assessment to be carried out during the building permit procedure, with particular emphasis on:**

- A. defining the width and importance of the designated safety zones around individual power plants for bird and bat migration;
- B. defining the width of migration corridors between marine areas designated for offshore wind farms developed by various investors, and their significance to birds and bats. If research data indicate that it is scientifically justified to define migration corridors along borders of marine areas designated for offshore wind farms built by various investors, any proposals concerning such corridors included in the new environmental impact assessment report should be based on the guideline that the axis of the indicated corridor coincides with the line which divides the said marine area. If, for scientific reasons, the corridor should run differently, the axis of the said corridor should be defined in such a manner so as to evoke similar and comparable economic effects for the wind farms in the said areas at the lowest possible expense for the environment;
- C. analysis of the adopted methods of laying foundations and assessment of impact of the said procedure on particular components of natural environment;
- D. determining the impact that the layout of wind turbines and other sea-surface components of the wind farm has on the availability of the said area to animals, including in particular sea birds and sea mammals, and determining the impact on long-distance and local flight routes of birds;
- E. proposals of solutions minimizing noise pollution and reducing the size of the noise polluted area, which are adequate and practicable considering the selected foundation laying method;
- F. analysis and choice of methods for maintenance of wind farm structures.

### **V. Post-implementation analysis**

An obligation is imposed to perform and submit to RDOŚ in Gdańsk, within 3 months after the end

of the second research season, as part of project operation phase monitoring, a post-implementation (follow-up) analysis prepared in accordance with the rules and using the data layout template specified for the final monitoring reports ordered hereunder, such analysis to encompass all the issues covered by such monitoring activities.

## **VI. Attach the characteristics of the project as Appendix 1 hereto.**

### **STATEMENT OF GROUNDS**

On November 30, 2015, the Regional Director for Environmental Protection in Gdańsk received an application from Polenergia Bałtyk II Sp. z o. o., dated November 27, 2015 for a decision on environmental conditions, submitted by Michał Kozłowski – the President of the Management Board and Michał Michalski – a Member of the Management Board, for a project involving **construction of the Bałtyk Środkowy II offshore wind farm.**

An environmental impact report and a map in a scale ensuring legibility of the presented data, with marked areas of the planned project implementation and expected project impact, together with a soft copy of the map, have been attached to the application.

In its letter dated November 17, 2016, the Investor requested a change of the project name from “Bałtyk Środkowy II” to “**Polenergia Bałtyk II**” while indicating at the same time that the parameters, location and the complete documentation submitted remain unaffected.

By notice of February 1, 2016, ref. No. RDOŚ-Gd-WOO.4211.26.2015.KSZ.3, the parties to the procedure were informed about initiation of the procedure and a possibility to review the documents and submit comments and requests, if any. The information on the application was included in a publicly available Ekoportal data list ([www.ekoportal.pl](http://www.ekoportal.pl)) under the number 760/2015, maintained pursuant to Article 21 of the Act of October 3, 2008 on providing access to information on the environment and its protection, public participation in environmental protection and on environmental impact assessment (consolidated text, Journal of Laws of 2016, item 353, as amended) – hereinafter referred to as the EIA Act. The Applicant did not request to cover any of the documents presented with the submission or during the procedure with confidentiality clause.

Pursuant to **§ 2 section 1 point 5) and point 6)** of the regulation of the Council of Ministers of November 9, 2010 on projects that may significantly impact the environment (*consolidated text, Journal of Laws of 2016, item 71*), the planned project has been classified as: *“plants using wind energy for the generation of electric power with a total nominal power output of the farm of not less than 100 MW and located in the maritime areas of the Republic of Poland”,* and as *“substations or overhead power lines with a rated voltage not lower than 220 kV, of at least 15 km in length”*. The project in question will involve construction of a wind farm located in maritime areas of the Republic of Poland, along with internal offshore substations with a rated voltage of at least 220 kV.

Additionally, the project may also comprise elements that, if considered separately, would be also classified as projects likely to create a significant impact on the environment pursuant to § 3 section 1 point 59 of the aforesaid regulation, such as: “airports other than mentioned under § 2 section 1 point 30 or landing fields, except for landing fields of trauma centers mentioned in the Act of September 8, 2006 on the National Emergency Medical Services (*Journal of Laws of 2013, item 757, as amended*), intended only for rescue helicopters”, and classified pursuant to § 3 section 1 point 7 as: substations or overhead power lines with a rated voltage not lower than 110 kV other than mentioned under § 2 section 1 point 6.

In consequence of the foregoing, pursuant to Article 71 section 2 point 1), the implementation of the project requires a decision on environmental conditions.

The Applicant has applied for a decision on environmental conditions to obtain a decision

mentioned in Article 72 section 1 point 1 of the EIA Act, i.e. a building permit decision issued pursuant to the Act of July 7, 1994 - Construction Law (consolidated text, Journal of Laws of 2016, item 290, as amended). The project will be located *in the southern part of the Baltic Sea, in the Polish Exclusive Economic Zone ("EEZ"), approximately 37 km north of the coastline, at the level of Smołdzino Borough (Pomeranian Voivodship).*

Bearing in mind that the project may exert a permanent impact on the environment and due to its location in a maritime area, pursuant to Article 75 section 1 point 1) sub-point c) of the EIA Act the authority competent to analyze the case is the Regional Director for Environmental Protection in Gdańsk. Pursuant to Article 59 section 1 point 1) of the EIA Act, the implementation of the planned project likely to create a permanent significant environmental impact, requires mandatory performance of the project environmental impact assessment.

The present case requires approval of the project implementation conditions by the Director of the Maritime Office in Gdynia and the Director of the Maritime Office in Słupsk, pursuant to Article 77 section 1 point 1) of the EIA Act, and opinion of the State Border Sanitary Inspector in Gdynia, pursuant to Article 77 section 1 point 2) of the EIA Act. Pursuant to Article 6 of the *EIA Act*, the requirement for approval or providing opinion does not apply if the authority in charge of the procedure is also the approving authority or authority providing the opinion. The decision on environmental conditions shall be issued prior to obtaining the decisions referred to in Article 72 section 1 of the EIA Act.

In consequence of the foregoing, in letter ref. No. RDOŚ-Gd-WOO.4211.26.2015.KSZ.4 dated February 1, 2016, the local authority requested an approval of the project implementation conditions from the Director of the Maritime Office in Gdynia and the Director of the Maritime Office in Słupsk. In decisions ref. No. INZ1.1-KW/AM-8103-22/16 dated March 10, 2016 and ref. No. OW-B5-271/03-6/16 dated February 22, 2016, the Director of the Maritime Office in Gdynia and the Director of the Maritime Office in Słupsk, respectively, approved the project implementation conditions.

In letter ref. No. RDOŚ-Gd-WOO.4211.26.2015.KSZ.5 dated February 1, 2016, in turn, the Regional Director for Environmental Protection in Gdańsk requested an opinion from the State Border Sanitary Inspector in Gdynia. The latter provided the opinion about the project implementation conditions in letter ref. No. SE.ZNS.80.4912.1.16 dated March 1, 2016.

In the course of the procedure the local authority has requested clarifications to the submitted EIA report, which the Investor provided in (unnumbered) letters dated June 21, 2016, August 30, 2016 and September 28, 2016. The report has been listed in the publicly available Ekoportal list (<http://www.ekoportal.pl>), under the number 636/2016.

On October 14, 2016, in announcement ref. No. RDOŚ-Gd-WOO.4211.26.2015.KSZ.14, the Regional Director for Environmental Protection in Gdańsk informed the public about submission of the EIA report and about the rights to submit comments and requests in the registered office of the authority within 21 days, in the period from October 26, 2016 to November 16, 2016. The announcement was published on the website of the authority ([www.rdos.gdansk.gov.pl](http://www.rdos.gdansk.gov.pl)) and on the bulletin board in the authority's registered office. Moreover, the aforesaid announcement has been submitted to the following officials for publication: the Director of the Maritime Office in Gdynia, the Director of the Maritime Office in Słupsk, the Mayor of Gdańsk, the Mayor of Gdynia, the Mayor of Sopot, the Head of Ustka Borough, the Mayor of Ustka, the Head of Smołdzino Borough, the Mayor of Łeba, the Head of Wicko Borough, the Head of Choczewo Borough, the Head of Krokowa Borough, the Mayor of Władysławowo, the Mayor of Jastarnia, the Mayor of Hel, the Head of Puck Borough, the Mayor of Puck, the Head of Kosakowo Borough, the Head of Stegna Borough, the Head of Sztutowo Borough, and the Mayor of Krynica Morska.

Comments and requests were submitted within the set deadline by EW Baltica - 3 Sp. z o.o. from Warsaw, EW Baltica - 2 Sp. z o.o. from Warsaw and PGE Energia Odnawialna S.A. from Warsaw.

The submitted comments and requests indicated that the analysis of the cumulative impact of the project on sea and migratory birds presented in the EIA report does not provide sufficient details. The comments and requests also indicated that it is appropriate to impose an obligation to reassess the environmental impact of the project in the decision on environmental conditions for the project to determine possible actions minimizing the potential cumulative impact on birds and Natura 2000 sites, and also included a reference to the method of implementation of the proposed minimizing actions in the form of a migration corridor.

Having analyzed the submitted requests and comments, the local authority considered it appropriate to submit them to the Applicant in letter ref. No. RDOŚ-Gd-WOO.4211.26.2015.KS2.18 dated January 30, 2017, with a request for response and clarifications.

With reference to the submitted comments and requests, and by considering the clarifications provided by the Applicant in the letter dated February 2, 2017, the local authority states what follows:

The Polenergia Bałtyk II project requires implementation of minimizing actions by establishing a migration corridor, considering the fact that there may be more than two wind farm projects implemented on the northern and the north-eastern slope of Słupsk Bank located in an immediate vicinity.

So far, the only project that has passed the environmental verification process and obtained the decision on environmental conditions is the Bałtyk Środkowy III OWF project. The said project is located several kilometers away from the Polenergia Bałtyk II project and according to the EIA report there is no risk of impact in the form of a barrier for birds migrating to and from the Central Bank area, and therefore at this stage there is no need to apply or recommend measures minimizing such impact. For the Polenergia Bałtyk II project, a measure has been taken to minimize the potential impact on overwintering birds in the Słupsk Bank area by excluding an area of 2 to 4 kilometers in width, located in the immediate vicinity of the boundaries of the Słupsk Bank Natura 2000 site, from the wind farm construction zone. This confirms the Investor's readiness to modify and limit the project if a risk of significant environmental impact is confirmed.

When examining the case, the change of the legal status that had occurred during the proceedings was taken into account, due to the fact that the Act of October 9, 2015 on amendment of the act on providing access to information on the environment and its protection, public participation in environmental protection and on environmental impact assessment and some other acts (Journal of Laws of 2015, item 1936) came in force. Pursuant to Article 6 section 2 of the amending act, the previous provisions are applicable to this procedure.

**Having analyzed the evidence gathered in this case, the local authority found and considered as follows:**

The project is currently at an early stage of preparation. The environmental decision for the OWF is issued before establishing the financial conditions of support for such a project, which according to the Act on renewable energy sources takes place for offshore wind farms after the decision is obtained. Only after the energy prices for a given OWF are established in an auction, the Investor will be able to carry out further, very expensive stages of project preparation such as conducting geotechnical surveys of the sea bed or design and selection of the technology suppliers regarding the foundations and the wind turbines. The whole process of preparing the OWF project takes approximately 7-9 years. At the same time, the offshore wind energy sector is developing very

dynamically and new models of wind turbines and other equipment appear every year. Considering the fact that construction of the Polenergia Bałtyk II OWF is planned as late as 2023-2026, it may be possible to use a wind turbine model which is not in production yet. For these reasons, the final technical parameters of the individual pieces of the farm equipment will be specified only in the building permit.

For the above reasons, the environmental impact assessment was performed based on an envelope of technical parameters, which defined the most far-reaching scenarios of environmental impact of the individual technical and technological solutions considered by the Investor at the present stage. Based on the assessment of impact of the most far-reaching scenarios, the EIA report has defined the parameters and environmental conditions limiting the extent and scale of the impact of the Polenergia Bałtyk II OWF as guidelines for the building permit design. The wind turbine parameters will depend on the selected power output (the higher the power output, the higher the tower and the longer the wing span is required). The basic parameters affecting the environmental impact of the wind turbines planned for installation on the Polenergia Bałtyk II OWF are presented in the table below.

Table 3. Basic technical parameters of wind turbines according to the option selected for implementation

Parameter	Option selected for implementation
Maximum total height of a wind turbine a.s.l. [m]	300 m
Minimum clearance between the lower position of the wing and the sea surface [m]	20 m
Maximum rotor diameter [m]	250 m
Maximum zone for a single rotor [m <sup>2</sup> ]	49 087 m <sup>2</sup>

It should be emphasized that one or more wind turbine models can be installed on the farm.

**The arrangement of wind turbines is not known yet.** Since the impact assessment performed for the project excluded the southern part of the farm from the wind turbine construction zone (approx. 16.59 km<sup>2</sup> at the border with Słupsk Bank Natura 2000 site, it is theoretically possible to place the wind turbines in the remaining area. The specific locations will be determined after geotechnical surveys of the sea bed to be performed at the building permit design stage.

The most important stages of the construction process are construction of foundations, installation of wind turbines and substations as well as inner array cable laying. Before starting the construction works, it will be necessary to perform geotechnical surveys which will allow to determine the specific locations of the wind turbines.

Prior to commencement of the construction works, the Investor will select the construction and installation port. It will be used to unload the farm components from the delivery vessels, to store the components to ensure continuity of deliveries to the installation site during favorable weather conditions, to assemble nacelles, rotors and towers, to load the individual components or partially assembled components onto construction and installation vessels of the jack-up type or other installation vessels. The ports of Gdańsk, Gdynia and Świnoujście are currently being considered.

Different vessels (ships and barges) will be used for construction of the farm, such as: cargo ships, large-size cargo ships, auxiliary vessels, hotel vessels, tugboats, jack-up vessels, cable laying vessels and others. At this stage, it is not possible to precisely determine their number, types or operating hours.

The currently anticipated time necessary to build the Polenergia Bałtyk II OWF is

approximately 3.5 years, with the farm construction process divided into at least 2 stages. The second stage of the project may be implemented once the Investor finds new possibilities of connecting to the grid. Currently it is not possible to determine when this will happen. The construction cycle time for each of the stages will be shorter and it is currently expected that it will not exceed 2 years. The currently expected time of the farm service life is 25-30 years.

Wind turbines owned by the Polenergia Bałtyk II OWF will convert the kinetic energy of wind into electricity as a result of the generation process. The operation of a wind turbine unit is based on a process in which the air stream generates a buoyant force (the aerodynamic lift) acting on aerodynamically shaped rotor blades and sets the rotor in a rotary motion. The rotating rotor drives a generator that converts mechanical energy of the rotor into low voltage electricity. The wind turbine generator generates electricity with a voltage of approx. 400 - 710 V, which is increased to medium voltage ("MV") by the wind turbine transformer. The generated electricity is transmitted via MV subsea cable lines to an internal offshore substation. In the substation the transmitted energy is transformed into high voltage ("HV") or extra high voltage ("EHV") for transmission to the National Power System.

Before commencement of operation, the Investor will select the operating port where the farm management center will be located. It is also possible to locate the management center offshore. The operating port should be adapted to short-term maintenance works and quick response. The ports of Gdańsk, Gdynia, Kołobrzeg, Władysławowo, Ustka, Łeba and Darłowo are currently being considered.

Different vessels (ships and barges), such as auxiliary vessels and small research vessels, will be used to handle the tasks as part of the farm operation stage. Other types of vessels may be used depending on the needs. At this stage, it is not possible to precisely determine their number, types or operating hours.

The Polenergia Bałtyk II OWF will be controlled using an IT system supervising the process (SCADA - *Supervisory Control and Data Acquisition*). The SCADA system collects current data (measurements), prepares them for visualization, controls the generation process, handles reporting tasks, generates alarms (e.g. may report a necessity of scheduled or unscheduled maintenance of the equipment or its inspection, and may even trip a faulty wind turbine) and stores data. A weather monitoring will be also performed to provide data on the sea state and wind speed so as to facilitate the farm equipment maintenance planning as well as wind turbine performance verification and generation forecasts. SCADA may be also used to transmit bird monitoring data if such monitoring is performed by the equipment installed on the farm structures (e.g. radar equipment or cameras). The control systems located on the individual farm structures will be connected using fiber optic cables (forming a part of the subsea cables) and, additionally, using radio communication from the monitoring and control center to be located most probably on one of the internal substations. The substation, in turn, will be connected with the onshore part through cables forming a part of the Offshore Transmission Infrastructure (OTI) representing a separate project.

During operation of the farm there will be regular periodic inspections performed on the individual elements of the farm (of the above-water and underwater parts of the wind turbines, substations, cables, etc.) in line with the Maintenance Plan specified in the contract with the turbine manufacturer. There will be scheduled (preventive) and unscheduled (corrective) maintenance performed. Additionally, an environmental monitoring program will be implemented.

Decommissioning of the Polenergia Bałtyk II OWF (or its individual elements, e.g. single turbines) may take place due to the following reasons:

- scheduled decommissioning due to the end of life of the equipment and closure of the farm,
- decommissioning due to technical reasons, e.g. errors made during the construction

process, due to which the competent authority orders removal of the farm equipment.

The estimated life cycle of a wind farm comes to minimum 20 years. However, the technological progress in the offshore wind energy sector is rapid and it is highly probable that this period will be extended to 25-30 years in the case of the Polenergia Bałtyk II OWF.

Before commencement of the decommissioning process, the Investor will select the port from which the works will be performed. Most probably this will be one of the ports used during the farm construction phase.

The individual elements of the wind farm will be probably decommissioned as follows:

- wind turbines – to be removed completely,
- foundations – to be removed down to 3 m below the seabed level or completely, or will be kept in place,
- inner array cables – to be removed or kept in place in the seabed covered by sediments,
- scour protection – to be kept in place,
- substations – to be removed or kept in place for reuse in the future.

The vessels used at the decommissioning stage will be similar to those used during the construction process.

Among the analyzed project implementation options, the following have been considered: an option proposed by the Applicant for implementation, a reasonable alternative option and an option most favorable for the environment.

The assumed **reasonable alternative option** of the project is based on the technology and equipment currently available on the market, and ensures the maximum effect in the form of the highest power output allowed by the permit (permit for erection and use of artificial islands, structures and devices in the Polish maritime areas (PSZW)) and the largest number of wind turbines. **The option selected for implementation**, in turn, is based on the technology currently being in the testing phase, which will very likely be marketed at the building permit design preparation stage and which may maximize the economic efficiency of the project, thus increasing its chances for a support as part of the auction system. It enables to achieve a better financial result by using fewer wind turbines with higher power output, thus optimizing the use of the energy potential of the farm area and shortening the construction time. The most important difference in the option selected for implementation as compared to the reasonable alternative option is **reduction of the number of wind turbines by 40%, i.e. to a maximum of 120 pcs, as compared to 200 pcs permitted in this area according to the permit for erection and use of artificial islands, structures and devices in the Polish maritime areas.**

Therefore, the option selected for implementation is more safe for the environment than the reasonable alternative option.

It follows from both options that the remaining parameters of the wind farm, such as the maximum height of the structure, the maximum rotor range and the maximum cable length, do not affect the scale of the environmental impact of the project in a considerable manner, so there are no premises for limiting these parameters.

The comparison of the most important parameters of the option selected for implementation and the reasonable alternative option considering the environmental impact assessment, is presented in the table below.

**Table 4. Comparison of basic parameters of the option selected for implementation and the reasonable alternative option**

Parameter	Reasonable alternative option	Option selected for implementation
-----------	-------------------------------	------------------------------------



Maximum total height of a wind turbine a.s.l. [m]	275 m	300 m
Minimum clearance between the lower position of the wing and the sea surface [m]	20 m	20 m
Maximum rotor diameter [m]	200 m	250 m
Maximum number of wind turbines [pcs]	200 pcs	120 pcs
Maximum zone for a single rotor [m <sup>2</sup> ]	31 416 m <sup>2</sup>	49 087 m <sup>2</sup>
Maximum total zone for the rotors [m <sup>2</sup> ]	6 283 200 m <sup>2</sup>	5 890 440 m <sup>2</sup>
Maximum number of accompanying infrastructure foundations [pcs]	6	6
Maximum seabed area occupied by 1 foundation [m <sup>2</sup> ] (gravity-base foundation, diameter of 40 m for the alternative option i 50 m for the option selected for implementation)	1 257 m <sup>2</sup>	1 964 m <sup>2</sup>
Maximum seabed area occupied by all the foundations [m <sup>2</sup> ] (gravity-base foundation, 206 pcs for the alternative option and 126 pcs for the option selected)	258 942 m <sup>2</sup>	247 464 m <sup>2</sup>
Maximum density of the wind turbines [pcs/km <sup>2</sup> ] (78 km <sup>2</sup> of the area planned for placement)	2.56 pcs/km <sup>2</sup>	1.56 pcs/km <sup>2</sup>
of the wind turbines for the alternative option and 77 km <sup>2</sup> for the option selected for implementation – considering		
Maximum length of the farm internal connection infrastructure cables [km]	200 km	200 km

In addition, the EIA report contains an analysis of 3 scenarios that would occur if **the project was abandoned**, i.e:

- 1) offshore wind energy will not develop in the Polish maritime areas so the analyzed project will not be implemented, nor will similar projects be implemented, including the mining industry,
- 2) the offshore wind energy will develop in the Polish maritime areas, but the analyzed project

- (the Polenergia Bałtyk II OWF) will not be implemented,
- 3) there will be no investments in offshore wind energy in the Polish maritime areas, but the mining industry will develop.

It follows from the information presented in the EIA report regarding the analysis of the aforementioned scenarios that: *in the first case, the environment of the Polenergia Bałtyk II OWF water region will remain unchanged as compared to the condition stated as part of the environmental research program. The existing anthropogenic pressures exerted on it will continue. The second scenario means similar impact that would occur in case of a cumulated impact of the Polenergia Bałtyk II OWF and other farms planned in the vicinity. In the third scenario, the pressure due to the impact of the mining industry will increase, including a possibility of increasing the risk of spills of oil-derivative substances. Apart from this, however, the pressure on the environment will not be significant.*

The EIA report was preceded by a comprehensive study of the marine environment carried out in 2013-2014. Abiotic elements were examined: hydrological and hydrochemical conditions (water quality, sea currents and waves, temperature, turbidity and electrical conductivity of water, meteorological conditions), seabed geology, mineral raw materials, physical and chemical properties of bottom sediments and the acoustic background.

Biotic elements were also examined: benthos, fish, birds (seabirds staying in the area of the project and flying over the farm, including migratory birds), marine mammals and bats. In addition, studies related to archeology, fishery and vessel traffic were carried out in the project area. Assessment of the impact of the project on the environment and Natura 2000 sites was based on determination of the facts as well as research and development concepts included in the environmental impact report of the project presented by the applicant.

The main assumption of the applied environmental impact assessment concept was to specify which parameters of the offshore wind farm are important in terms of its impact on the environment and, consequently, which environmental conditions, including the method of their formulation in the decision on environmental conditions, should limit the project to prevent its implementation from causing considerable environmental damage, regardless of the final technology chosen from the solutions considered at the environmental impact assessment stage.

Based on the evidence gathered in this case concerning the type and reach of the environmental impact, including the impact on human health and Natura 2000 sites, it can be concluded that the impact of the Polenergia Bałtyk II project will be as follows:

***Impact of the option selected for implementation and the reasonable alternative option on the abiotic environment:***

The most far-reaching project scenario, i.e. the one that may potentially have the greatest impact on the abiotic environment (i.e. the seabed and its sediments, sea water and mineral deposits), is construction of the wind farm using 206 gravity-base foundations of 40 m in diameter, as this scenario will have the greatest impact on the seabed. The most far-reaching project scenario may occur as part of the reasonable alternative option. The option selected for implementation assumes the use of approximately 40% less foundations. However, they may have a larger maximum diameter (up to 50 m).

**Construction** works, in particular the foundation placement works, power cable laying and the related necessity of frequent anchoring of vessels, will disturb the structure of the bottom sediments. This will cause a large amount of suspended matter to rise and float in the water. Various substances, including pollutants and biogenic substances, will be released into the water from this suspended matter. However, their quantities will be relatively small. In addition, if there are layers of stones and boulders placed around the foundations to prevent scouring, the composition of the sediments will change.

Construction of the Polenergia Bałtyk II OWF will also involve occupation of the seabed area within the farm boundaries, which will also make it more difficult or impossible to access mineral deposits. During the construction works, the bed sediments will be moved and the seabed structure will be disturbed, which may result in sediment washing or covering with an additional layer of solids. The sand from the exposed deposits may also be used as ballast for gravity-base foundations (if such foundation type is selected).

During **operation** of the farm, the disturbance of the structure of bed sediments in the immediate vicinity of the foundations and the related scouring of harmful substances to the pelagic zone will be much less intensive than during the construction process, especially when scour protection layers are applied. On the other hand, zinc or aluminum used to protect the foundations against corrosion will penetrate into the water. It is also possible that the temperature of water and sediments in the immediate vicinity of cables will slightly increase due to cable heating.

During operation of the farm, access to mineral deposits on its surface will be much more difficult or impossible, and the processes related to scouring of the bed sediments in the immediate vicinity of the foundations may affect the sand deposits (regardless of a minimum extent of this impact).

The impact created at the project **decommissioning** stage will be similar to the one exerted at the construction stage. However, its intensity will be lower. Interference with the seabed will not be as significant as during installation of the foundations in the seabed. Some structural components may be left in the seabed, e.g. heavy gravity-base foundations. The piles will be most likely cut off 3 m below the seabed. The transmission cables may be left in place or may be partially removed. The decommissioning works may affect mineral resources as the latter may be covered with an additional layer of lifted bed sediments. After removing the elements of the farm, its whole area will be available for research and possible mining of mineral deposits.

During the construction, operation and decommissioning of the farm, unplanned events may also occur, e.g. a spill of oil-derivative substances, which may contaminate the water column and bottom sediments. However, potential contaminants will largely diffuse in water, whereas the amount of substances likely to be released and the probability of an emergency is low.

The results of assessment of the aforementioned environmental impact indicate that no significant impact will occur. The significance of overwhelming majority of the most far-reaching project scenario impact has been assessed as low or negligible, whereas moderate impact could be observed only in a few cases. The impact of the option selected for implementation will be usually proportionally smaller (due to a smaller number of foundations).

Due to low significance of most of the sources of impact of the Polenergia Bałtyk II OWF on the abiotic environment, the Investor was obligated, among others, to adopt such a method of the construction works related to installation of the individual farm structures so as to protect the sea water against pollution with solid and liquid waste as measures minimizing the impact. Most of the sources of impact of the Polenergia Bałtyk II OWF on the abiotic environment will not cumulate due to limitation of the impact range to the construction/operation/decommissioning site of a given foundation or its immediate surroundings.

The potential accumulation of impacts can be spoken of primarily in the case of suspended matter spread due to disturbance in the structure of bottom sediments. Suspended matter will propagate mainly to the southwest at a distance of approximately 20 km and to the southeast at a distance of 10 km (the most far-reaching scenario). As the calculations performed using a numerical model show, in the area of the planned Polenergia Bałtyk II OWF the thickness of the deposit will not exceed 3.5 mm, and in majority of the area on which it will settle, it will not exceed 0.2-0.6 mm. The spread of suspended matter is also connected with the release of a certain amount of pollutants and biogenic substances from the sediment to the water column, water turbidity and the possibility of raw material deposits being covered with an additional layer of sediment.

The implementation and operation of several projects will also result in a greater seabed occupation and thus will limit or prevent exploration, investigation or mining of mineral resources in the project area. This applies in particular to the seabed portions occupied by the Baltica 2, Baltica 3 and Bałtyk Środkowy III farms which are planned to the east of the Słupsk Bank. The areas of some of the seabed portions overlap with the area covered by the license for Słupsk E. However, it should be noted that the areas of wind farms are small in relation to the hydrocarbon exploration licensing areas. The difficulties will be exacerbated by the existing transmission infrastructure and navigation routes.

If several projects are implemented simultaneously, vessel traffic in adjacent areas will also increase, which entails an increased risk of collision and emergency spills of oil-derivative substances.

The wind farm is located in the Polish exclusive economic zone. The impact on the abiotic environment is local. The Polenergia Bałtyk II OWF is not expected to cause transboundary impact, i.e. impact in the maritime areas of neighboring countries.

In order to verify the EIA results and to identify the areas of uncertainty related to changes in the geological processes related to the seabed (local erosion - scouring of foundations or excessive accumulation of sediments in the vicinity of the foundations, exposing or covering up the cables laid on the seabed or buried in the seabed), this environmental decision imposes an obligation on the Investor to perform environmental monitoring. It will be necessary to conduct monitoring using an ROV underwater viewing system at specific intervals throughout the Polenergia Bałtyk II OWF service life. It has been pointed out that bathymetry near the foundations will be necessary for each type of the seabed surface (P1, P2, P3, P4, P5, P6) in order to determine the rate and scale of sediment scouring depending on the substrate type. After decommissioning of the farm, it will be necessary to perform geophysical monitoring (bathymetry and side-scan sonar survey) in order to determine the navigational risk in the form of the foundation remains. It is also possible to use technologies enabling continuous monitoring of the scouring rate. There is no need for separate monitoring of the impact on mineral deposits.

***Impact of the option selected for implementation and the reasonable alternative option on benthos:***

The environmental surveys of benthos were conducted from June 19, 2013 to July 7, 2013 and from May 3, 2014 to May 5, 2014 in the area of the Polenergia Bałtyk II OWF including a one mile buffer zone. The survey scope covered phytobenthos video inspection and sampling of phytobenthos and macrozoobenthos.

The assumptions for setting the phytobenthos survey area were developed based on the references and the available data concerning the depth range of phytobenthos presence in the Baltic Sea. The data analysis has shown that the maximum range of presence of macroalgae (with a seabed coverage of at least 10%) attached to the hard seabed (stones) in the Baltic Sea is 22 m, whereas the range of presence of plants rooted in the sandy seabed is 10 m (Feistel et al. 2008). Since the depth range of the planned OWF is approximately 20-40 m, it was assumed that the video inspection sites will cover only macroalgae and will be determined in the hard seabed areas, to a maximum depth of 25 m.

The EIA report also takes into account the results regarding phytobenthos obtained during the quantity survey of ichthyofauna conducted by MIR-PIB (Drgas and Janusz 2014). During these surveys, a diver took samples of epiphytes from the surface of stones and filmed the seabed using an underwater camera at 7 stations located both in the OWF area (6) and in its buffer zone (1), in the depth range of 24-30 m.

Quantitative sampling of macrozoobenthos on the soft seabed was carried out using the van Veen grab sampler. Each sediment sample was examined for volume, smell and color, whereas the type of sediment was established through macroscopic examination. The samples were washed on board on a 1 mm mesh sieve, transferred to containers and preserved with formaldehyde solution with a concentration of 4%. One sampling cycle was performed at each station, which represented one sample for the analyses. In case of unsuccessful sampling (empty/unclosed grab sampler), the sampling process was repeated at least three times. In total, 97 samples of macrozoobenthos were collected for laboratory analyses.

The surveys of macrozoobenthos on the hard seabed included quantitative sampling of epiphyte fauna from the surface of stones. The stones were extracted from the seabed using an ROV equipped with a stone grab. On board the vessel, the organisms were removed from a specific stone surface using a scalpel. Depending on the size of the stone, a 5 x 5 or 10 x 10 cm frame was used. The biological material was placed in plastic bags, described and stored at a temperature of -18°C until the laboratory analysis was carried out.

The method of sampling and preservation of macrozoobenthos samples is based on the guidelines contained in *the Manual for Marine Monitoring in the COMBINE Programme of HELCOM (Appendix 8C)* and *the Methodological Guide for Field Surveys and Laboratory Analyses of Macrozoobenthos Present in Transitional and Coastal Waters (Benthic Macroinvertebrates)*.

The assessment of the ecological quality of the area of the Polenergia Bałtyk II OWF and the buffer zone based on macrozoobenthos was carried out in accordance with the regulation of the Minister of Environment of November 9, 2011 *on the method of classification of the condition of groundwater bodies and environmental quality standards for priority substances* (Journal of Laws No. 257, item 1545). The measure of ecological quality is the value of the multimetric index B, which in its algorithm takes into account the population, sensitivity of the individual species and the number of species (Osowiecki et al. 2012). The condition of macrozoobenthos communities measured with the "B" index was determined for each station.

In the area of the Polenergia Bałtyk II OWF and in the buffer zone, phytobenthos was examined only on the stony seabed for presence of macroalgae. Large depths of the OWF bottom and the buffer zone (approx. 20-40 m) exclude any presence of rooted plants which in the Baltic Sea are recorded up to 10 m in depth. In the area of the Polenergia Bałtyk II OWF and in the buffer zone, macroalgae from the brown and red algae division were identified. They were mostly present in the form of residual or single, small specimens scattered across the seabed (the seabed coverage by macroalgae was < 1%, i.e. one to several specimens along the ROV travel route of at least 150 m). Such a poor quantitative phytobenthos structure is typical of areas of the Baltic Sea with a depth of > 20 m (Feistel et al. 2008, Kruk-Dowgiałło et al. 2011, Błęńska et al. 2014). The phytobenthos quantity survey area constituted approximately 20% of the OWF and the buffer zone area. It was characterized by depths from 18 to 30 m and featured sandy and stone sediments. In the area of the OWF and its buffer zone, phytobenthos (macroalgae) was found at 16 out of 20 survey sites and at 3 out of 7 stations of the National Marine Fisheries Research Institute (MIR-PIB), in the depth range of 18-26 m. At a depth of 26 m (station P6) one small-size phytobenthos specimen was identified. The macroalgae were overgrown with cobbles and single boulders lying on the sandy seabed, the surface of which was very often overgrown with compact and dense colonies of mussels and *Balanus*. At 13 out of 20 survey sites and 3 out of 7 MIR-PIB stations, the macroalgae were present in the form of residual or single, small specimens scattered across the seabed (the seabed coverage by macroalgae was < 1%, i.e. one to several specimens along the ROV travel route of at least 150 m). Such a poor quantitative phytobenthos structure is typical of areas of the Baltic Sea with a depth of > 20 m (Feistel et al. 2008, Kruk-Dowgiałło et al. 2011, Błęńska et al. 2014). Macroalgae forming communities (seabed coverage from 10 to 70%) were recorded in a small area constituting only

0.02% of the OWF and the buffer zone area, in the shallowest part of the buffer zone, i.e. from 18 to 22 m. It was found that the depth of 22 m constitutes the maximum range of the phytobenthos presence in the area of the OWF and the buffer zone, which coincides with the maximum depth of the phytobenthos presence in the Baltic Sea (Feistel et al. 2008).

The following taxa of macroalgae were identified in the survey area among the specimens recorded on the video footage:

- a) red algae belonging to the Rhodomelaceae family, i.e. *Polysiphonia* sp. (*Polysiphonia fucoides* is the most frequent species recorded in the Polish maritime areas) and/or *Rhodomeia confervoides* - they were the prevailing species found in the OWF area including the buffer zone, and were found at 13 out of 20 survey sites and at 1 out of 7 MIR-PIB stations;
- b) brown filamentous algae which include *Pylaeilla littoralis* and/or *Ectocarpus siliculosus* in the Polish maritime areas - found at 8 out of 20 survey sites and at 2 out of 7 MIR-PIB stations;
- c) red algae *Furcellaria lumbricalis* – recorded at 1 out of 20 survey sites and at 1 out of 7 MIR-PIB stations.

The macroalgae in the form of residual or small, single specimens (coverage of < 1%) belonged mainly to the division of red algae *Polysiphonia* sp. and/or *Rhodomeia confervoides* (frequency of 33%) and brown filamentous algae *Pylaeilla littoralis* and/or *Ectocarpus siliculosus* (frequency of 22%). These species also occurred in the form of small communities (0.02% of the OWF and the buffer zone area), among which red algae *Sphaceiaria cirrosa* and *Ceramium diaphanum* with residual thalli were identified.

The qualitative and quantitative structure of macroalgae in the area of the Polenergia Bałtyk II OWF and the buffer zone was different. In both areas residual amounts of protected species were recorded: *Furcellaria lumbricalis* – one specimen was recorded in the OWF area at 1 video inspection site (p15) and residual thallus was identified in the sample taken from 1 MIR-PIB research station: P6; *Ceramium diaphanum* – the species was found in a residual form in the sample taken from 1 station (p06) in the buffer zone.

When compared to the underwater vegetation of the Polish maritime areas (e.g. of the Puck Bay or Słupsk Bank boulder field), the phytobenthos (macroalgae) of the Polenergia Bałtyk II OWF and the buffer zone area features low environmental value. Macroalgae are mostly present in residual form or as single, small specimens scattered across the seabed. Due to a negligible amount of macroalgae they do not form dense communities here, that would represent a perfect habitat for development and existence of invertebrate phytophilous fauna or ichthyofauna. The macroalgae communities occur only in a small area of the buffer zone, which constitutes only 0.02% of the OWF area including the buffer zone. The prevailing plants are red algae: *Polysiphonia* sp. – a common species common in the Polish maritime areas, and/or rare *Rhodomeia confervoides*, and the common brown filamentous algae species *Pylaeilla littoralis* and/or *Ectocarpus siliculosus*, which due to their preference for eutrophic waters are considered an element of the environment decreasing its environmental value.

There were rare and protected species found in the OWF area and in the buffer zone. However, their incidental presence (except for *R. confervoides*) and poor quantitative structure (low percentage of the seabed coverage, residual or small size of the thallus) do not increase the environmental value of the OWF and the buffer zone area to a considerable extent. Their possible loss will not cause a major impact on population of these species in the Polish maritime areas either.

The nature of macrozoobenthos, i.e. its taxonomic composition, population and biomass, is shaped by physical and chemical properties of water: salinity, oxygen content in the water layer above the seabed and in the sediment surface layer, and the type of bottom sediments. Each type of sediment

is inhabited by macrozoobenthos communities with different taxonomic composition.

The salinity within the survey area corresponds to the lower range for the mesohaline waters and comes to approximately 7-7.5 PSU. The oxygen conditions in the near-bed zone within the entire area are considered good.

The samples collected in the eastern part of the area showed mainly sandy (fine, medium and coarse sand) and gravel sediments. In the central and western part, in approx. 70% of the Polenergia Bałtyk II OWF area, there were cobbles and boulders lying on the seabed (Rudowski et al. 2014). The hard surface of the stones was covered by numerous *Mytilus trossulus* mussels which are the main nutritional component of benthic carnivores (benthophagus).

In the central part of the Polenergia Bałtyk II OWF area, along the north-south axis, there are numerous concentrations of cobbles and boulders. This prevented sampling of macrozoobenthos using the van Veen grab sampler. Quantitative samples of epiphyte fauna growing on a stony seabed were collected at 20 stations using a remotely operated underwater vehicle (ROV). The area where Complex I (*Mytilus trossulus*) is present comes to 119.71 km<sup>2</sup>, and for Complex II comprising *Pygospio elegans* this area comes to 68.67 km<sup>2</sup>.

In the Polenergia Bałtyk II OWF area, 32 taxa of benthic macrofauna (species and higher taxonomic units not classified as species) were found. Complex I of *Mytilus trossulus* was slightly more diversified – 31 taxa compared to 28 taxa found in Complex II of *Pygospio elegant*. From 3 to 12 taxa were recorded at the individual stations. Complex I of *Mytilus trossulus*, in which the average number of taxa was  $9.2 \pm 2.13$ , featured greater taxonomic diversity. The group of the most common taxa (absolutely constant and constant species) consisted of species typical of the shallow and medium deep seabed of the open zone of the southern Baltic Sea (Osowiecki and Kruk-Dowgiałło 2006, Warzocha 1995). The absolutely constant species (found at the largest number of stations) present in both of the macrozoobenthic complexes were the following psammophilic polychaetes: *Pygospio elegans* and *Marenzelleria neglecta*. Complex I in the group of absolutely constant species included the habitat-forming clam species represented by the *Mytilus trossulus* mussel. The structure of prevalence in terms of population within more important taxonomic groups of macrozoobenthos in the identified complexes differed significantly. The *Bivalvia* clams and the *Polychaeta* polychaetes, representing 61% and 28% of the total macrozoobenthos population respectively, had the highest share in Complex I (*Mytilus trossulus*). Polychaetes were the prevailing group in Complex II, accounting for over 70% of the total macrozoobenthos population. Snails stood out from the remaining divisions and represented 16% of the overall population. The structure of population in the identified macrozoobenthos complexes was different. The *Mytilus trossulus* clam, which constituted 58.6% of the total macrozoobenthos population, was the prevailing group in Complex I in terms of population. The share of the remaining taxa was more than twice as small. Complex II, apart from the prevailing *Pygospio elegans* (63.8%), comprised taxa typical of a sandy seabed. These include small amphipods *Bathyporeia pilosa* (9.8%) and *Monoporeia affinis* (6.0%) as well as polychaetes *Marenzelleria neglecta* (5.9%).

The biomass of macrozoobenthos in the Polenergia Bałtyk II OWF area ranged from 0.80 g per 1 m<sup>2</sup> to 648.63 g per 1 m<sup>2</sup> (excluding station 144). The highest values of biomass on the sandy seabed were recorded in the locations of compact mussel aggregations, where the mussel constituted almost 100% of the total biomass of macrozoobenthos. The surface distribution of the macrozoobenthic biomass in the survey area coincided with the population distribution. The maximum biomass values were found in the northern part (the buffer zone) and in the area inhabited by Complex I in the central part of the surveyed water area. The biomass prevalence structure is shaped by clams featuring high individual weight as compared to other macrozoobenthic divisions. In Complex I dominated by clams, the average biomass was more than ten times higher than in Complex II dominated by polychaetes. The biomass percentage structure of the most important taxonomic macrozoobenthos groups in both

of the complexes was similar. The share of *Bivalvia* clams was higher in Complex I (96.9%). In Complex II, apart from the clams (63.4%), the share of polychaetes was also significant (24.9%). The prevailing biomass species in Complex I was the clam species *Mytilus trossulus*, from which the complex took its name. The biomass of mussels growing on stone surface on a mass scale constituted 93.5% of the total macrozoobenthic biomass in this complex. Of the remaining species, the clams *Macoma balthica* had the largest share of 3.2%. In Complex II of *Pygospio elegans*, the following species typical of a sand seabed prevailed in terms of biomass: clams *Macoma balthica* with a share of 47.5% as well as polychaetes: *Pygospio elegans* with a share of 13% and *Marenzelleria neglecta* with a share of 10.6%.

The main component of the nutrition base for sea birds are clams. Four species belonging to this division were found in the surveyed area. The mussel *Mytilus trossulus* reached the highest average density and biomass value among the species present on the seabed covered with gravel and stones (Complex I), whereas in case of the sandy seabed (Complex II) the same was true for *Macoma balthica*. The highest population and biomass value per 1 m<sup>2</sup> was achieved by a mussel growing on the surface of boulder field stones in the central part of the Polenergia Bałtyk II OWF area.

The mussel *Mytilus trossulus* is often present on the seabed in high density. On the sandy seabed it occurs as aggregations of individuals bonded by byssus filaments, whereas on the stony seabed it covers a cobble surface with a tight layer. The large mussel biomass per unit area makes the boulder fields (i.e. natural underwater reefs) an attractive feeding ground for sea birds feeding on benthos (benthophagi). The highest density and the largest concentrations of macoma biomass were found on the sandy and mosaic seabed of the Polenergia Bałtyk II OWF area, especially in its eastern part. The presence of macoma was not found in the boulder field area. The remaining two clam species: the *Cerastoderma glaucum* cockle and the *Mya arenaria* soft-shell clam were found only occasionally in the Polenergia Bałtyk II OWF area.

Works causing local disturbance of the bottom sediment structure will be performed during construction of the Polenergia Bałtyk II OWF. These include, in particular, installation of the foundations and power cable laying. Disturbance will be also caused by anchoring the vessels and driving the legs of jack-up vessels and barges into the seabed to stabilize their position. These works will cause physical destruction of benthic organisms which inhabit the bottom sediments in the construction areas and their immediate vicinity. An increased mortality of macrozoobenthos will also result from bringing these organisms to the sediment surface where they will be under pressure from predators (mainly fish).

The largest area of the seabed will be affected if gravity-base foundations are used and will vary depending on the analyzed option. It is also assumed that the seabed surface affected by laying of internal power cables will be the same regardless of the selected option (despite different distance between the wind turbines, the total length of the individual cable sections will remain the same).

Construction of the farm according to the alternative option, where benthos can be destroyed over an area of approximately 1.09 km<sup>2</sup>, has been considered the most far-reaching scenario. Since the total area of the farm specified in the permit for erection and use of artificial islands, structures and devices in the Polish maritime areas (PSZW) comes to approx. 122 km<sup>2</sup> of which the gross covered area will not exceed 95 km<sup>2</sup>, destruction of benthos (even in the most far-reaching scenario) may take place over an area corresponding only to 1.15% of the farm area (for the option selected for implementation this figure comes to 0.98%). In case of opting for foundations other than gravity-base foundations, this area will be even smaller. The loss of the upper layer of sediment with a thickness of at least 0.5 m results in elimination of macrozoobenthos from the investment project area (Newell et al., 1998), and the power cables will be buried down to 3 m. Macrozoobenthos lives both on the seabed surface and in the sediment. Many organisms inhabit the upper 4-5 cm layer of the sediment



(Brakelmann et al., 2010), whereas some of them can be buried down to 35 cm as a result of biological traits of the individual species (Brakelmann, 2005). Disturbance of bottom sediments in the immediate vicinity of the foundation and the cable will lead to a partial destruction of benthic communities in this location, with an area even smaller than the permanent degradation area.

The phytobenthos of the corresponding Polenergia Bałtyk II OWF area was found within a depth range of 21-26 m at 4 out of 6 survey sites and at 2 out of 6 MIR-PIB stations. Single, small specimens of macro-regions were overgrown with cobbles and single boulders lying on the seabed. The coverage of the seabed with macroalgae, mainly with brown filamentous algae and red algae of the *Rhodomelaceae* family, came to < 1%. Such a poor quantitative phytobenthos structure is typical of areas of the Baltic Sea with a depth of > 20 m (Feistel et al. 2008, Kruk-Dowgiałło et al. 2011, Błęńska et al. 2015). Due to the fact that they are annual plants reproducing, among others, by fragmentation of the thallus, the brown filamentous algae identified in the area are of low sensitivity and may repopulate the degraded habitats in one year. However, the red algae, which are perennial plants, have a medium sensitivity with respect to the described sensor. In case of habitat loss, revitalization of the red algae population may take from 1 to 5 years. Due to their incidental presence and poor quantitative structure (residual thalli) in the Polenergia Bałtyk II OWF area, the installation of the foundations and cables causing habitat loss will not have a significant impact on the population of these species in the Polish maritime areas. The impact described is not applicable to the Polenergia Bałtyk II OWF buffer zone where no wind turbines or substations will be constructed.

Despite two types of complexes identified in the Polenergia Bałtyk II OWF area, they are dominated by clams in terms of biomass. The complex of *Mytilus trossulus* is dominated by the mussel (94%), which lends its name to the complex, followed by *Macoma balthica*, whereas the complex of *Pygospio elegans* is dominated in terms of biomass by clams – the epibenthic *Macoma balthica* (48%) and the mussel *Mytilus trossulus* (11%) followed by polychaetes, namely: *Pygospio elegans* intolerant to degradation of the environment and an opportunistic polychaete species of *Marenzelleria neglecta*. Clams constitute the main nutrition base for sea birds and fish, and play an important habitat-forming role. Sensitivity of most macrozoobenthic organisms occupying the planned project area to physical disturbance of the seabed is medium, which is equivalent to their low susceptibility to changes and their ability to restore the population to its original condition after approximately 5 years. It is in the fifth growing season after degradation that the longest living clam species, such as the soft-shell clam *Mya arenaria* in Complex II, will reach their maximum size. This is also applicable to the mussel forming a cluster on the hard seabed in the central part of the Polenergia Bałtyk II OWF, which constitutes 48% of its surface. The opportunistic polychaetes (e.g. *Hediste diversicolor* and *Marenzelleria neglecta*) as well as the *Pygospio elegans* species intolerant to environmental degradation show medium sensitivity to mechanical destruction. The sensitivity of *Malacostraca* crustaceans, being less populous than clams and polychaetes in both Complex I and Complex II, to the described impact is low. These mobile species are able to avoid adverse environmental conditions by escaping. Therefore, their mortality will be lower. An occasional presence of *Travisia forbesi* polychaetes has been recorded on the soft seabed. Despite an incidental presence of this species in the Polenergia Bałtyk II OWF area it has been included in the assessment, since according to the Red List of Baltic Sea species in danger of becoming extinct (HELCOM 2013a) *Travisia forbesi* comprises the NT (Near Threatened) biotope category described as sands of the exposed Baltic zone, dominated by the infauna species from the polychaete division, including *Ophelia* spp. and *Travisia forbesi*. In addition, *Travisia forbesi* may be a part of a similar biotope but in the non-exposed Baltic zone. As the *Ophelia* spp. species has not been recorded in the Polenergia Baltic II OWF area, it is not certain whether this area corresponds to the described biotope. However, a habitat loss due to construction of the wind farm will lead to a loss of the rare *Travisia forbesi* species which is particularly sensitive to sediment grain size (tolerates fine sand) and is intolerant to areas with high

organic loading rate of the sediment (Zettler et al., 2013). In fact, the bottom sediments in the Polenergia Bałtyk II OWF area have organic content below 10% (Dembska et al., 2015 - Volume III Section 5 of the EIA report).

As shown in the EIA report, when compared to the underwater vegetation of the Polish maritime areas (e.g. of the Puck Bay or Słupsk Bank boulder field), the macroalgae of the Polenergia Bałtyk II OWF and the buffer zone area feature low environmental value and their possible loss will not cause a major impact on population of these species in the Polish maritime areas.

According to the EIA report, the significance of the impact consisting in destruction of compact aggregations of the *Mytilus trossulus* mussel, which occur in the boulder field occupying as much as 48% of the area of the Polenergia Bałtyk II OWF, was defined as high due to considerable importance of these environmental resources. However, it cannot be considered as significant since permanent destruction of benthos affects less than 1% of the farm area even in the alternative option, which is a very low value. Besides, clams are a group of organisms that will quickly, and as one of the first, recolonize the underwater parts of the wind turbines and the seabed environment around them during operation of the farm.

Disturbance of the bottom sediment structure during construction works may have a direct negative impact on benthos. This will be local, long-term (i.e. it will last longer than 3 growing seasons) and irreversible impact of very high intensity, repeating during the construction period. No impact on the structure and functioning of phytobenthos in the buffer zone is expected. Given that even in the alternative option the physical destruction of benthos will occur only in about 1% of the farm area, no mitigation measures are required. This authority accepted the aforesaid reasoning as justified.

A direct consequence of disturbance of the bottom sediment structure will be lifting and propagation of suspended matter in the pelagic zone, the concentration of which depends on the speed and direction of currents and the turbulence processes as well as the size of the bottom sediment fraction. In the Polenergia Bałtyk II OWF area there are sandy sediments of different grain size, occupying an area comprising 52% of the total farm area, whereas the remaining 48% of the Polenergia Bałtyk II OWF area is covered by hard seabed, namely stones and boulders (Błęńska et al., 2015 - Volume III Section 6 of the report). For the purposes of the EIA report, a suspended solid propagation model was prepared for all the considered project implementation options. The analysis shows that the maximum concentration of suspended matter resulting from the bottom sediments being lifted during the construction works (without considering natural concentration of the suspended matter in the pelagic zone), regardless of the considered option (alternative option/option selected for implementation), will not exceed the 35 mg/l (point values of the suspended matter' concentration) within the limits of the Polenergia Bałtyk II OWF and 10 mg/l beyond the farm limits. It should be emphasized that in the majority of the analyzed area these concentration values will be much lower.

The red algae, which are perennial plants, identified in the buffer zone and the corresponding area of the Polenergia Bałtyk II OWF, demonstrate low sensitivity to an increase of the suspended matter in the pelagic zone as they are able to photosynthesize in a lower spectrum of photosynthetically active radiation reaching greater depths. Brown algae, which are annual plants, demonstrate a very low sensitivity regarding the described factor, as they have a short life cycle and several reproduction methods (including vegetative reproduction). Owing to these properties, a potential recovery of the population to its original condition can take place in a year after the impact factor ceases.

Most macrozoobenthic organisms present in the project area are not sensitive or demonstrate very low sensitivity to an increased concentration of suspended matter. An increased concentration of suspended matter in water means increased turbidity and more difficult trophic conditions for filtering macroinvertebrates, including clams. At concentration of the suspended matter above 250 mg/l, the growth of these organisms can decelerate (Essink, 1999), followed by clogging of the filtration

apparatus, which may consequently lead to death (Moore, 1977). Benthic organisms can survive a month under very high concentration of suspended matter of up to 100 mg/l, which occurs naturally during storm (Birklund, 2009). North Sea clams are more resistant to increased concentration of suspended matter in water than clams from the Baltic Sea due to their natural adaptation to stressful living conditions: tides, strong currents and storms (Coates et al., 2014). These clams are physiologically adapted to filter suspended matter with concentration ranging from 40 to 400 mg/l with admixtures of silt and detritus, owing to larger gill plates than in case of the clams from the Baltic Sea (Essink, 1999).

The benthos present in the Polenergia Bałtyk II OWF area will be subject to short-term exposure to an increased content of suspended matter in the farm area and in the buffer zone, which means that the process is not significant. This will be negative, local, short-term and reversible impact of high intensity, repeating during the construction period. The significance of the described impact will be negligible or low for phytobenthos and Complex II of macrozoobenthos, and low for Complex I of macrozoobenthos as well as the mussel cluster in the boulder field of the Polenergia Bałtyk II OWF, where in both cases the *Mytilus trossulus* mussel is the prevailing species. Considering the foregoing arguments, the EIA report concluded that no mitigation measures are required. The local authority accepted the aforesaid reasoning as justified.

During the sedimenting process in the area and the vicinity of the Polenergia Bałtyk II OWF, the habitats of benthic organisms may be covered with an additional layer of sediment, depending on the extent and thickness of the sedimenting suspended matter.

A part of the phytobenthic population may be destroyed under stress caused by the sedimenting suspended matter, with a limited survival rate for the remaining population. Due to the morphological structure of the thalli, the mode of reproduction and the life cycle length, the phytobenthos sensitivity can be classified as low. Vegetative reproduction by fragmentation of the thallus, characteristic of most macroalgae, is a good strategy under cover of suspended matter (Eriksson and Johansson, 2005). However, recovery of the phytobenthos population to its original condition depends mainly on the thickness of the sediment layer. For example, regeneration of the *Furcellaria lumbricalis* red alga will be low when its spores are covered with a 5 cm layer of sediment.

The coverage of the seabed with macroalgae (filamentous red algae belonging to the *Rhodomelaceae* family) recorded in the Polenergia Baltic II OWF area was < 1%. Due to their incidental presence and poor quantitative structure (residual thalli), covering the organisms with suspended matter will not have a significant impact on the macroalgae population in the Polish maritime areas. The significance of the impact can be considered negligible.

Small communities of macroalgae (0.02% of the OWF and the buffer zone area) recorded only in the buffer zone are formed mainly by habitat-forming, bushy red algae and filamentous brown algae which can be easily destroyed by being covered with sediments. The filamentous brown algae are characterized by short life cycle and several reproduction methods (including vegetative reproduction by fragmentation of the thallus). These individual traits are conducive to rapid colonization. The perennial brown algae damaged by a thicker layer of settling sediments are likely to restore the population in the region in 1 to 5 years. Their sensitivity to potential impact has been identified as low. The significance of the impact may be considered low as covering of the organisms with suspended matter (if any) will not have a significant impact on the macroalgae population in the Polish maritime areas.

The EIA report indicates that sensitivity of macrozoobenthic organisms covered with an additional 5 cm layer of sediment for a month is basically low (Birklund, 2009), as in the case of the *Mytilus trossulus* mussel characteristic of one of the identified complexes and having the main share in the

central part of the Polenergia Bałtyk II OWF area. The second complex of *Pygospio elegans* consisted of species featuring low sensitivity to the described impact. Vagile infauna species (polychaetes and oligochaetes) have the ability to dig out, crustaceans to escape, and clams to extend long siphons above the additional layer of sediment. In this complex, the *Macoma balthica* is one of the macrozoobenthos species most resistant to the described impact as it can survive for one month with a layer of sedimenting suspended matter increased by 7-20 cm (Turk and Risk, 1991; Essink, 1999). The maximum tolerance of the *Mya arenaria* soft-shell clam to sedimentation of sandy sediment is 5 cm/month (Essink, 1999). Other reference data indicate that organisms buried superficially and feeding through filtration, especially young individuals, can survive covered with an additional layer of sediments up to 50 cm in thickness (Hiscock et al., 2002). However, this will not be possible in the case of fine and delicate *Gonothyraea loveni* hydrozoans (an accessory species in the Polenergia Bałtyk II OWF area) with medium sensitivity to the settling process leading to damage of the feeding polyps and reproductive buds of this organism. In general, macrozoobenthos is more tolerant to conditions created by sedimenting suspended matter consisting of fractions of fine sands rather than silt, and most macrozoobenthos species are resistant to sedimenting suspended matter with a maximum thickness of 0.2-0.3 m (Essink, 1999).

The sedimentation of lifted sediment on the seabed will result in a negative, local, short-term, reversible, low-intensity impact on benthos, repeating during the construction period. Due to the local, short-term and insignificant impact, the overall significance of impact of the settling process in the corresponding farm area and in the buffer zone will be negligible for the phytobenthos present in the corresponding farm area as well as the macrozoobenthos of Complex II, and it will be small for the phytobenthos present in the buffer zone, Complex I of the macrozoobenthos and the mussel cluster in the boulder field of the Polenergia Bałtyk II OWF, as indicated in the EIA report. Considering the aforesaid arguments, no mitigation measures were required. In the opinion of this authority, the foregoing reasoning is justified.

During the settling process in the area of the Polenergia Bałtyk II OWF, the habitat of benthic organisms may be covered with an additional layer of sediment with a maximum thickness of 2.5-3 mm (Lech-Surowiec et al. 2015 - Volume II Section 11 of the report), which is a relatively low value. The modeling indicates that a small part of the suspended matter will be carried away from the surveyed area with currents, to a location where it will settle after the foundations are placed and the cables are laid in the seabed. The reach of the sedimenting suspended matter will cover an area of up to several kilometers beyond the limits of the farm, mainly to the west. However, the thickness of the settled sediment may come to only 0.2-0.6 mm (marked with navy blue in the key), which is a value almost impossible to detect and insignificant considering the impact on the physiology of benthic organisms.

According to the information included in the EIA report, placement of the foundation for a wind turbine on the seabed will cause local changes in the structure of the seabed biocenosis demonstrated by:

- 1) destruction of benthos in the wind turbine foundation location (construction stage),
- 2) destruction or reduction in population of benthic species in the area of sedimentation of the suspended matter lifted from the seabed during the foundation works (construction stage),
- 3) a change in the sediment structure (and the structure of benthos inhabiting the sediment) resulting from a different sorting of the sediment by the near-bed water currents flowing around the foundation (operation stage),
- 4) the appearance of a new epiphyte complex on the walls of the wind turbine foundation (operation stage),
- 5) destruction of the epiphyte complex (decommissioning stage),
- 6) destruction or reduction in population of benthic species in the area of sedimentation of the

suspended matter lifted from the seabed during removal of the foundation (decommissioning stage),

Therefore, monitoring is planned to determine the scale, spatial and temporal range of the aforesaid impact factors. Macrozoobenthos studies should be conducted using standard methodology (HELCOM COMBINE, 2014), whereas epiphyte flora and fauna should be studied in accordance with the methodology presented by Kruk-Dowgiałło et al. (2010).

In the EIA report, the following assumptions were made in the monitoring program:

1. studies should begin shortly after placing the foundation,
2. monitoring should be continued until a complete reconstruction of the destroyed complex and/or formation of the epiphyte complex is achieved, i.e. 5 years (this is how long it takes to rebuild the quantitative structure of the longest living species, i.e. clams),
3. the stations for macrozoobenthos sampling from the seabed should be determined in the near-bed current axis, at a distance of 20 m, 50 m and 100 m from the foundation (main profile) and at the same distance in the perpendicular profile (reference profile) of 5 wind turbines,
4. sampling of the epiphyte complex using a DAK sampler as well as video and photo report made by a diver in three depth zones for 5 wind turbines.

The benthos monitoring proposal used in Germany has been taken into account (Standard, 2013). No technical difficulties or impact on the effectiveness of the wind farm are expected when the proposed monitoring measures are applied. It is assumed that periodic reports will be prepared after each year of monitoring and a summary report after the completion of the whole cycle of surveys in the 5th year of the project's operation.

The Regional Director for Environmental Protection in Gdańsk considered the above to be justified and imposed on the Investor the obligation of the full monitoring of benthos proposed in the EIA report in the above scope. However, at the stage of reassessment the exact locations of reference points should be indicated, taking into account: location beyond the impact of the planned project, substrate similar to the substrate in the area of the planned farm.

Based on the preliminary assessment -- screening, the EIA report concluded that during the construction stage of the project, there will be impacts, including cumulative impacts, which will not have a significant negative impact, either direct or indirect, on the integrity, coherence and objects of protection of PLC990001 Ławica Słupska Natura 2000 site in the context of the protected habitats 1170 and 1110, of which benthos is a component. The anticipated impacts will not undermine the protection objectives of the assessed site. In the analysis of the associated impacts it was concluded that the habitat loss due to the construction of the farm will be minor and that the depletion of benthos constituting the food base for seabirds and fish will not be permanent. Introducing hard substrate into the environment will create an "artificial reef" effect and the area around the foundations will become a place of concentration and feeding for many fish species. The significance of cumulative and unplanned impacts will be negligible or minor for the benthos in the Polenergia Baltic II OWF area.

The supplement to the EIA report of September 28, 2016 indicates that due to the lack of designated boundaries of the range of protected natural habitats in PLC 990001 Ławica Słupska Natura 2000 site, it is not possible to provide a numerical value of the surface area of habitat 1110, which will be subject to deposition of an additional layer of sediment formed as a result of construction works. Assuming that habitat 1110 would occupy the whole area within the range of the discussed impact, it was calculated that the temporary deposition of sediment in the Słupsk Bank area would cover approximately 15% of the habitat 1110 area for the alternative option and 0.4% for the option selected for implementation, respectively 24.16 km<sup>2</sup> and 0.61 km<sup>2</sup> of habitat. Upon cessation of all the works, sediment deposition will cover 10.4% of habitat 1110 for the alternative option and 1.1% for the option

selected for implementation, that is 16.62 km<sup>2</sup> and 1.78 km<sup>2</sup> respectively. The supplement indicates that the habitat area affected by that the suspended matter with temporary concentration of no more than 0.006 kg/m<sup>3</sup> over the entire construction period will represent 22.8% of habitat 1110 for the alternative option and 8.5% of habitat 1110 for the option selected for implementation, that is 36.52 km<sup>2</sup> and 13.58 km<sup>2</sup> of the habitat area respectively.

Therefore, the Investor was required to reassess the impact of the planned project (sediment deposition) on the conservation status of natural habitat 1110 -- sandy submarine banks which is a subject of protection in the PLC 990001 Ławica Słupska area, including the analysis of the scope of the impact and habitat surface area affected by that impact.

***Impact of the option selected for implementation and the reasonable alternative option on fish:***

According to the results of monitoring of ichthyofauna in the area of the Polenergia Bałtyk II OWF and its buffer zone, 20 fish taxa were identified. Using pelagic trawl and bottom exploratory set, 15 species of fish were recorded and 12 species of fish larvae and sprat eggs were recorded in the ichthyoplankton samples collected with a Bongo net (including 5 species not recorded in the trawl and bottom sets carthes). Because of the difficulty in assaying the larvae of sandeel and gobies to the species level, the larvae were assayed to the family level.

In the period from October 2012 to September 2013 in the area of the Polenergia Bałtyk II OWF and its buffer zone the following fish species were caught: nine-spined stickleback, three-spined stickleback, common seasnail, great sand eel, codfish, European plaice, shorthorn sculpin, armed bullhead, salmon, fourbeard rockling, rock gunnel, turbot, European flounder, European sprat, herring, lumpfish, viviparous eelpout, common dab, sandeel, gobies.

The sensitivity of particular species to impacts connected to the successive stages of the project will vary. The greatest impact concerns juvenile fish forms, as adult individuals are more resistant to harmful factors that may be present in the natural environment (Knudsen et al., 1992; Wahlberg and Westerberg, 2005).

In the EIA report, a three-stage scale was used to assess the degree of susceptibility (sensitivity) of selected species to potential impacts of the wind farm, based on Bergstrom et al. (2014).

The analysis refers to the impact of the Polenergia Bałtyk II OWF with a distinction as to the stage at which a given impact occurs (construction, operation or dismantling);

- **high** sensitivity refers to the type of impact that affects both the population size and distribution of fish species as well as the food web,
- **medium** sensitivity refers to the type of impact that affects the population size and distribution of species but does not affect the food web,
- **low** sensitivity refers to the type of minor or no impact on the population size and distribution of individual species.

During the construction stage of the OWF, fish may be sensitive to increased content of suspended matter in the water column, water pollution, acoustic disturbances, creation of a spatial barrier and habitat change.

Increased suspended matter content in the water column may have a significant impact on the early stages of fish development due to the fact that the possibility of avoiding the negative impact of this factor is limited. Pelagic eggs may be adversely affected by suspended matter (falling to the seabed). In the case of adult forms, an avoidance reaction is usually observed (for concentrations of suspended matter generated during the construction of the OWF).

Despite the potentially high sensitivity of fish to chemicals, the risk of larger quantities of harmful substances escaping from sediments during construction activities, as indicated in the EIA report, is low due to their low concentrations in sediments in the South Baltic area, Emissions of toxic

substances from vessels will not result in a noticeable increase in levels of chemical in the South Baltic waters, while the risk of emission in case of collision has been estimated to be low.

Acoustic disturbances is one of the most important negative factors affecting the ichthyofauna. Noise can have a significant negative impact on the development and life of fish. The noise level resulting from the construction of foundations can reach 260 dB re: 1  $\mu\text{Pa}^2\text{s}$  and cable laying works can generate noise of up to 178 dB re: 1  $\mu\text{Pa}^2\text{s}$ .

However, noise-induced mortality was recorded only within a few meters from the sound source. Sounds and vibrations generated during the construction of the OWF induce the fish to leave their feeding grounds, hideouts and changing spawning grounds (Slotte et al., 2004), thus influencing the survival of individuals and their reproductive success.

The EIA report indicates that the creation of a spatial barrier during the construction stage will take relatively short time and that fish actively move to avoid the barrier.

Changes of habitat caused by the construction of a wind farm may affect the ichthyofauna through changes in the morphology of the seabed and the character of the sediment thus directly affecting the living and reproduction conditions of the ichthyofauna and indirectly through the effect of habitat changes on benthic organisms being the source of food for fish. Due to the short-term duration of that impact, the EIA report determined the sensitivity to be low for all the species.

At the stage of operation of the OWF the fish may be sensitive to increased suspended matter content in the water column, water pollution, acoustic disturbances, creation of a spatial barrier, habitat changes and electromagnetic field.

During the operation stage, the only source of toxic chemicals that may potentially affect the ichthyofauna is the leakage of harmful substances from vessels during the service and maintenance works of the OWF or potentially the leakage from the failure of the offshore power station (OPS). The risk level of pollution and the scale of emission during the operation of the OWF (based on the literature) allows to determine the sensitivity of all species to be low.

The intensity of noise generated by wind farm depends on the type of turbine, speed of wind, number of turbines in operation and the distances between them as well as local hydrological, geological conditions, depth and level of natural background noise. The frequency of sound generated in water by a running turbine falls between 1-400 Hz and the level ranging between 80-100 dB 1 $\mu\text{Pa}^2\text{s}$  increases with the number of turbines (Nedwell et al., 2003). Due to the low frequency and intensity of the noise, there is no risk of permanent damage to hearing organs or tissue of fish through the noise generated by running wind turbines. Experimental studies have shown that noise is not loud enough to trigger avoidance reaction in fish. Therefore the sensitivity was assessed as low.

The presence of wind turbine structures may to a small extent represent an underwater physical barrier to fish migration. Typically, the emergence of new structures providing a firm substrate and a refuge for fish will result in an increase in the population size of certain species of fish and can also increase biodiversity. Wind turbine structures can be places of refuge as well as places of reproduction and development of early developmental stages of many species of fish. The exclusion of fishing activities has an additional impact, however only a local impact. A higher sensitivity to habitat change through the creation of an artificial reef has been attributed to fish for which it will create more favorable conditions for reproduction (common seasnail, gobies) or shelter (cod).

Knowledge of the impact of electromagnetic fields on fish is relatively limited. Effects of electric and magnetic fields have been observed in some fish species that are considered sensitive. It is assumed that the electromagnetic field observed around the connection cables may also affect fish migration capacity, although studies on the effect of the power cable connecting Poland and Sweden (SwePol Link) have not shown significant effects on salmonid fish, flatfish and juvenile cod.

At the stage of decommissioning of the OWF, fish may be sensitive to increased suspended matter

content in the water column, water pollution, acoustic disturbances and habitat changes.

According to the information provided in the EIA report, similar potential hazards associated with increased suspended matter concentrations can be assumed to exist during the construction stage, such as negative impacts on larvae and egg development, obstruction of food supply and gill clogging.

The occurrence of negative impact of toxic chemicals at the stage of OWF decommissioning may be related to the leakage from vessels or equipment involved in cable laying and as a result of the entry of harmful substances into the water together with suspended matter lifted from the seabed as a result of works related to the removal of foundations or cables. The scope and significance of these threats, as in the case of the construction stage, are small.

The source of acoustic disturbances during the decommissioning process will be the noise associated with the increased movement of vessels participating in the dismantling of infrastructure elements. Noise will be generated also by the removal of turbine structures themselves. Sounds generated during this phase of the project may pose a threat to the species colonizing the new habitats, established after the construction of the farm, taking into account most of the effects described in the section on the construction phase.

The removal of the infrastructure of the OWF will result in the destruction of the habitat created during construction stage and developing or remaining in a state of equilibrium, created by structural elements that provide a hard substrate (Spanggaard, 2006). We can therefore expect the disappearance of the artificial reef effect associated with a decrease in the population size and diversity of ichthyofauna and a deterioration in conditions favorable to the reproduction and development of early stages of fish development.

Of the 20 taxa observed during the monitoring of ichthyofauna, 7 are of particular economic importance, as they are subject to commercial fishing. These include: European sprat *Sprattus sprattus*, Atlantic herring *Clupea harengus*, Atlantic cod *Gadus morhua*, European flounder *Platichthys flesus*, European plaice *Pleuronectes platessa*, turbot *Scophthalmus maximus* and Atlantic salmon (*Salmo salar*). In the exploratory fishing conducted in the OWF area and its buffer zone, sprat, herring, cod and flounder had the largest populations, which also constitute the basis for industrial fishing (more than 96.2% of the total Polish marine fishing in 2013). In addition, during monitoring studies, 27 goby larvae were found in ichthyoplankton samples, most probably belonging to the partially protected sand goby species *Pomatoschistus minutus* and 16 common seasnail *Liparis liparis liparis*, which is also partially protected in Poland.

The aforementioned species, due to their high importance for the functioning of the ecosystem, significance for industrial fishing and legal protection status, will be discussed in detail later in the assessment of the impact of the offshore wind farm on the ichthyofauna. The remaining species were less abundant and will not be considered in the environmental impact assessment.

The disturbance of the bottom sediment layer during construction works will also result in the release of a certain amount of contaminants and nutrients that will pass into the water column.

The studies conducted directly in the area of the planned construction of the Polenergia Bałtyk II OWF confirmed the low concentration of hazardous substances in the sediments (PAHs, PCBs, heavy metals, mineral oils, radionuclides). The permissible concentrations of metals, PAHs and PCBs were not exceeded in any of the examined sediment samples taken from the area of the Polenergia Bałtyk II OWF. The estimated amount of heavy metals, pollutants and nutrients that may be released in the alternative option and the option selected for implementation will not be significant compared to the annual loads brought into the Baltic Sea from rivers and wet precipitation. Taking into account the above survey results presented in the EIA report, it was concluded that at the stage



of construction of the Polenergia Bałtyk II OWF there will be no significant threats to ichthyofauna related to increased concentrations of toxic chemicals released from sediments. The release of a certain amount of pollutants and nutrients from disturbed bottom sediments may result in direct and indirect negative impacts on ichthyofauna, local, temporary, reversible, repeatable (during the construction period), of low intensity.

Given that even in the most far-reaching scenario, the significance of impacts on fish related to the release of contaminants and nutrients from sediment to the water column is negligible or low, the EIA report concluded that no mitigation action is required. The local authority considered to be justified.

The noise level associated with construction works is largely dependent on the type of foundation used. The technical concept prepared by Royal Haskoning DHV for the Polenergia Bałtyk II OWF allows for 4 types of them; gravity-base foundation (whose installation does not require piling), monopiles, jacket and tripod foundations. Significant acoustic disturbances during the construction of foundations occurs in the case of monopiles and truss structures (jacket) and tripod type, and according to the quoted report, are on average below 170 dB. Therefore, they are lower than the majority of values reported in the literature for which a negative impact on ichthyoplankton was observed. The most far-reaching scenario assumes maximum sound exposure peaks of up to 260 dB when sound waves cumulate over a 24-hour period. For the purpose of analysis of impact significance, ranges of sound exposure values were adopted to assess the intensity of impact:

- <140 dB -- low impact,
- 140-170 dB -- medium impact (avoidance reaction),
- 170 - 210 dB -- high impact (TTS - Temporary Threshold Shift),
- 210 dB > - very high impact - (PTS - Permanent Threshold Shift, mortality).

The spatial scope (the data contained in the DHI report) indicates the impacts of the above values at approximately 130 km for 140 dB, 4 km for 170 dB and approximately 200 to 400 m for sound exposures above 200 dB (for single impacts). When calculated per 24 hour period, the cumulated sound exposure shows an even wider spatial range -- from about 80 to 120 km for 170 dB and 5 km for values above 210 dB. It can be assumed that the avoidance reaction (140 dB limit) can be observed even over 120 km from the impact source. The avoidance reaction may adversely affect spawning processes in the vicinity of construction works. This effect is a much greater threat to the population when avoidance occurs in an area where environmental conditions are particularly favorable for spawning and there are no similar areas nearby. Within a 80 - 100 km range Polenergia Bałtyk II OWF there is the most important cod spawning ground (the Bornholm Deep). The area of the Polenergia Bałtyk II OWF is not itself a spawning ground for codfish nor a target spawning ground for deep water spawning of European flounder due to the prevailing hydrological conditions. During ichthyological studies, sprat and probably herring was found to be spawning, but the EIA report concluded that the area was small compared to a large spawning grounds of pelagic fish.

Noise and vibration generated during installation of foundation piles can have a direct negative impact on the ichthyofauna. Without the application of mitigation measures, it may cause impacts of international scale, medium term, reversible or irreversible, repeatable (during the construction period), of medium intensity.

Due to the high significance of the noise impact during the installation of the monopiles, which were considered to be the most far-reaching scenario in terms of the impact on ichthyofauna, it may be necessary to use a mitigation measures during the construction stage (during the installation of the piles) if such a foundation is selected. The DHI acoustic report clearly shows that the reduction of the range of negative sound exposure is achievable with measures that are now commonly accessible on the market. For example, for a bubble curtain, in the case of 170 dB the territorial range (TTS) of the impact will decrease 4 times (to about 20-30 km). Similarly, the avoidance reaction (140 dB) will

be observed up to approximately 30-40 km from the sound source. After the application of mitigation measures, the scale of the impact will decrease to a regional one, which will significantly influence the magnitude and significance of the impact. The option selected for implementation assumes constructing much fewer foundations than the most far-reaching scenario, which will result in a shorter time of their installation, and therefore a shorter period of increased noise levels. It is therefore accepted that the option selected for implementation will have a lower impact on ichthyofauna than the most far-reaching scenario.

The Regional Director for Environmental Protection in Gdańsk, taking into account the above results of the analysis of the EIA report, imposed on the Investor a obligation of using of air curtains at the piling stage. However, if at the stage of reassessment, it turns out that this measure, recommend for use and intended for reduction of noise level, can be replaced by a more effective technology, it may be subject to modification. The mitigation measure ultimately selected must ensure that underwater noise emitted during pile installation is reduced to an acceptable level and spatial range.

Any structures supporting the stage of foundation of the OWF and newly created elements of wind installations may constitute a barrier to fish migration routes. However, they can avoid these obstacles in order to move to areas with more favorable living conditions. According to the EIA report, the density of turbines is so low that it will not affect the migration possibilities of ichthyofauna. A mechanical barrier in the form of emerging foundations and other underwater objects can directly adversely affect the ichthyofauna. This impact will be local, temporary, reversible, repeatable (during the construction phase), and of low intensity. Considering that even in the most far-reaching scenario the impact of a mechanical barrier on fish is negligible or minor, the EIA report concluded that no mitigation action is required. The local authority considered the above to be justified.

Construction works will lead to the complete destruction of benthos in the trench areas for foundations and in the cable trenches. This will result in a depletion of food resources for fish living on benthic organisms. At the stage of the report, it was found that the area where the change of habitat will completely eliminate benthic organisms will be relatively small (about 1% of the total area of the project). The benthic biomass that potentially may be lost as a result of construction works is about 760 Mg, most of which is the biomass of mussel growing on the surface of the stone, which constitutes 48% of the area of Polenergia Bałtyk II OWF. Taking into account the above data, the predicted rapid rate of recovery of the benthic population and the fact that fish are actively moving in search of food, it has been concluded that the loss of organisms constituting the benthophagic fish diet can be considered insignificant. Also, the reduction of the fish food base due to the negative effect of covering of the seabed with a layer of fine sediment from the water column should not be of vital significance. The thickness of that layer in the alternative option, during construction works and after their completion, does not exceed 2 mm in most areas of the farm, only in some spots the value is higher. Outside the area, this thickness will not exceed 1 mm. In the option selected for implementation the values are 1 mm (within an area) and 0.4 mm (outside an area) respectively. The sediment will not be stable and will continue to disperse under the influence of sea currents over time. However, such a relatively small change in habitat may disturb the development of benthic eggs (herring, common seasnail, gobies) by covering already deposited eggs or making it more difficult for them to be deposited in the modified sediments. However, the extent of such an impact will be local and may be considered insignificant. The results of studies of zoobenthos structure and analyses of its susceptibility to this factor indicate that organisms that constitute part of the diet of benthophagic fish, such as molluscs and crustaceans, are not sensitive to its impacts. Therefore, there is no reason to assume that the impact of deposition of sediment from the water column will significantly reduce the food base of benthophagic fish.

Habitat changes due to construction works may have a direct or indirect negative impact on

ichthyofauna, in particular on benthophagic fish and seabed spawners. This impact will be a local, temporary, reversible, repeatable (during the construction period), and of medium intensity. In the implemented option significantly fewer wind turbines will be constructed, than as forecast in the most far-reaching scenario, which will result in less habitat changes. It is therefore accepted that the option selected for implementation will have a lower impact on ichthyofauna than the most far-reaching scenario.

Considering that even in the most far-reaching scenario the significance of impacts associated with habitat changes is negligible or low, at the stage of the report it was concluded that no mitigation action was required.

The most significant potential impact is the cumulative impact from piling noise. The DHI technical report presents this issue in 2 options: accumulation of emissions inside the project and accumulation with the external project. In the first case, the total scale of the impact of the Polenergia Bałtyk II OWF is affected by the intensity of the factor and the time and scale of the impact. Most impacts are assessed to be of insignificant magnitude and the significance of the impact is assessed to be low or negligible. In the case of sound exposure, the DHI acoustic report presents the situation of cumulative impacts in which two structures are piled simultaneously and mitigation measures are applied. In this case, the range (TTS) will not increase significantly and will be 20-30 km from the sound source and the avoidance reaction will be up to 60 km respectively. Bearing in mind the most far-reaching scenario, the EIA report concluded that according to the methodology the construction can be classified as having: negative character, direct impact, regional scale, constant frequency of impact, medium term duration, medium intensity. Taking into account the Impact Assessment Matrix, the impact of construction of the OWF will be minor for codfish and negligible for other species. In the second case, assuming that the impact of the remaining farms is identical to that of the Polenergia Bałtyk II OWF, and that they will be built at the same time, the scale of exposure includes the regional level. Then (also taking into account Impact Assessment Matrix) the cumulative impact of all projects will be classified as small. This is confirmed by the DHI acoustic report for cumulative impacts, when the hypothetical construction of two wind farms (Polenergia Bałtyk II and Baltica 2 OWF) with simultaneous piling of one structure may cause an avoidance reaction within a radius of up to approximately 60 km from the sound source, which includes only Polish maritime areas and the area ICES 25, which according to the adopted methodology is a regional exposure. For significant impacts to occur, it would be necessary for a factor to occur on a larger than regional scale, with a high frequency long-term impact. Such an impact could occur if the negative sound impact is not mitigated during the construction of offshore wind farms or if wind farms are located close to cod spawning areas at the Danish border.

The following emissions and disturbances of the state of the environment, which may cause impacts on fish, are expected to occur during the phase of operation of Polenergia Bałtyk II OWF:

1. emission of chemical compounds from corrosion protection agents,
2. emission of noise and vibration,
3. creation of a mechanical barrier,
4. creation of an "artificial reef",
5. emission of electromagnetic field and radiation.

Unplanned impacts may also occur during the operation of the farm, in particular contamination of the water column and bottom sediments with:

- 1) oil-derivative substances,
- 2) anti-fouling agents,
- 3) accidentally released municipal waste or domestic sewage,
- 4) accidentally released chemical agents and farm waste, which may indirectly affect fish.

Steel structures or elements of the foundations of the wind farm and substations will corrode in the marine environment. It will therefore be necessary to apply appropriate safeguarding measures. The most common corrosion protection method used in the marine environment is cathodic protection. It can be implemented as a galvanic or electrolytic protection.

Galvanic cathodic protection consists in mounting aluminum (Al) or zinc (Zn) anodes on the foundations. The anodes are gradually consumed and Al or Zn are transferred to the water column and accumulate in the bottom sediments. In the case of electrolytic protection, such impacts do not occur. The assessment concerns only galvanic cathodic protection. Approx. 10 tons of Zn will pass to the environment annually. This is not much when compared to about 700 tons of Zn discharged annually to the Baltic Sea via rivers from Poland. However, even the above quantities, when released into the water column or accumulating in the bottom sediments, may affect the ichthyofauna. However, such an impact will be at the threshold of being barely detected. The report shows that the contamination of the water column and the bottom sediments with compounds from corrosion protection agents will not affect the structure and functioning of ichthyofauna in the project area in any of the project options.

When wind farms are operating, the noise and vibration from the operating turbines will be emitted. The noise emission assumed in the technical concept of Royal Haskoning DHV will emit noise only 2 dB(A) above the fish threshold of audibility. In the case of some fish species, for whose development a permanent substrate is attractive, there may be an effect of avoiding the OWF area due to stress caused by the constant vibration of wind turbines (Thomsen et al., 2006). Avoidance reactions consisting in avoiding passing vessels were reported in surveys of the populations of Baltic cod, herring and sprat, which, among main species exploited by fishing, have best ability to hear sounds (Mitson, 1995). The reaction of fish to noise also depends on their physiological condition. In the case of herrings, which are characterized by a very good hearing, sound sources associated with vessel movements and fishing gear are usually avoided outside the spawning season (Olsen et al., 1983; Vabo et al., 2002) but this behavior changes when the herring spawns (Nottestad et al., 1996; Axelsen et al., 2000). However, the effect of avoiding the area in the immediate vicinity of the turbine is likely, but the range of this impact should not exceed a few meters. The avoidance reaction in respect to increased pressure caused by the generated sound occurs within 4 meters of the turbine (Wahlberg and Westerberg, 2005). The effect due to the reaction to particle acceleration caused by operating turbines has an even smaller range of up to 1 meter. Noise and vibration from operating wind turbines can have a direct negative impact on the ichthyofauna. This will be a local, long-term, reversible, permanent (during operation), low intensity impact.

The presence of wind turbine structures may to a small extent constitute an underwater physical barrier to fish migration. However, the density of turbines will be so low that, regardless of the type of foundation used, it will not affect the migration ability of ichthyofauna. Danish studies have shown that the existence of the OWF has no negative impact on fish migration routes (Leonhard et al., 2011). A mechanical barrier in the form of emerging foundations and other underwater objects can directly adversely affect the ichthyofauna. This impact will be local, temporary, reversible, repeatable (during the construction phase), and of low intensity.

The EIA report concluded that due to the large share of the mussel in the population and biomass of benthos, this organism and other periphyton organisms are expected to attach to the turbine foundation structures relatively quickly, which will create favorable feeding conditions for some flatfish and some gobies, as well as shelters for juvenile fish. New hard structures, whether artificial or created by periphyton organisms, can create an additional substrate suitable for demersal eggs from fish discussed in the study (herring, gobies, seasnail, rock gunnel, shorthorn sculpin).

The largest possible gravity-base foundation in the most far-reaching scenario (alternative option)

has a diameter of 40 m and a base surface area of 1257 m<sup>2</sup>. Assuming a 15 m wide protective layer against leaching is applied around it, its surface area will be approx. 3848 m<sup>2</sup>, and for 206 foundations (most far-reaching scenario) it will amount to 792 688 m<sup>2</sup>, (0.79 km<sup>2</sup>) in total. At the same time, the final report on the seabed survey in the area of Polenergia Bałtyk II OWF indicates that the rocky seabed area determined on the basis of sonar images is about 130 km<sup>2</sup> (the area of the OWF and its buffer zone combined). However, the comparison of the two area surfaces is likely to be confusing because the actual surface area of the hard substrate conducive to development of conditions favorable for spawning is much smaller than the total area determined by the sonar images. Thus, it is difficult to quantify the relative increase in the area of hard substrate suitable for the reproduction of certain fish species, such as the gobies, herring or common seasnail. According to the EIA report, it should be assumed that this may be a significant factor positively influencing the spawning of these fish species.

In case of introduction of restrictions on fishing in the OWF area and the exclusion of this area from navigation (which is one of the considered options), the pressure from both these sectors will decrease and the farm area may become a kind of refuge for fish, both adults and fish in early developmental stages -- larvae and juvenile fish. According to the report, excluding the area from pressure of fishing could have a positive effect on ichthyofauna. However, the magnitude of this effect probably would not be very large. The monitoring of fishing in the area of Polenergia Bałtyk II OWF carried out as part of the pre-investment survey indicates low fishing productivity of this region (31% of the average productivity in the Polish maritime areas). At the same time, the area where no fishing activity would be carried out would be a fraction of the percentage of the area exploited for fishing of industrial species. It would be unjustified to infer a substantial drop in fishing pressure on commercial fish at the stock level resulting from banning fishing in the area. Also, taking into account the small size of the area where no fishing activity will be carried out and compared to the spawning grounds available in the southern Baltic Sea area, a possible improvement of spawning conditions and development of early stages of industrial fish (herring, sprat) will have a local effect at the most.

A greater positive impact related to banning fishing can be expected in regard to protected species (gobies, common seasnails) laying eggs on the seabed. The absence of disturbances related mainly to seabed trawling activities could have a positive impact on the spawning processes of these fish. However, given the current very low intensity of fishing with this equipment (e.g. in 2013 no bottom trawling during fishing activities in this area was recorded -- the source: Monitoring of fisheries in the area of the "Bałtyk Środkowy II" offshore wind farm, their discontinuation did not seem to result in a rapid effect of a significantly increased spawning success. However, it can be assumed that the accumulation of even a slight increase in spawning success of the gobies and the common seasnails over a few successive years could result in a certain increase in the number of these species. But it is not possible to quantify the effect of an artificial reef on the size of fish stocks whose stock estimates exist (cod, herring and sprat). The area of Polenergia Bałtyk II OWF is small, whereas the fluctuations in the state of the resources in the whole Baltic Sea depend on many environmental and anthropogenic factors having a much broader impact than a potential additional spawning ground area or an area excluded from fishing, which is anyway less productive in term of fishing than the average of the Polish maritime areas.

The new habitat created as a result of the construction of the OWF will be characterized by the presence of a hard substrate and relatively rich food base for fish feeding on benthos. It may constitute a favorable living environment for the round goby, an invasive species.

The creation of an "artificial reef" can have a direct positive impact on the ichthyofauna. These will be local, long-term, reversible, permanent (during the operation), low intensity impacts. Given that even in the most far-reaching scenario the impact of an artificial reef on fish is negligible or minor,

the EIA report concluded that no measures are required in this respect to minimize the impact. 2 supplements of May 18, 2016 indicate that not every foreign species is an invasive species, i.e. one that will find favorable conditions for breeding, expansion and displacement of native species. Despite the knowledge that hard, underwater elements: natural (e.g. boulder fields) or artificial (ship wrecks, groynes, foundations and piles of offshore wind farms) may constitute a new area to be colonized by native as well as non-native species, it is impossible to predict at this stage of knowledge whether there will be any foreign species within the area of Polenergia Bałtyk II OWF that could become invasive. The probability of occurrence of the discussed species within the area of Polenergia Bałtyk II OWF is very low, because so far foreign species in the Baltic Sea have colonized mainly the coastal zone, bays and estuaries, as the proximity of harbors creates favorable conditions for them, and Polenergia Bałtyk II OWF is located more than 100 km away from these sources (the port in Szczecin, Gdynia, Gdańsk). Bearing in mind that the role of foreign species in ecosystem is not always unambiguous, each case should be analyzed individually. The analyses conducted so far within the framework of post-implementation monitoring on the existing offshore wind farms do not indicate no threat of foreign or invasive species spreading in the area of the farm. Although the goby's reproductive strategy -- protecting the eggs developing in the nest and safeguarding them against predators -- is conducive to the establishment of this species in various conditions (Leather and Carpenter's 1996), the species prefers low depth at which spawning takes place (from 0.2 to 1.5 m on different substrates, Wandzel 2003). Such bathymetric conditions are not provided by the area envisaged for the construction of the OWF.

The EIA report indicates that the shape of the artificial reef will potentially favor the conditions for life and reproduction of species valuable for nature or commercial purposes or cause the succession of invasive species. Taking into account the relatively small knowledge and experience concerning the processes of colonizing OWF areas in the phase of operation by organisms, it would be advisable to conduct periodical monitoring studies to follow the successive stages of formation of plant and animal communities in the OWF regions as compared to the adjacent areas.

Such monitoring should be based on the use of standard multi-panel research networks used in pre-investment survey. In the first year after the completion of the construction works, it would be necessary to put out 2000 meters of net inside the OWF in annual schedule of 4 periods -- spring, summer, autumn and winter, subject to a 2-time exposure of the net in each season. At the same time, for comparison purposes, the same set of survey tools should be deployed at a distance of 20 km from the project in an area with similar bathymetry. The buffer zone of Polenergia Baltic II OWF may not be suitable for such comparisons due to the possibility of attracting fish by artificial reefs of the wind farm. Another survey should be carried out 3 and 6 years after placing the structure on the foundation. Moreover, sampling of ichthyoplankton should be carried out in the same places and with the same frequency following the methodology recommended by the Food and Agriculture Organization of the United Nations (FAO) (Smith and Richardson, 1977). This methodology is one of the recommended methods of ichthyoplankton sampling listed in the "Report of the Study Group on Standards in Ichthyoplankton Surveys (SGSIPS)" (ICES, 2010) and is used by International Council for the Exploration of the Sea (ICES) member countries.

The Regional Director for Environmental Protection in Gdańsk, taking into account the fact that this is one of the first offshore wind farms in Poland and the fact that the above surveys are also conducted on other farms, inter alia, in Germany by the International Council for the Exploration of the Sea (ICES), in order to be able to compare the changes in the ichthyofauna taking place on the planned wind farm as compared to a reference site (a site outside of the farm), considered conducting such monitoring to be justified and imposed on the Investor the obligation to conduct monitoring in this respect. At the same time, the extension of the monitoring at the reference site to include benthos

and sea mammals should be reconsidered in the assessment stage.

**Impact of the option selected for implementation and of the rational alternative option on birds:**

The planned wind farm is located in the immediate vicinity of PLC 990001 Ławica Słupska Natura 2000 site. Ławica Słupska (PLC 990001) Natura 2000 site was established by the Regulation of the Minister of Environment of July 21, 2004 on areas of special protection of birds Natura 2000 (Journal of Laws No. 229, item 2313) as an area of special protection of birds and approved by the Decision of the European Commission as an area of Community importance in September 2009. According to the standard data form (updated February 2017), the following bird species are protected in the area of PLC 990001 Ławica Słupska: the common guillemot *Cephus grylle* and the long-tailed duck *Clangula hyemalis*, as well as the following natural habitats: 1110 -- sandy submarine banks permanently covered by shallow water and 1170 -- reefs. During winter, at least 1% of the population the following species on the migratory route occur in the above Natura 2000 site: the long-tailed duck, the black guillemot. Wetland birds occur at concentrations of over 20 000 individuals. The isolated habitat area 1170 (marine banks of molluscs) in Polish sea waters, shallow water is inhabited by numerous invertebrates, providing a rich food base for wetland birds stopping there in autumn and wintering. The dominant plants are macroalgae, with many species that have been found to have disappeared in the Gulf of Gdansk, the red seaweed *Delesseria sanguinea*, which has been reported lost in the Baltic Proper area. The Słupsk Bank is located at the depth of 8-20 m, about 22 km from the Polish coast. The threat to this Natura 2000 site include: exploration for and extraction of oil or natural gas.

Pre-implementation monitoring of sea birds was carried out from the vessel, using the methodology described in the methodological manual issued by the General Directorate for Environmental Protection (Meissner 2011 a). Which included:

- 1) Counting all birds floating and flying along transects, including separate counting of birds in the 600 m wide strip (300 m each on each side). The counting was done simultaneously by 2 people standing close to each other, each counting birds on one side of the vessel.
- 2) Additionally, the belt transect on each side of the vessel was divided into 4 zones:
  - a) up to 50 meters from the side,
  - b) 50-100 meters from side,
  - c) 100-200 meters from the side,
  - d) 200-300 meters from the side.

The aim was to allow the final analysis to take into account corrections related to the decreasing detection rate of birds with increasing distance from the vessel side. This is a standard procedure for counting the number of birds in water regions (e.g. Ronconi & Burger 2009). The counting using belt transect divided into the above mentioned zones was started with a check on October 24, 2012. The correction factors for the number of birds due to decreasing detection rate with increasing distance from the vessel side were based on sufficient data for the remaining period.

- 3) Counting the number of flying birds using "snap-shot" technique (recording birds in flight at a given moment in the belt transect). According to the current methodology (Komdeur et al. 1992), birds accompanying a vessel were not taken into account, as this would inflate their number by counting the same individuals several times.

The observations were done continually from a height of about 4 - 5 m above sea level, as the vessel was moving along the belt transect. A constant speed of about 9 knots was maintained during counting. Starting with the cruise on October 24, 2012, the length of each transect was divided into sections corresponding to 5 minutes of the cruise. During the previous cruises, a standard 10-minute segmentation was applied, in accordance with the methodology described in

the methodological manual issued by the General Directorate for Environmental Protection (Meissner 2011). The shortening of the sections took place before the expected increase in the number of birds, which occurs in the deep sea water regions of the Baltic Sea in autumn. In the discussed period, a total of 18 survey cruises were carried out and a total of 11 people took part in the observations. Each time the team of observers consisted of 3 ornithologists. During 31 survey cruises carried out in the "Bałtyk Środkowy II" area a total of 34 species of water birds were recorded, including 18 species of birds strictly related to the aquatic environment. The total number of birds observed was 74,161 and the average number per one survey cruise was 2,392.

During summer, 8 survey cruises were carried out, during which a total of 819 birds were recorded, including 770 specimens of species associated with the marine environment. The species definitely prevailing in number was the European herring gull, which constituted 81.9% of all observed birds and 87.1% of sea birds. It was also the only species found during all the checks. The average number of birds associated with the aquatic environment per one survey cruise was 100. For seabirds this value was slightly lower, reaching 96 birds per cruise. Only 23 specimens of birds associated with terrestrial habitats were recorded.

During seven cruises carried out during autumn migration a total of 5,208 birds were recorded, of which 97.1% were species associated with the aquatic environment and 90.8% were birds associated with the marine environment. The number of seabirds in the autumn migration period was significantly higher than in the summer and amounted to 676 individuals on average per one survey cruise. The most numerous species in this phenological period was the long-tailed duck.

During 10 cruises carried out in winter months, the vast majority of the recorded birds were species associated with the aquatic environment, 99.9% of which were seabirds. Only two hooded crows were observed flying by on December 13, 2012. In total, more than 60,000 individuals belonging to 19 species of water birds were recorded, which translates into an average number of 6,118 birds per cruise. By far the most numerous species was the long-tailed duck, whose share in the whole group amounted to 96.4%. Just like in summer and autumn, in winter the European herring gull appeared in relatively large numbers and was the second largest species in terms of numbers. High numbers the European herring gull were recorded at the time when long-tailed ducks were present in the area under survey. The sea ducks swallow the mussels that they take from the seabed only after they reach the surface, a behavior that seagulls use, trying to steal their food (the so-called kleptoparasitism) (Varpe 2010).

During six cruises carried out during spring migration a total of 7,352 birds from 37 species were recorded. Birds associated with the marine environment constituted as much as 99.7% of all observed individuals. In spring, the most numerous species was the long-tailed duck (58.6% of all the birds recorded), while only the common scoter and the European herring gull exceeded 5% share in the whole grouping. The average number of water birds was much lower than in winter and amounted to 733 individuals per one cruise. The obtained results indicate that spring migration in the examined water region is weakly displayed, and that the most birds stay in the area of the planned project in March. At the end of April and in May a fairly intensive migration of common scoter was observed and during these two checks the species represented respectively 61% and 92% of all water birds.

The Słupsk Bank is one of the most important long-tailed duck wintering grounds in the Baltic Sea. It is estimated that in winter between several dozen and over 150 thousand of these birds stay here (Durinck et al. 1994, Skov et al. 2011, *Ornithological monitoring of Ławica Słupska (Słupsk Bank) Natura 2000 site (PLC 990001). Final report with research results*). Water birds in wintering grounds often penetrate the neighboring areas in search of sources of food or safe resting places (Black et



al. 2010, Link et al. 2011) and this behavior also applies to sea ducks (Rodway & Cooke 2001, Merkel et al. 2006). The very high number of long-tailed ducks observed in the "Bałtyk Środkowy II" area in December 2012 was most likely related to such a situation. In the following year, high concentrations of birds were observed only on the Słupsk Bank.

Of the total number of 43 species recorded during the survey in the Słupsk Bank, 37 are under strict protection and 2 species under partial protection in Poland. Four species have a game status. The Little gull, black-throated loon, red-throated loon, black tern, common tern and the European golden plover are listed in Annex I to the EU Birds Directive. Two species, the velvet scoter and long-tailed duck, are in a higher IUCN endangered species category. Two species have an upgraded SPEC 2 status and a further 9 have been upgraded to SPEC 3 status, of which for the greater scaup the tundra swan this category does not apply to breeding populations but to the populations wintering in Europe.

Of 31 species of water birds identified in the surveys, 15 are species having a strong association with the marine environment. The long-tailed duck were by far the most frequently observed, and in the case of other three species only one individual of each species was observed.

In general, the number of birds recorded during the cruises was significantly higher in the second season of the study, and during three out of five countings it exceeded 10 thousand individuals, of which during two consecutive checks, on February 3, 2014 and February 20, 2014 over 17 thousand and over 24 thousand birds were recorded respectively. However, in the first season of survey over 10 thousand sea birds were recorded only once, during the cruise on November 20, 2012. The changes in the number of birds present on the Słupsk Bank were overwhelmingly affected by the long-tailed duck. This species constituted as much as 94% of the entire avifauna group in whole period of the study. The species closely related to terrestrial environments appeared in the surveyed area during the day in extremely small numbers and amounted only to 0.04% of all the birds. In the summer and though most of the autumn, the number of birds on the Słupsk Bank was low. The increase in the number of birds began in October. In the months from November to March the number of birds in the surveyed water region was higher, and in April their number began to decrease. A large discrepancy in the maximum numbers of birds between the first and second seasons is noteworthy. The maximum number during the second winter was twice as high as in the first season and fell on a different phenological period. This proves that there are large differences between seasons in the number of birds using the Słupsk Bank outside of the breeding period.

The analysis of changes in number was carried out for the three most numerous species: the long-tailed duck, velvet scoter and European herring gull. In total they constituted 99% of all the birds observed. In the first season, when the observations covered all phenological periods, long-tailed ducks appeared on the Słupsk Bank in October, and in November their number increased rapidly, exceeding 10,000 individuals. From December to February there was a gradual decrease in the number of this species and during the cruise on February 11, 2013 only 2358 ducks were recorded. March saw an increase in the number of long-tailed ducks, most likely due to the spring migration, but the number of birds observed at that time was twice as low as in November. The picture of changes in the number of this species recorded in the second season during the supplementary survey was different. In December 2013 the number of long-tailed ducks was higher than in November and January, and in February 2014 their number increased rapidly, reaching 15651 and 23890 birds during two consecutive cruises. It is noteworthy, however, that a similar decrease in the number of long-tailed ducks occurred in January in both seasons. This indicates that these birds leave this area are likely to migrate to other areas of the Baltic Sea at the beginning of winter. A very high number of long-tailed ducks in February 2014 could have been the result of bird movements after the northern and eastern parts of the Baltic Sea froze. The picture of changes in the number of this species in the 2013/14 season is probably not typical and may have resulted from a very long

period of high temperatures, which was exceptional for winter, and followed by subsequent rapid cooling of temperature. Until mid-January, many parts of Europe experienced temperatures above the freezing point and the areas of eastern and northern Baltic Sea, which usually freeze at this time year, were free of ice. The obtained results confirm the importance of Słupsk Bank for long-tailed ducks. It also confirms that these birds do not stay there constantly and large fluctuations in their numbers are marked.

The results of pre-investment ornithological surveys indicate that a sea area in the south-western part of the planned project is an important site for wintering population of the long-tailed duck. The significance of the area is most likely due to the relatively shallow water (depth up to approx. 25 m) and the abundant biomass of the mussel that inhabits the seabed, which is confirmed by the results of the benthic surveys. Therefore it constitutes a habitat allowing for energy-efficient feeding of birds. An additional factor possibly influencing periodical grouping of birds in this area is its location: approximately in the middle between the customary large vessel routes (to the north from the borders of the Polenergia Bałtyk II OWF and along Słupsk Bank). Therefore, the EIA report proposed that the exclusion area should have a minimum width of 2 km from the borders of Natura 2000 Słupsk Bank area (in the eastern part of the farm area) and extend westwards, reaching the width of up to 4 km for a significant distance of its length, which will additionally enable the protection of feeding ground in the south-western part of Polenergia Bałtyk II OWF used by the aforementioned long-tailed duck. Exclusion of such an area from the farm area will reduce the magnitude and significance of the impact of Polenergia Bałtyk II OWF on the wintering population of the long-tailed duck to moderate.

The scaring of birds in the area excluded from construction of the wind turbines will occur only during the construction phase of farm facilities other than wind turbines, but the facilities are not expected to exert negative impact on seabirds during their operation.

The Regional Director for Environmental Protection in Gdańsk accepted this request and imposed on the investor a condition of excluding the area of 2 to 4 km in the southern part of the wind farm in order to preserve feeding grounds for the long-tailed duck.

The EIA report shows that the wind turbine complex built on the route of movements related to seasonal migrations will create a barrier for the migrating birds. Although a single farm will not significantly extend the flight routes of birds bypassing its area, but several such farms located very close to each other may cause an increase in energy cost of long-tailed ducks on migration-related flights, as well as on travel between feeding grounds. For this reason, it is necessary to maintain sufficiently broad corridors between adjacent areas occupied by neighboring offshore wind farms.

The area of Polenergia Bałtyk II OWF is adjacent to Słupsk Bank in the southwest, which is one of the most important wintering grounds for the long-tailed duck in the Baltic Sea (Skov et al 2011). These birds appear in large numbers in this area in November and stay there until the end of April (Ornithological monitoring of Ławica Słupska (Słupsk Bank) Natura 2000 site (PLC 990001). However, there are large fluctuations in the number of the long-tailed duck, indicating that the birds travel during wintering. Most likely, their movements are connected with the search for feeding grounds. Initially, the sea ducks gather in areas where zoobenthos (mainly mussels) is abundant and the water is not very deep (Brager et al., 1995; Kaiser et al., 2006; Kirk et al., 2008). Later, when the density of their prey declines as the result of their feeding, they move to other places, including those with greater water depths (Brager et al., 1995; Kirk et al., 2008; Meissner, 2010). This is also evidenced by changes in the locations of the largest concentration of long-tailed ducks within Słupsk Bank area. In autumn, the largest number of birds gathered in the northern part of this sea area, but during a survey visit on November 20, 2012, very large flocks appeared on the eastern edge of Słupsk Bank. In winter the birds moved westwards, and in spring, when the number of birds was already much lower, their density distribution was more balanced while the most long-tailed ducks were present in the central part of this sea area.

The distribution of birds at sea may also be affected by the movements of vessels. Sea ducks avoid regular ferry routes, which affects their presence even up to 1 km from the shipping route (Larsen & Laubek, 2005). Surveys conducted in the western Baltic Sea and the eastern North Sea have shown that different species react differently to passing vessels (Schwemmer et al., 2011). In the case of the long-tailed duck, most of the observed birds would take to flight at a distance of about 50 to 750 m from the vessel. It has also been noted that larger stocks take to flight at a greater distance (Schwemmer et al., 2011) and that the strongest scare away effect is triggered by large and fast-moving vessels (Ronconi & Clair, 2002; Larsen & Laubek, 2005). Long-tailed ducks are capable of getting used to the regular ship traffic that takes place along a fixed routes, which results in their shorter escape distance, but fishing vessels do not move along shipping routes and their effect on short-term changes in bird distribution in sea areas may be greater (Schwemmer et al., 2011). The time that the ducks remain airborne after being scared away varies greatly and varies for different species. In different phenological periods it was from 30 seconds to 5 minutes on average (Korschgen et al., 1985; Kahl, 1991; Knapton et al., 2000). Assuming that the long-tailed duck flies at a speed of about 70 km/h (Pennycuick et al., 2013), it can travel between 0.6 and 6 kilometres during this time.

In order to reduce the negative impact of the planned farm on birds being the subject of protection in Natura 2000 Ławica Słupska site PLC 990001, the following conditions were imposed on the investor for the implementation of the planned investment: works related to generating high volumes on noise, i.e. piling works, should be carried out in the period from May 1 to September 30, when the number of birds in this area is the lowest. Whereas during the period when long-tailed ducks occur in large numbers at Słupsk Bank (from November 1 to April 30), a ban is introduced on the entry of ships participating in the construction, dismantling and tasks related to the operation of BS II OWF into the Natura 2000 site.

According to the EIA report, the highest number of collisions should be expected in the case of the European herring gull, but even in the most far-reaching scenario (WA, tower height 120 m), annual losses would amount only to about 0.11% of the population of this species, estimated at over 1.3 million individuals (Wetlands International 2014). The European herring gull is a common species with a low conservation status (only partially protected). It is the most abundant species of seagull. The European herring gull is concentrated in thousands on coastal areas, particularly around fishing harbors (Meissner et al., 2007), and its presence in the open sea, far from the shore, is strongly influenced by the presence of fishing vessels. It is estimated that the relatively large number of potential collisions calculated above will not significantly affect this species. It should also be remembered that the calculations are based on the number of seagulls found during the pre-investment monitoring, while the investor plans to limit the possibility of commercial fishing in the farm area (in particular by prohibiting the use of certain fishing methods, defining zones around the power plant which cannot be crossed and limiting the size of vessels which may pass through the farm area), which should limit the presence of that species in the vicinity of the power plant and thus reduce the predicted number of collisions.

The long-tailed duck was the most numerous seabird species in the surveyed sea area. The species rarely takes to flight (Žydelis et al. 2015). Moreover, in vast majority, these birds fly low above water surface (up to 15 m), so despite high concentrations, the collision rates for this species are very low and will not affect its population (Žydelis et al. 2015).

Collisions between the velvet scoter and the wind turbines within Polenergia Bałtyk II OWF are unlikely. This species spends most of its time floating on water or diving, so it is assumed that these birds only fly for 10 minutes during an entire day of 8 hours (Žydelis et al. 2015). Moreover, the majority of their flying take place at low altitudes, below the range of the operating rotors, which combined with their not very high number in this area indicates that collisions of these birds with power plants are not expected.

Collisions during the operation stage are direct, negative impacts on sea birds of local range which are long-term, irreversible, repetitive over the operation period, of low to high intensity.

The construction and subsequent operation of the offshore wind farm will result in scaring away and displacing seabirds from their habitats in the area occupied by the power plants and in the adjacent water strip of approximately 2 km in width.

A single offshore wind farm is a barrier for birds, which, in the vast majority of cases, avoid the sea area with wind farms. Such a behavior minimizes the risk of collision, especially during the day when the visibility is clear. However, the farm area will be excluded as a feeding ground for a long time, which may have a negative effect on some species.

For eleven species, the significance of this impact has been identified as low or negligible. These birds did not gather in large numbers in the examined sea area and after the construction of the farm should find other feeding grounds. For velvet scoter the significance of such a barrier was assessed as moderate, and for the long-tailed duck originally as high. Both these species are characterized by a high conservation priority and in the area of Polenergia Bałtyk II OWF there exist very abundant mussel communities constituting the main food component of these ducks (Benthos studies in the area of "Central Baltic II" OWF, Final report with the results of the surveys). Velvet scoter has been rare in this area, so this negative impact will affect a small part of its population. The long-tailed duck, on the other hand, gathered there in large numbers and the exclusion of this feeding ground may be of great importance for this species.

During the operation of the wind farm one should expect changes in the way the space is used by birds. In the vast majority of cases, turbines act as a deterrent to birds and passing waterbirds evade wind turbine operation areas at distances between 100 m and even 3000 - 4000 m (Christensen et al., 2004; Kahlert et al, 2004a; Drewitt & Langston, 2006). The sea area directly adjacent to power plants are used less frequently as feeding and resting places (Drewitt & Langston, 2006). The area where the wind farm masts will stand is no longer available as a feeding ground for birds, and, in some cases, significantly lower density of birds can be observed within a radius of up to 2 or even 4 km from the wind farm (Petersen et al., 2004). Waterbirds' avoidance of the area where wind turbines are located reduces the risk of collisions with power plant structures, which results in significantly lower mortality. Seagulls, such as European herring gull, which is taken into account in the environmental impact assessment, use structures protruding from water, including inactive wind turbines, as their resting places (Petersen et al., 2006) and are more frequent in the offshore wind farm construction phase than in the previous period (Christensen et al., 2003). During the operation phase, the interest gulls show in the offshore wind farm is clearly decreasing (Petersen et al 2006; Petersen & Fox, 2007).

It can be concluded from the EIA report that it is important to determine the clearance between the lower position of the rotor wing and the sea surface. The smaller it is, the greater the chance of birds colliding with the working rotor. This is due to the fact that most seabirds fly low above water. During the entire survey period, 91% of all registered flights were below 15 m. The EIA report indicates that the clearance should be a compromise between the proposed technical parameters of the power plant in the maximum option and minimizing the risk of collision. The results of daytime observations of the height of bird travels show that an assumed minimum distance of 20 m between the water surface and the maximum lower rotor wing position significantly reduces the risk of collision. This value should therefore be treated as the absolute minimum. Increasing that distance will even further reduce the risk of mortality of seabirds as most of their flights observed in the altitude range of 15 to 60 m take place in the lower part of it.

The local authority agreed with the conclusions of the EIA report and imposed the condition of

ensuring a minimum distance of 20 m between the rotor wings of the power plant rotor and the sea surface.

The report on the impact of the project on the environment shows that at the farm construction stage, one should expect increased vessel traffic and periodically increased noise level. The following environmental disturbances are expected to occur, which may affect the birds flying over the farm area during the construction phase of the Polenergia Bałtyk II OWF:

- the barrier caused by the presence of ships,
- collisions with ships.

Helicopters will also be used during the construction phase, but due to the unknown number and types of helicopters, their impacts have been assessed together with the impact of the vessels. The presence of a large number of vessels used for the construction purposes may result in a barrier effect, thus affecting the movements of migratory birds. The scale of the impact will depend on the number of vessels used during the construction phase, their size, the duration of the construction works, and the season in which they are performed.

The EIA report indicates that migratory birds, which are sensitive to disturbance from ships, will avoid them vertically or horizontally, which may slightly increase their migration route and increase the energy cost of flying. However, such avoidance will represent a small part of the overall migration route and the additional energy expenditure will be insignificant (Masden et al., (2009)). Considering the above, the impact of the creation of the barrier effect due to the presence of construction vessels in the area of the Polenergia Bałtyk OWF II is assessed as low to negligible for all migratory bird species.

The presence of vessels during the construction stage will create a barrier to the movements of birds, forming direct negative impact on birds migrating over the farm area, of local range, short-term, reversible, repeatable during the construction stage, of low intensity. Similar impacts will occur during the decommissioning stage.

Migratory birds, especially some terrestrial bird species, may be attracted by the lights emitted by vessels used during the construction stage in adverse weather conditions and at night. The degree of likelihood of a collision occurring is poorly studied and the available knowledge does not allow it to be estimated, but there are reports that, similarly to land-based structures, migratory passerine species occasionally collide with structures of anthropogenic origin at sea (Blew 2013). In addition, during night hours in special weather conditions birds may be attracted by the light emitted by the vessels used during the construction stage. Night-time collisions of waterbirds with vessels have been documented for vessels in south-west Greenland, closely linked to poor visibility (Merkel and Johansen 2011). Should birds be attracted by light emissions, the level of collision is not expected to be related to the height of the vessels. Existing knowledge does not indicate that this is a significant problem, hence it is assessed that the impact of vessels used in the construction phase will be limited to a relatively small area. The expected number of collisions will be low, hence the impact is assessed to be negligible to low, depending on the category of importance of the migratory bird species concerned.

Collisions of migratory birds with vessels participating in the construction are direct negative impacts of local range, short-term, irreversible, repeatable during the construction phase, of low intensity. Similar impacts will occur during the farm decommissioning stage.

The EIA report indicates recommendations allowing to reduce even these relatively small impacts on migrants, i.e:

- building new wind farms starting from one place, so that the sea area intended for the project can be filled with structures gradually, expanding the area of the farm to include neighboring

- wind farms,
- maximizing the pace of construction works in May - September, when the number of birds in this area is the lowest, however, taking into account possible restrictions related to lighting of the structure at night in the period of autumn migration,
- limiting sources of strong light at night during migration periods,

The Regional Director for Environmental Protection in Gdańsk found the proposed recommendations to be justified and introduced them into the conditions for the project implementation.

With the cumulative impact of the planned project on migratory birds, in the phase of assessment, power plants with the total capacity of 900 MW, including 600 MW under BSill OWF and 300 MW under Baltica 3 OWF, will be built between 2019 and 2021 were taken into account. Assuming that an average wind turbine will have a capacity of 6 MW, 150 of them will be built. The associated infrastructure (substations, etc.) will also be built. It was assumed that at least the first phases of BSill and Baltica 3 OWFs would already exist at the time of commencing the construction of Polenergia Bałtyk II OWF, causing impacts on migratory birds.

It was then assumed that between 2023 - 2026 wind turbines with a total capacity of 1,350 MW would be built, including 600 MW under Polenergia Bałtyk II OWF and 750 MW under the IMF Baltica 2. A total of 185 wind turbines will be built. The accompanying infrastructure will also be built. It was therefore assumed that 192 foundations would be erected and approximately 190 km of internal cables would be installed on the seabed as a result.

After 2026, if additional connection conditions are obtained, the Investor may build further wind turbines under the Polenergia Bałtyk II OWF with a total capacity of 600 MW. 60 wind turbines will be built. The associated infrastructure (substations, etc.) will also be built. It can be assumed that additional 63 foundations will be erected and approximately 62 km of internal cables will be installed on the seabed as a result.

There is also another scenario for the construction phase, which assumes that between 2023 and 2026, in addition to the above-mentioned Polenergia Bałtyk II and Baltica 2 OWF's, additional wind farms with a total capacity of 600 MW will be built within the framework of BSill OWF. A total of 245 wind turbines will be built. The accompanying infrastructure will also be built (substations, staff welfare platforms, metering and research platforms, etc.). It can be assumed that 255 foundations will be erected and approximately 252 km of internal cables will be installed on the seabed as a result. After 2026, if additional connection conditions are obtained, the Investor may build further wind turbines with a total capacity of 600 MW in the framework of Polenergia Bałtyk II OWF. 60 wind turbines will be built. The associated infrastructure (substations, etc.) will also be built. It can be assumed that additional 63 foundations will be erected and approximately 62 km of internal cables will be installed on the seabed as a result.

The EIA report shows that in the case of birds migrating over the farm area, the possibility of significant cumulative impacts with other projects than the OWF's, i.e.: hydrocarbon licenses, shipping routes, offshore power lines, is not expected.

Also another, very unlikely scenario was analyzed, i.e. the construction of three additional OWF's at the same time as the above mentioned farms, which are planned in the vicinity and have a valid PSZW but do not have the conditions for connection to the grid. These farms are:

Baltic II (west of Polenergia Bałtyk II OWF), Baltic Power and C-Wind (located east of BSII and Baltica 3 OWFs). Such a barrier would be an obstacle for migratory birds. With the gradual, strongly extended development of new wind farms (more likely scenario), this effect will increase gradually, depending on the schedule of works in all of these areas.

The the wind farm structures located above water level may form a barrier for birds flying over the sea area of the farm. The scale of the barrier effect will depend on the number of turbines constructed,

their size and the light and noise emitted.

As mentioned earlier, the birds react to the presence of an obstacle on their route by re-routing their flight in a horizontal or vertical direction, hence they are expected to avoid the wind farm area. The length of the route needed to avoid this obstacle will increase the energy cost of the flight, but the changes will not be major and the energy costs of daily flights of birds, even if doubled, will still account for a small part of their daily activity and energy consumption. Pelagic bird species, such as gulls, spend most of the day flying in natural conditions, and the additional bypass of an obstacle, in this case the presence of a wind farm, will not have any measurable effect on their daily activity or energy balance.

Due to the lack of detailed information on the behavioral reactions of birds to the presence of wind farms, the effects for both considered options (the one selected for implementation and the reasonable alternative one) are considered to be identical.

The barrier in the form the operating Polenergia Bałtyk II OWF will be a source of direct negative impacts on migratory birds with the degree of impact depending on the species, i.e. long-term, reversible, permanent during the operation period, of low intensity. Birds migrating over the area of Polenergia Bałtyk II OWF will be exposed to the risk of collision with the structures of the wind farm. The collision risk was determined using the widely used Band risk model (Band et al. 2012), in a version dedicated to offshore wind farms. No significant impacts of Polenergia Bałtyk II OWF on birds flying over the farm area were identified.

The risk of collision for water birds and passerine birds migrating during the night hours, which are attracted by the wind farm due to the emitted light, can be reduced by adjusting the lighting system of the wind farm and the vessels used for its construction. Although the knowledge in this scope is poor, it is generally assumed that the smaller the light is the better, and that the lights should be placed as low as possible, because the lower the lights are, the fewer birds they will attract (Blew et al. 2013). Reducing light emission can be achieved by:

- shielding light sources, if they are necessary during construction works,
- avoiding lighting if it is not necessary,
- avoiding the upward positioning of lights,
- if lighting is not required, switching the lights off for 5 to 10 minutes when flocks of birds are seen in the space illuminated by the light beam.

In addition, potential impacts in the form of bird collisions may be reduced by shutting down wind turbines during periods of most intense migration of sensitive species. The migration peak of some species, such as common cranes, usually takes place only during a few days of the migration season. Knowing the migration dates of the species, the prevailing atmospheric conditions and carrying out the visual and radar monitoring, it is possible to predict the period during which several days of intensive migration of birds will take place.

Painting the wing tips with bright colors, which should increase the probability of seeing the working turbine by flying birds has also been proposed. However, this does not solve the problem of collisions happening at night and in limited visibility (fog), which account for the vast majority of cases. In addition, it is recommended to use solid towers and not to use truss structures (this does not apply to the foundations). The minimum clearance between the lower position of the rotor wing and the sea surface shall be set at 20 m.

Between 2026 and 2050, a total of 295 wind turbine with associated infrastructure will be operated under the projects of IMF Polenergia Bałtyk II and IMF BSIII, the IMF Baltica 3 and IMF Baltica 2. After 2026, if additional connection conditions are obtained under Polenergia Bałtyk II OWF, the number of wind turbines operated jointly with the connection infrastructure may increase to 355.

There is also another scenario for the operation phase, which assumes that in the years 2026 - 2050

under Polenergia Bałtyk II and BSIII, Baltica 3 and IMF Baltica 2 OWF's a total of 355 wind turbines with associated infrastructure will be operated (similarly to the scenario described in the previous paragraph, but with a different distribution of turbines in the areas covered by the OWF). If Polenergia Bałtyk II OWF obtains additional conditions for connection, this number may increase to 415 wind turbines.

The cumulative impact on migratory birds was assessed taking into account not only the above mentioned 4 most probable Polish projects, but also three additional ones (without connection conditions, i.e. Baltic II, Baltic Power and C-Wind) because they are located nearby and the spatial arrangement of seven farms located close to each other forms a polygon strongly elongated in an east-west direction. It was considered that despite the long time horizon in which the above mentioned OWFs may be constructed, it should be analyzed as a potential barrier for migrants. The analysis of the barrier effect also took into account the areas of 2 Polish farms located north of Polenergia Bałtyk II OWF at the southern Central Bank (Baltica 1 and the suspended Northern Baltic Project) and the planned Swedish farm Södra Midsjöbanken, located in the Swedish EEZ, adjacent to the Polish Exclusive Economic Zone.

The cumulative barrier effect was assessed for the four most numerous migratory bird species: long-tailed duck, velvet scoter, common crane and goose, using the methodology used in the assessment for the area of the Polenergia Bałtyk II OWF. It was assumed that migratory birds changed the route of their flight and circled the OWF at a distance of 1-2 km. The planned OWFs are located in two areas: southern (Polenergia Bałtyk II OWF, BSIII OWF, Baltica 2 OWF, Baltica 3 OWF, Baltic Power OWF, Baltic II OWF and C-Wind) and northern (BP, Baltica 1, Södra Midsjöbanken).

Considering the migration of birds along the northeast-southwest axis, the content of the EIA report shows that it is unlikely that the birds on their route will encounter obstacles located in both mentioned areas, therefore the cumulative barrier effect may be only partial and not taking into account all the planned OWFs together. It is expected that the possible avoidance of the southern area by birds is similar to the northern area due to their similar size. The modeling results show that even if birds avoid several wind farms, the additional distance they will cover and the increase in the energy consumption related to migration will be very small, certainly within the limits of variability in the length of routes covered by different individuals and differences caused by weather conditions.

A significant impact of a larger group of projects located on the north-eastern slope of Słupsk Bank may be the difficulty of access to this area for the populations of sea birds for which it is a wintering site. The creation of a coherent barrier in this area may also hinder the movement of these populations, including similar overwintering areas. As part of the minimizing actions it was proposed that during the administrative procedures (EIA or repeated EIA) for offshore wind farms, which will be established in this area after the execution of the Polenergia Bałtyk II OWF and the BSIII OWF (distant from each other by several kilometers and therefore not forming a significant barrier together), the authority conducting the procedure each time considered the need to apply the minimizing action in the form of leaving a corridor (or corridors) with a width of 4-5 km (preferably 8 km) between the farms or groups of farms. The corridor shall be properly localized and compliant with the found main directions of movement of migratory birds in the autumn to the overwintering areas and in the spring - from the overwintering areas, free from wind farms and shall enable the reduction of the risk of creating a barrier effect in terms of access to and from Natura 2000 sites Słupsk Bank and Baltic Coastal Waters for the populations being the subject of the protection thereof. The EIA report also points out that such a corridor or corridors may arise "naturally" during the building permit design phase, e.g. if, after the execution of deep drillings it turns out that the geological structure of the seabed in some areas does not allow the foundation of the wind farm on it. Therefore,



the need to create special corridors facilitating bird migration will largely depend on the final shape of the planned OWFs.

The assessment of migratory birds and seabirds has concluded that the planned project alone will not have a significant impact on the integrity and coherence of Natura 2000 sites. As the analysis of the report indicates, such impact will take place in the case of a cumulative impact. The EIA report indicates that at the stage of implementation of the adjacent investment projects, it should be considered to designate a migration corridor enabling free migration of avifauna. 2 supplements to the EIA report of June 24, 2016 show that as a result of the construction of four most realistic farm locations (Bałtyk Środkowy II, Bałtyk Środkowy III, Baltica 2 and Baltica 3) in the next few years, an east-west barrier of approximately 45 km in length will be created. Such a barrier will also be an obstacle for migratory birds. The cumulative impact of these investment projects will be significant primarily for Melanitta, black-throated loon and red-throated loon, due to their high timidity and high protection status, as well as for the long-tailed duck, which is very numerous in the Słupsk Bank region. When planning the four above wind farms located close to each other, the width of the corridors between them, free from high structures, should be considered. The supplement indicates that there are currently no reliable data on the reaction of seabirds to the closely located wind farms, as the surveys carried out so far applied to single farms. Two possible solutions have been indicated. The first one would be based on the precautionary principle and, in order to prevent a negative impact of the four farm complex on the marine avifauna in advance, the solution would set a corridor or corridors with a width of approximately 8 km between the farms or groups of wind farms, providing birds with access to the Słupsk Bank during the migration periods. This distance is due to the fact that a bird passing between farms will have a guaranteed distance of approximately 4 km from each of them, and this distance is given as the maximum radius of bypassing wind farms by seabirds. The second proposed solution would require the results of pre-development monitoring in the adjacent planned Baltica 2 and Baltica 3 wind farms. What is more, an additional survey should be carried out, concerning the way birds move around the vast water body area during wintering. However, this would prolong the period of pre-investment survey and postpone the implementation of planned projects. During the public participation, PGE Energia Odnawialna S.A. submitted its comments. (letter dated November 16, 2016), which drew attention to the fact that each Investor who plans to set up offshore farms will be an entity equally benefiting from the environment. Moreover, the legitimacy of radar surveys was questioned due to their specificity, limitations and sample nature.

Bearing the above in mind, the local authority stated that proper analysis and determination of migration corridors for birds, in the case of the investment project in question, would be possible at the stage of reassessment of the environmental impact, once the locations of individual wind turbines and the results of the pre-investment monitoring surveys for the planned Baltica 2 and Baltica 3 wind farms are known. The investor was therefore required to carry out a repeated assessment in this respect.

***Impact of the option selected for execution and the rational alternative option on marine mammals:***

During the passive acoustic monitoring of marine mammals in the area of the Polenergia Bałtyk II OWF, the C - POD devices from stations No. 1 and 3 collected data from the period of 381 and 380 days, respectively, i.e. the whole survey period. C-POD detectors from station No. 2 collected data from the period of 305 days, i.e. 80% of the survey period. Interruptions in data collection at station No. 2 lasted from December 14, 2013 to February 25, 2014. This was due to the loss of equipment.

Data analysis, including classification by KERNO and HEL1 algorithms, together with confirmation of the results by visual validation of the data, showed one day of positive detection (DPD) during the monitoring period, which means that the presence of porpoises in the vicinity of the survey stations

was recorded during one day. Detections of porpoises were recorded at stations 1 and 2 on the same day in the spring - on May 27, 2013.

During six aerial surveys in the area of the Polenergia Bałtyk II OWF nine individuals of marine mammals were observed. Five of them were porpoises and four were seals. Porpoises were observed in April (two individuals), June (one individual) and July (two individuals) 2013. All observed animals were adults. Seals were observed in April 2013 - one gray seal individual and two harbor seals, and in November 2013 - one seal not definite in terms of species.

On the basis of the results of passive acoustic and visual monitoring from the air in the survey area of the Polenergia Bałtyk II OWF, the presence of marine mammals was found. Among the animals observed there were porpoises and seals. The species of seals observed are: gray seal, harbor seal and individuals that are not species specific. Marine mammals were found in spring, summer and autumn, most of the observations/detections took place in spring. In spring 2013, six marine mammals were detected - one porpoise was detected using passive acoustic monitoring (one day with porpoise detection), two individuals were observed during aerial observations, during which three seals were also observed. In the summer there were 3 visual observations of the porpoises from the air, but no acoustic method was used to detect them. No seals were observed in the summer. One seal aerial visual observation was made in autumn 2013 and no porpoises were recorded. No aerial observations or acoustic detection of marine mammals were recorded in spring 2014. Acoustic monitoring did not show any detection of porpoises in winter, and in this period there was no visual monitoring from the air. Therefore, it cannot be excluded that seals were passing through the survey area whilst they could not be observed.

Monitoring of marine mammals, conducted in the area of the Polenergia Bałtyk II OWF, confirmed the occasional presence of porpoises in the open waters of the Polish Baltic Sea. These results are consistent with those of other surveys conducted and published so far (e.g. Koschinski, 2002; Gillespie, 2005; SCANS, 2006; SAMBAH, 2014) which report low numbers of porpoises in the Polish part of the Baltic Sea. Detailed information on areas of particular importance for porpoises in the Polish Baltic Sea is not yet known. However, preliminary results from the SAMBAH project suggest that this is a region with a low acoustic detection rate for these animals (SAMBAH, 2014).

Based on data from visual monitoring from the air, it was stated that the area of the Polenergia Bałtyk II OWF and the areas adjacent thereto were not a breeding ground for porpoises, as no young individuals were observed during the monitoring.

Porpoises show regional migratory behaviour in response to changes in water temperature and food availability (Koschinski, 2002). In terms of nutrition, they are opportunists, they move depending on the availability of the food base. In the Baltic Sea, their main food is herring, sprat and cod (ICES, 2006). These fish species were recorded by the Marine Fisheries Institute (MIR) in the area of the Polenergia Bałtyk II OWF. In addition, the MIR data indicate a significant increase in sprat and herring abundance in early summer (July 2015). Taking into account the above, it was concluded that it was possible that the porpoises observed during the monitoring used the survey area for feeding. However, as there is no absolute certainty as to the cause of the presence of porpoises in the area, since visual monitoring did not allow the identification of clear trends in the behavior of these animals, it is also possible that the animals observed only migrated through the survey area.

The information contained in the EIA report indicates that there are no current data on permanent places where seals go ashore on the open coast of the Polish Baltic Sea. However, there is one known place where gray seals go ashore located in the Gulf of Gdansk. Gray seals use shallows in the Vistula mouth as a resting place, the number of individuals recorded in this location is increasing every year. Harbor and ringed seals are also occasionally seen in the Vistula mouth (WWF Poland,

2013). Additionally, according to HELCOM (2013), seals are found in Polish waters with high regularity - gray seals regularly visit the entire Polish coastline and harbor seals - its western part. Ringed seals stay in this area on the smallest scale - in the northernmost area of the Polish Exclusive Economic Zone (HELCOM, 2013).

Observations of seals along the Polish coast by WWF Poland and the Marine Station of the Institute of Oceanography of the University of Gdańsk confirm the presence of these animals on Polish beaches and in coastal waters. The data on seal activity mainly concern single individuals resting on the beach or dead animals thrown ashore (Figure 1-4 - Appendix) (WWF Poland, 2013; WWF Poland database [http://link.wwf.pl/baza\\_ssaki/public/mapa/mapa](http://link.wwf.pl/baza_ssaki/public/mapa/mapa)). Additionally, from the data obtained from GPS transmitters placed on the backs of gray seal pups, released to the Baltic Sea by the Marine Station of the Institute of Oceanography of the University of Gdańsk, we know that these seals move around the entire Polish part of the Baltic Sea. Migrations also occur in the area of the planned OWF (WWF Poland, 2013).

The presence of seals in waters adjacent to the Polenergia Bałtyk II OWF region was also recorded during the surveys for the purposes of the report. Seal observations were made in spring and autumn but due to the small number of individuals (four in total) and the small number of aerial surveys carried out, it is not possible to draw conclusions on the seasonal trends of seal presence in the area.

Taking into account the knowledge of the seals feeding and the data on the Polenergia Bałtyk II OWF area indicated above, it is possible that the survey area is used by gray seals as a feeding ground. Similarly to porpoises, gray seals migrate to areas rich in fish and can travel long distances for this purpose (Thompson, 1996). They feed on many species of fish, mostly hunting for herring, sprat, cod, whitefish and salmon (ICES, 2006 c, d). Therefore, taking into account the fact that in the Polenergia Bałtyk II OWF area the presence of fish species preferred by the gray seal has been recorded, it is possible that the seals use the survey area to obtain food. The situation is different in the case of the harbor seal. It is unlikely that this species would use the survey area as a feeding ground. Unlike gray seals, harbor seals do not migrate long distances for food, but hunt near land-based resting places (Dietz, 2013). Since no such sites were found on the Polish Baltic Sea, it can be concluded that harbor seals do not appear in the area of the Polenergia Bałtyk II OWF for the purpose of obtaining food. The same is true for the ringed seal, which is rare in Polish waters and has no known land resting places for these animals in this area (WWF, 2013; HELCOM, 2013).

The monitoring activities carried out for the purposes of the EIA report revealed the occurrence of three species of marine mammals in the research area - the porpoise, gray and common seals. The surveys show a clearly low level of activity of porpoises and seals in the area of the Polenergia Bałtyk II OWF and in the adjacent waters. In the EIA report it was indicated that seasonal trends in their occurrence are difficult to determine due to the low number of animal detections/observations. However, most of the detection/observation took place in the spring, as expected. The absence of young porpoises suggests that the surveyed area is not a breeding ground for this species. However, it was found that the area of the Polenergia Bałtyk II OWF may be feeding ground of porpoises and gray seals due to the migratory nature of their feeding. This does not apply to harbor seals, which usually remain close to their land-based resting places, which were not found in the Polish waters. No ringed seal was found during the survey, but it can be assumed that the species occasionally appears in the area. For all species of marine mammals, it was considered that the BŚ II area may be the area through which animals migrate.

The porpoise is a small animal and therefore, unlike other whales, has a limited capacity to stockpile. Therefore, its occurrence is correlated with the continuous availability of the food base (Koopman 1998, Gannon et al. 1998, Lockyer et al. 2003, Lockyer 2007). In addition to biological factors (reproduction) and other environmental factors, such as depth, distance from the shore, type of sea

bed or temperature (MacLeod et al. 2007, Ławicki et al. 2009), the availability of food is probably the most important factor in the distribution of porpoises within the area inhabited thereby, and therefore the location of the fish species that constitute food for the porpoises is of great importance for the planning of their protection. The most recent data on porpoise abundance and distribution were obtained from the SAMBAH (Static Acoustic Monitoring of the Baltic Sea Harbor Porpoise) project completed in December 2014. The actual population of porpoises living in the Baltic Sea has been estimated at only 447, which confirms the critically endangered category assigned to it by the IUCN in 2008. The current abundance assessment is based on data obtained by listening of animal echolocation sounds of these mammals, which have been recorded for two years during the SAMBAH project. The porpoises orient themselves in space by means of echolocation, using high-frequency sounds, similarly to bats. Based on recordings obtained in two years and the same number of ongoing statistical analyses, the scientists estimated the number of animals living in the Baltic Proper at 447 individuals (95% confidence interval 90-997). The spatial modeling technique made it possible to create maps of the seasonal distribution of porpoises in the examined water body. The maps show the areas in which two populations of these mammals living in the Baltic Sea region occur periodically - the population of the Baltic Proper and the population of the Western Baltic Sea. It has also been found that they are separated during the reproductive period from May to December. Individuals from the Baltic population are concentrated in the south-east area of Öland (mainly the Midsjö area - water within the boundaries of the Swedish exclusive economic zone). The most important factors having detrimental impact on porpoise health include high accumulation of the so-called persistent organic pollutants, known as or POPs or TZO (Aguilar and Borell 1995). In recent years, hazardous chemical substances present in the marine environment have also included butyltin compounds - a component of antifouling paints for painting hulls of ships. The porpoises investigated in Denmark, unlike other predatory animals living in coastal waters there, accumulated the highest concentrations of this substance in liver tissue (Strand and Jacobsen 2005). Studies on porpoises in Polish waters also showed high concentrations characteristic of industrialized waters (Ciesielski et al. 2004) - source: Porpoise protection program commissioned by the General Directorate for Environmental Protection - Warsaw 2015.

At the stage of the report, no choice was made as to the method of anticorrosive protection of the technical infrastructure of the farm. This will only be done at the reassessment stage. The CPPS piling noise greater than 171 dB re 1 pPa<sub>2</sub> - s SEL under water, at the stage of construction may lead to disturbances in echolocation, degradation of hearing of individuals within its range.

Therefore, this decision imposes on the Investor conditions for the implementation of the investment project: during the driving of piles fixing the farms to the sea bed, measures limiting the emission of noise shall be applied, e.g. in the form of an air/bubble curtain or another technology ensuring that the noise mode does not exceed the level causing the temporary shift of the hearing threshold (CPPS; no more than 171 dB re 1 pPa<sub>2</sub> - s SEL under water) on the border of the Natura 2000 site Ostoja Słowińska PLH220023. In the event that the noise measurements result in exceeding the above mentioned threshold, the pile driving should be interrupted and additional minimizing measures should be taken to achieve the above mentioned limit noise mode. The Regional Director for Environmental Protection in Gdańsk shall be immediately informed about such situation and further minimizing measures applied, not later than 7 days after the occurrence of the event. Moreover, the investor is required to carry out a repeated assessment in the scope of determination of foundation methods, and on the basis thereof - an assessment of the impact of this stage of the project on particular components of the natural environment. In the reassessment, the analysis and selection of the method of maintenance of the structural elements of the farm should be carried out. Taking into account the location of the planned wind farm between the concentration site of individuals from the Baltic porpoise population in the breeding period from May to December, in the

area to the south-east of Öland (mainly the Midsjö area - water within the boundaries of the Swedish exclusive economic zone), and the Ostoja Słowińska [Slowinski National Park] where the porpoise is protected, as well as the results of the pre-investment monitoring, the introduction of specific measures to minimize impacts associated with the implementation of the planned wind farm has been conveyed to the stage of reassessment once it is clear what kind of foundations will be used.

***Impact of the option selected for implementation and the rational alternative option on bats:***

During the pre-implementation monitoring no bats were found in the area of the planned wind farm. Due to the lack of binding legal regulations in Poland concerning the methodology of bat monitoring and analysis of the impact of wind farms on their population, the methodology based on the draft "Guidelines for assessment of the impact of wind farms on bats", prepared by Polish specialists and practitioners on behalf of the General Directorate for Environmental Protection in 2011 (Kepel et al. 2011) has been assumed for the surveys including monitoring and analysis of bats population in the area of the planned project. According to the above mentioned guidelines, the methodology of bat monitoring is based on acoustic observations on planned transects covering the whole survey area and on acoustic observations on selected control points (static observations). Surveys on offshore wind farms should be conducted on the same principles as monitoring on onshore wind farms. However, controls in marine areas can only be limited to periods of expected seasonal migration of bats. In view of the pilot bat monitoring programs carried out in the previous years to monitor the presence of bats on planned or already existing offshore wind farms and the results thereof (Ahien I. et al., 2007), bat surveys were planned to be carried out using the direct survey method.

In order to carry out the pre-investment monitoring, two listening points and a transect were determined for the whole area of the planned wind farm. The surveys were carried out in two migration periods: spring and autumn. The spring survey was carried out in 2013 at the end of April and in May and in the same period in 2014. Modification of the methodology in relation to the guidelines indicated in the project (Kepel et al. 2011) and the commencement of the 2013 survey at the end of April did not negatively affect the results obtained, as the measurements for the spring migration period were repeated in the following year (2014) and represent added value. Surveys for autumn migration were carried out in August, September and October 2013. A total of 21 measurement days out of 25 planned were performed. The lack of cruises is due to inadequate weather conditions on the sea. However, due to the fact that the surveys were carried out in the required measurement periods: spring and autumn 2013 and that the missing measurements were completed in the period of spring migration at another date (surveys in April and May 2014), it is assumed that the number of observations and listening sessions was sufficient to further assess the impact of the planned OWF on bats in the surveyed area.

During the monitoring cruises carried out during spring and autumn migration, no chiroptero fauna activity was registered in the area of the planned offshore wind farm OWF Polenergia Bałtyk II and in the 2 mile buffer zone constituting the area of potential impact. According to the information contained in the EIA report, the lack of individuals clearly indicates the lack of a permanent migration corridor of bats in the area of the Polenergia Bałtyk II OWF. In terms of nature, on the basis of the conducted surveys, it can be stated that the area of the planned Polenergia Bałtyk II OWF does not constitute a valuable area for bats. However, it cannot be excluded that the migration routes of any of the bat species do not pass through the area of the Polenergia Bałtyk II OWF, as no surveys monitoring bat migration over Polish marine areas have been conducted so far and there are no relevant literature items on this subject. In addition, along the Polish coast there are no established exit points, but at the height of the planned offshore wind farm, the Slowinski National Park is located, which is the place of presence of about 10 species of bats. Bats may potentially appear in the area of the investment project in order to seek food (Ahlen I. et al. 2009, 2007; Poerink et al. 2013).

In addition, surveys conducted in previous years (2005, 2006 and 2008) along the southern coast of the Scandinavian Peninsula and the islands of southern Sweden and Denmark, covering islands such as Gotland, Öland, Bornholm, Lolland, Falster, Salthol and Peberholm and water areas: Oresund, Kattegat and the Baltic Sea confirm the presence of approximately eleven species of bats in the South Baltic area, out of 18 species known in this part of Europe. Bats such as the Nathusius' pipistrelle (*Pipistrellus nathusii*), the common noctule (*Nyctalus noctula*), the parti-coloured bat (*Vespertilio murinus*), the lesser noctule (*Nyctalus leisleri*) and the soprano pipistrelle (*Pipistrellus pygmaeus*) are characterized by seasonal migration over long distances. Their migration takes place in the north-eastern direction in spring and in autumn in the south-western direction. Migrations are dispersed and do not occur along designated routes. They migrate alone or in loose groups of two or three (Ahlen et al. 2009; Ahlen, 1997). A total of 4051 records were noted, of which 3553 belonged to migratory species.

Due to the lack of bat activity during monitoring, the EIA report states that there are no migration corridors in the area of the project. The area of the Polenergia Bałtyk II OWF is not a significant area for bats, thus, it was assessed they shall not be affected at the stage of construction, operation and decommissioning of the farm, independently and cumulatively. There shall also be no impact on the integrity, coherence and subject of protection of the Natura 2000 sites. According to the information contained in the EIA report, post-development monitoring should be carried out due to the possibility of attracting bats by the operating turbines and an increase in the concentration of insects in their area.

The local authority considered the above to be justified because the gathering insects are potential food for migrating bats, which can make the location of the Wind Farm more attractive for these species and imposed on the Investor the necessity to carry out a 5-year post-development monitoring.

***Impact of the option selected for execution and the rational alternative option on the integrity, coherence and subject of protection of Natura 2000 sites:***

As part of the environmental impact assessment of the Polenergia Bałtyk II OWF, the EIA report comprehensively assessed the impact on the integrity, coherence and subject of protection of the following Natura 2000 sites, i.e. Ostoja Słowińska Protected Area, Słupsk Bank and Coastal Waters of the Baltic Sea. Taking into account the type and role in the ecosystem of particular environmental resources and the scale and type of potential impacts of the Baltic Polenergia II OWF (independently and cumulatively), the possibility of significant negative impact of the planned farm on the integrity, coherence and subject of protection of Natura 2000 sites protecting: abiotic environment (habitats), benthos, fish and bats was excluded. In these cases, the assessment was completed at the first stage and there was no need to proceed to a proper assessment.

However, at the preliminary assessment stage it was not possible to exclude the possibility of impact on six bird species: common razorbill, black guillemots, long-tailed duck, melanitta, velvet scoter and European herring gull, which are protected by at least one of the nearby Natura 2000 sites (Ostoja Słowińska Protected Area, Słupsk Bank and Coastal Waters of the Baltic Sea), as well as the Pomeranian Bay area further from the Project, and two species of marine mammals: porpoise and gray seal, which are protected by the Natura 2000 site - Ostoja Słowińska Protected Area. Therefore, the following recommendations were proposed in order to reduce this impact: creation of a buffer zone between the farm area and the borders of the Natura 2000 site - Ławica Słupska PLC 990001 (Słupsk Bank) with a width from 2 to 4 km; recommendation by the competent authority to take into account in the design of subsequent offshore wind farms located in the area of Słupsk Bank, the undeveloped migration corridors with a width of not less than 4-5 km (preferably 8 km) between subsequent projects. This recommendation applies in particular to the planned farms located on the

north-eastern slope of Słupsk Bank; introduction of a ban on the entry of vessels involved in the construction, dismantling and operation of the farm into the area of Słupsk Bank when there are many long-tailed ducks in the area (November 1 – April 30).

After the analysis of possible impacts that the assessed project may cause, independently and in combination with other projects, on marine mammals, the EIA report concluded that after the application of minimizing actions, in the form of:

- limiting the spread of underwater noise during the installation of pile foundations through the use of relevant technology, e.g. a bubble curtain,
- proper organization of the construction process, ensuring at least one break in the piling process every two months, not shorter than 4 days, but such breaks may also result from weather conditions,

the Polenergia Bałtyk II OWF, in the option selected for execution and in the rational alternative option, shall not have a significant impact on marine mammals protected under the Natura 2000 network, as well as on the integrity of the Natura 2000 site Ostoja Słowińska PLH 220023 (Ostoja Słowińska Protected Area), or on the coherence of the Natura 2000 network.

The use of technical solutions to limit the spread of piling noise shall significantly reduce the distance of occurrence of mammalian hearing impairment (Temporary Threshold Shift – TTS or Permanent Threshold Shift – PTS) or behavioral reactions (e.g. escape) in porpoises, seals and fish. The most common methods of preventing the spread of noise include various types of air (bubble) curtains. In simple terms, air curtains are systems that consist of a compressor and connected perforated pipes, releasing small air bubbles around the sea bed. The bubbles floating to the surface block the propagation of sound around the driven pile.

The report analyzed the solution consisting in placement of the so-called air (bubble) curtain around the driven pile, reducing the level of noise from piling by about 14 dB. The noise propagation from driving a monopile with a diameter of 12.5 m, with a pneumatic hammer with an energy of 3000 kJ, was modeled in two options – before and after the use of this curtain.

The estimated impact zones indicate that for a single impact, the zone where a Permanent Threshold Shift (PTS) can occur for both porpoises and seals is located relatively close to the sound source (maximum 20 m and maximum 300 m respectively). Temporary Threshold Shift (TTS) can take place at distances up to 8.4 km for porpoises and up to 2.6 km for seals. A behavioral response (escape, avoidance) is expected at distances up to 129.3 km for porpoises and up to 2.6 km for seals. It should be noted that these are maximum values, and in the sea there is quite a significant sound attenuation, especially at the shore, which is related to bathymetry. After using a mitigation measure with an effectiveness not less than that of the reported air (bubble) curtain, the maximum impact zones for a single impact shall be significantly reduced. For example, the range of the TTS and the behavioral response of porpoises is reduced to 1.6 km and 32.4 km, respectively. The results of the maximum range of impact for multiple hammer impacts during piling are much higher than those obtained for single impact. Assuming that the animals do not move during the 1-hour time of exposure to noise, the impact manifested as PTS on porpoises and seals can be expected at distances of up to 4.7 km and 25.8 km, respectively. TTS shall take place within 27.2 km for porpoises and 119.9 km for seals. The use of an air curtain or other similar solutions shall greatly reduce the level of emitted sound and thus significantly reduce the zones of impact. The maximum range of occurrence of PTS for porpoises and seals is expected to be reduced to 0.8 km and 5.1 km, respectively. The range of TTS impact in this case shall be a maximum of 5.6 km for porpoises and 29.7 km for seals.

Due to major ranges of noise impact on fish found during driving of monopiles, the use of a mitigation measure, e.g. bubble curtain, was also recommended during the construction stage (during pile driving), if such a foundation is selected. When it is used, in the case of 170 dB, the territorial range

(TTS) of the impact shall decrease 4-fold (to about 20-30 km). Similarly, an avoidance response (140 dB) in fish shall be observed up to approximately 30-40 km from the noise source and the significance of such an impact has been assessed as negligible to low.

Three Natura 2000 sites protecting marine mammals are within the range of the maximum potential range of impact from piling noise: Ostoja Słowińska Protected Area (approx. 42 km to the south), Puck Bay and Hel Peninsula (approx. 103 km to the southeast) and Kashubian Cliffs (approx. 95 km to the southeast).

According to the preliminary assessment (screening), the impact of piling noise on the integrity, coherence and subject of protection of the above mentioned Natura 2000 sites, the behavioral response of mammals can be triggered even from a long distance. This response can be important in the case of prolonged, continuous noise emission caused by piling of successive foundations. In the most far-reaching scenario of the project, there is a probability that both seals and porpoises shall have TTS. Noise may, in the most far-reaching scenario, lead to behavioral reactions in a small percentage of porpoises at a distance of approximately 129.3 km and TTS in seals at a distance of 119.9 km. The EIA report indicates that these large-scale behavioral responses can also lead to a barrier effect, but only if migration or local/regional movement of animals is hindered, for example in narrow passageways. The situation in the area of the Polenergia Bałtyk II OWF is different as the behavioral impact zone is in open waters, giving the possibility of movement in all directions.

Although the distance of the Polenergia Bałtyk II OWF from the Puck Bay and Hel Peninsula area means that theoretically in this area TTS may occur in seals (up to 119.9 km) and behavioral reactions in porpoises (up to 129.3 km), the results of the acoustic modeling clearly showed that the Hel Peninsula protecting the bay was a sound barrier, minimizing potential impact on marine mammals in the Natura 2000 site. It was found that the impact of the project on mammals protected in this area would not be significant.

Due to the distance of the Kashubian Cliffs site from the Polenergia Bałtyk II OWF (95 km), the only possible source of disturbances may be underwater noise. Although TTS and masking of sounds important for gray seals can occur, acoustic modeling has shown that noise levels fall very sharply in shallow waters south of the OWF. Therefore, most of the noise is suppressed and the noise level shall be too low to cause any impact. It was found that the impact of the project on mammals protected in this area would not be significant.

At the screening stage it was not possible to exclude a significant impact of the Polenergia Bałtyk II OWF on marine mammals being the subject of protection of the Ostoja Słowińska PLH220023 site during the construction process and a significant impact on the integrity of this site. It was, therefore, necessary to carry out a proper assessment. However, no proper assessment was required for the other two Natura 2000 sites, where the significance of piling noise impacts on marine mammals was assessed to be negligible.

The proper assessment carried out for the Natura 2000 site - Ostoja Słowińska Protected Area confirmed the validity of the recommendation that technical mitigation measures should be applied during piling to reduce the level of piling noise. Without their application, the possibility of behavioral and/or TTS responses in mammals cannot be excluded, especially considering also the possibility of cumulative effects by simultaneous operation of 2 piling teams.

It should be stressed that the modeled zones of potential impacts on mammals may change as a result of changes in the assumed piling locations in the Polenergia Bałtyk II OWF and Baltica 2 OWF areas. Consequently, a negative impact on the coherence of the area cannot be excluded when simultaneous piling takes place in the southern parts of both projects. It should be noted, however, that the area of the Polenergia Bałtyk II OWF allowed for the construction of wind farms has been



moved away from the borders of Słupsk Bank by 2-4 km, which means that the risk of simultaneous piling in this place and in the area of the Baltica 2 OWF is significantly reduced (possible piling in the "excluded" area of the Polenergia Bałtyk II OWF may concern only substations in the maximum number of 6).

The results of the proper assessment indicated the need to limit the possibility of creating a long-term barrier effect related to the months-long process of foundation assembly, which could cause a permanent significant change in the behavior of marine mammals within its range, and thus a permanent or long-term disturbance of the integrity of the area of the Ostoja Słowińska Protected Area. Therefore, in addition to the need to use technical mitigation solutions (e.g. air curtains), at the stage of the report it was recommended to make a break in the piling process at least once every two months which should not be less than 4 days, and these breaks may also result from weather conditions. However, the local authority decided to leave this issue for the assessment stage, when it shall be known what type of piling has been chosen. According to the Regional Director for Environmental Protection in Gdańsk, such a solution could expose the animals that benefit from this break to the risk of permanent or temporary shifting of the hearing threshold.

Following the analysis of the environmental impact, with the use of minimizing actions, it is concluded that there is no possibility of occurrence of significant impacts on the integrity, coherence and the subject of protection of Natura 2000 sites, caused by the impact of the Polenergia Bałtyk II OWF on marine mammals.

Moreover, the use of technical mitigation solutions ensures that there are no cross-border impacts during piling. The minimum distance of the Polenergia Bałtyk II OWF from the border of the Exclusive Economic Zone of Sweden is about 30 km, Denmark – 30 km, Russia – 135 km and Germany – 150 km. The report concludes that for a single impact during piling at a single location using the suggested mitigation measures, a significant reduction in impacts can be expected to the extent that cross-border impacts can be excluded.

At the preliminary assessment stage it was not possible to exclude the possibility of impact on six bird species: common razorbill, black guillemots, long-tailed duck, melanitta, velvet scoter and European herring gull, which are protected by at least one of the nearby Natura 2000 sites (Ostoja Słowińska Protected Area, Słupsk Bank and Coastal Waters of the Baltic Sea), as well as the Pomeranian Bay area further from the project, and two species of marine mammals: porpoise and gray seal, which are protected by the Natura 2000 site - Ostoja Słowińska Protected Area.

At the stage of the EIA report, it was stated that the impact on porpoises in the form of behavioral responses in other Exclusive Economic Zones is so minimal that cross-border impacts leading to negative consequences, such as the creation of a barrier effect, could be excluded. Impacts due to noise associated with the construction stage, although reaching long distances for behavioral response, shall not result in a barrier effect for the subpopulation.

The EIA report recommended a soft start piling procedure to deter marine mammals and fish from the construction area and prevent significant hearing damage to these animals that could occur, if they were in the immediate vicinity of the erected foundation.

The most significant potential impact of the Polenergia Bałtyk II OWF consists in deterring and consequently displacement from its habitats of long-tailed duck that periodically, in winter, feeds intensively on a part of the farm area adjacent to the Słupsk Bank. The basic minimizing action is, therefore, the exclusion of this part of the wind farm (approx. 16.59 km<sup>2</sup>) from the construction of wind turbines (with the approval of other elements of a farm, such as e.g. substations or cables). This shall reduce the effect of displacement to an acceptable level.

The selection of an appropriate design for wind turbines is important for potential bird collisions. The

impact assessment of the Polenergia Bałtyk II OWF showed that the number of turbines and their size are the key parameters determining the risk of bird collision. A large number of turbines increases the risk of collision. This is evidenced by the calculations of a higher collision rate for the rational alternative option in which the construction of 200 turbines is planned, in comparison with lower number of collisions obtained in calculations for the option selected for execution, in which the construction of only 120 turbines is assumed. In addition, turbine parameters such as tower height, clearance between water surface and lower wing position and rotor surface are very important factors influencing the height of bird collision indicators. As many water birds fly close to the water, the higher height of the turbine rotor means fewer potential collisions. However, this is not necessarily the case for land birds, which generally fly higher above sea surface. Therefore, the technical parameters of wind turbines may differently affect different species of birds. Results of pre-investment monitoring indicated that a significant part of birds fly over the farm water body close to the water surface – up to 15 m. It was assumed that a minimum clearance of 20 m could prevent a significant number of potential collisions. The simulation of potential collision rate indicates that birds may occasionally collide with the wind turbines of the Polenergia Bałtyk II OWF, but this impact shall be negligible or minor for all analyzed species, both migrating and marine ones, usually seasonally (e.g. long-tailed duck) in the area of the farm. It was recommended to erect or decommission the wind farm in a systematic manner, gradually adding adjacent structures to the water body (or, in case of decommissioning, increasing the area free from wind farm structures). This shall gradually increase the effect of deterring birds and their displacement from the area designated for the project. The Polenergia Bałtyk II OWF borders on the Słupsk Bank to the south, which is an important wintering ground for seabirds, especially for long-tailed duck, therefore, it is justified to carry out the most intensive works during the periods when the negative impact on these birds shall be minor. For this reason, it was recommended to maximize the pace of construction (or demolition) works in May-September, when the number of birds staying in the water body of the farm and in the area of the Słupsk Bank is the lowest, simultaneously considering the possible restrictions related to lighting of the structure at night during autumn migration. Painting the blade tips in bright colors should increase the likelihood that flying birds see the operating turbines, but the painting should comply with the air traffic safety regulations in force. In addition, the wind turbines shall not operate during the periods of the most intense migration of sensitive species. The peak migration of some species, such as common cranes, usually takes place only during a few days of the migration season. Knowing the migration dates of species, the prevailing atmospheric conditions and constant monitoring of flying birds during the migration periods, it is possible to predict the several-day period of intensive migration of birds particularly exposed to collisions and in this period to limit the operation of the wind farm.

The impact assessment for Natura 2000 sites carried out in the report excluded a major negative impact of the Polenergia Bałtyk II OWF, independently and in connection with other offshore wind farms which may be constructed in its immediate vicinity on the north-eastern slope of the Słupsk Bank, on the integrity and the subject of protection of Natura 2000 sites and the coherence of the Natura 2000 network, through the impact of the farm in the form of displacement from the habitats (which concerns mainly the long-tailed duck), barrier effect and collision, provided that minimizing actions are applied. They are to consist in excluding from wind turbine construction a fragment of the farm area adjacent to the Słupsk Bank and constituting a feeding ground for the long-tailed duck, introducing a ban on the movement of vessels used during the construction, operation or decommissioning of the farm within the Słupsk Bank during the months of the most intensive use of the farm by the long-tailed ducks (November 1 – April 30) and taking into account, when designing subsequent offshore wind farms in the Słupsk Bank area, undeveloped migration corridors with a width of not less than 4-5 km (preferably 8 km between subsequent projects). This distance is due to

the fact that most sea birds avoid the area of the wind farm at a distance of up to 4 km. At the same time, the local authority assigned the designation of corridors between the planned Polenergia Bałtyk II OWF and Baltica 2 OWF and Baltica 3 OWF to a reassessment of the environmental impact.

Analysis of the rate and direction of oil spill in the area of the discussed wind farm indicates that the Słupsk Bank Natura 2000 site is a particularly endangered place due to its close location and dominant wind directions (Pawelec et al., 2014). With wind strength above 3°B, the oil slick can be expected to reach the north-eastern part of the area after only 2-4 hours, which in practice makes it impossible to take effective preventive action. Taking into account the average wind distribution for the South Baltic, the drifting pollution slick shall reach the Słupsk Bank in 12-18 hours. With the expected maximum range of the slick spreading at the boundary of the wind farm area, after 24 hours it is not able to reach the Natura 2000 site Coastal Waters of the Baltic Sea (Pawelec et al., 2014). Oil spills, especially large ones, shall result in loss of seabirds. These losses shall be significant if the slick appears in winter, when the concentration of the long-tailed duck, both in the area of the planned project and in the vicinity of the Słupsk Bank, is the highest. Other scenarios, which correspond to different meteorological conditions prevailing at any given time cannot be excluded but they are statistically less likely. Determination of the actual extent of the slick shall be possible only during the event, on the basis of current meteorological data and data on the type and potential amount of pollution. In connection with the potential threats described above, it was recommended to equip the vessels used at the Polenergia Bałtyk II OWF with the means to eliminate the leakages of oil-derivative substances and to apply technical solutions at the offshore substations, which shall enable them to take over, in emergency situations, the entire volume of transformer oil that will be present at the substations.

Taking the above into account, according to the Regional Director for Environmental Protection in Gdańsk, in application of the actions imposed to minimize the impact of the planned project, there shall be no significant impact on the subject of protection in the following Natura 2000 sites: Ławica Słupska PLC 990001 and Ostoja Słowińska PLH 220023.

***Impact of the option selected for execution and the rational alternative option on the landscape:***

On the basis of information contained in the EIA report, parameters of the project and analyses carried out, it was estimated that the range of potential impact of the Polenergia Bałtyk II OWF may be up to 50 km. Greater range of visibility than that found in the existing projects results from significantly higher maximum size parameters of the Polenergia Bałtyk II OWF (maximum total height of the structure, maximum range of the rotor zone). The following towns and villages are within this range: Ustka (urban municipality of Ustka), Rowy (rural municipality of Ustka) and Łeba (municipality of Łeba). The EIA report, based on the available literature data, categorized the significance of the landscape (as a resource which the Polenergia Bałtyk II OWF may affect) as medium.

It was found that two main social groups shall be exposed to visual impacts of the location of the Polenergia Bałtyk II OWF in the offshore area: the residents of coastal towns located in the impact zone and tourists visiting the Polish coast in the impact zone.

The places with special exposure to the sea include, for example: sea ports in Ustka and Łeba, with exposure to the sea, hotels (e.g. Neptun hotel located on the beach near Łeba), lighthouses near Ustka, Łeba, Stilo, the seaside promenade in Ustka. For the purpose of the assessment, observation points were selected which, due to their exposure and their significance to the public perception of potential impacts, have been identified as potentially sensitive to impacts from the Polenergia Bałtyk II OWF. The following vantage points in the surroundings of the Project, with an exposure to the sea, have been selected:

- pier in the vicinity of Ustka,
- beach in the vicinity of Rowy,
- dunes within the borders of the Słowiński National Park,
- beach within the borders of the Słowiński National Park,
- beach in the vicinity of Łeba,
- lighthouse in Stilo.

These points were assigned an appropriate category of importance, photographic documentation and visualizations were made of them, and then the impact on the landscape was assessed. The assessment took into account the meteorological conditions, which directly contribute to the increase or decrease in visibility. The meteorological parameters of particular significance for the visual impact of the planned Polenergia Bałtyk II OWF include sunshine duration and the number of sunny days (no clouds and precipitations) per year, which shall increase the visibility of the project, as well as precipitation, haze, mist and cloud, which shall lead to the reduction of the OWF visibility from the land. The climate on the coast is classified as the climate of the coastal strip with the lowest amplitudes of air temperatures, high humidity, mild winters, cooler summers and strong winds. The prevailing wind here is from the west and southwest. The EIA report indicates that the obtained data on visibility for 2013 show that very good visibility (from 20 km) dominated for the most part of the year, especially in the summer months (June, July, August).

The analysis carried out for the purposes of the project, assumed that the accumulation of impacts of the Polenergia Bałtyk II OWF with other projects may take place in the case of the following projects: BS1II OWF, Baltica 2 OWF, Baltica 3 OWF, offshore transmission infrastructure (OTI). WindPRO software was used to develop the visualization. For visual and analytical purposes, it was assumed that wind turbines were painted with colors commonly used by turbine manufacturers for offshore wind turbines.

During the **construction stage** there shall be impacts on the landscape related to specific works such as: construction (structure) and transport of components, assembly/installation of turbines at the sea and construction of internal and external infrastructure and output cable to land.

The magnitude of the impact from vessel traffic during the construction stage of the Polenergia Bałtyk II OWF (for both adopted options) is classified as insignificant, mainly due to the significant distances between transport routes, construction ports and the construction site. Because the landscape significance has been classified as moderate, the impact significance has been assessed as negligible.

The analysis carried out for each of the selected observation points showed that regardless of the considered option, the visual impact of the project on the landscape during **the operation stage** shall be similar. The visibility of the Polenergia Bałtyk II OWF decreases with increasing distance of the observer from the project and disappears within a radius of about 45-50 km. The project may theoretically cause the greatest visual impact on observers located near Rowy, due to the shortest distance of this point from the farm area. But the significance of the impact for this point has been assessed as minor. In the case of dunes and beaches within the limits of the Słowiński National Park, the beach in Łeba and the pier in Ustka, the impact significance was assessed as moderate, but such classification was determined by the very high significance of the asset. Wind turbines shall be very poorly visible from these points or shall be visible only incidentally. Due to the significant distance, wind turbines, being a part of the Polenergia Bałtyk II OWF, should be theoretically invisible from the Stilo lighthouse – the significance of the impact for this observation point was determined as unchanged. However, this decision requires the investor to take measures to protect the landscape to minimize the impact of the project in question by using the appropriate color scheme of the rotors to reduce the contrast between the turbines and the background.

At the stage of investment **liquidation**, the aesthetic values of the landscape shall be temporarily reduced as a result of demolition works. These impacts shall consist in increased traffic of vessels taking part in decommissioning of the farm. The significance of the impact on the marine landscape for this stage was assessed as negligible for both options considered.

The significance of the **cumulative** impact during the construction phase for the executed option and the alternative option has been assessed as negligible. In case of execution and operation of the Polenergia Bałtyk II OWF, BS1II OWF, Baltica 2 OWF and Baltica 3 OWF, their visual impact shall accumulate. The extent of accumulation shall depend on the observation point. The information contained in the EIA report shows that the scale of accumulation shall be small and shall not significantly affect the change of visual perception of these projects from the indicated observation points. No large or very large cumulative impacts were indicated for any observation point. During the decommissioning stage, regardless of the considered option, there shall be no or negligible accumulation of impacts with other projects in this respect.

In the vicinity of the planned project (about 33-66 km), in the onshore area, there are area-based forms of landscape protection, such as:

- national parks (Słowiński National Park),
- landscape parks (Nadmorski (Coastal) Landscape Park),
- protected landscape areas (Coastal Protected Landscape Area, Seashore Protected Landscape Area to the east of Ustka, Seashore Protected Landscape Area to the west of Ustka).

The construction, operation and decommissioning of the Polenergia Bałtyk II OWF, regardless of the considered option, independently and in combination with other projects, shall not have any impact on the indicated area-based forms of nature conservation.

Due to the distance of the Polenergia Bałtyk II OWF from the borders of other countries, it was stated that there shall be no cross-border impact of the project on the landscape.

Due to the lack of significant impacts of the Polenergia Bałtyk II OWF on the marine landscape, no monitoring was found necessary.

***Impact of the option selected for implementation and the reasonable alternative option on the cultural heritage:***

The most far-reaching project scenario, **i.e. one that may potentially have the greatest impact on cultural heritage**, is the construction of a wind farm with the use of 206 foundations. The most far-reaching scenario can occur in the reasonable alternative option. The option selected for implementation assumes the use of approx. 40% less foundations, although with a similar (but smaller) total area.

The impact assessment carried out for the purposes of the project concerned the impact of the Polenergia Bałtyk II OWF on the facilities of great importance for the protection of cultural heritage. "Underwater cultural heritage" means all traces of human existence of a cultural, historical or archaeological nature which were or are totally or partially underwater, temporarily or permanently, for at least 100 years, including sites, structures, items, artifacts and human remains, including their archaeological and natural contexts, ships, aircrafts and other vehicles or parts thereof, cargo or other contents, including their archaeological and natural contexts, and items of a prehistoric nature. Cables and pipelines and systems currently in use are excluded from the definition.

The following potential impacts on the underwater cultural heritage have been identified during the execution of the Polenergia Bałtyk II project OWF: damage or complete destruction by anchors of vessels, damage during the erection of pile foundations, subsidence, discovery of archaeological items and sedimentation of disturbed sediments.

In addition, unplanned emissions may occur at each stage of the project, such as pollution of the pelagic zone and bottom sediments by oil derivative substances, pollution of the pelagic zone by accidentally released chemicals, which may indirectly affect the sites of cultural heritage protection. During construction works, military items, including unexploded ordnance, may also be encountered. For this reason, this Decision imposes an obligation on the Investor to take measures to minimize and mitigate any negative environmental impact resulting from the possibility of discovering the remains of military action, in the form of developing and implementing an appropriate procedure aimed at preventing accidents related to unexploded ordnance and chemical warfare agents at each stage of the project implementation.

Two shipwrecks were found during archaeological surveys. One of them is a steamboat of no historic value. The other one is a wooden sailing ship (most likely a commercial one) with visible remnants of the cargo in the form of copper spouts. The shipwreck found is a valuable archaeological item. It is covered by conservation officer's protection, which entails legal consequences in the event of its damage. The copper-cargo shipwreck BS2\_156 found in the area of the planned Polenergia Bałtyk II OWF has a very high historical value. According to the provisions of the UNESCO Convention on the Protection of the Underwater Cultural Heritage of 2001 and the United Nations Convention on the Law of the Sea of 1982, there is an obligation to protect the wreck from damage.

For the purpose of the impact assessment it has been assumed that in order to ensure the safety of the teams working on the farm area at all stages, i.e. construction, operation and decommissioning, **a protection zone shall be established** around each of the identified wrecks, within which it shall be forbidden to anchor vessels and lay farm components, including cables. It was assumed that the protection zone around the first shipwreck shall have 50 meters and around the second – the valuable one – 280 meters.

Attention should be paid to the intercultural character of monuments located in maritime areas. In most cases, shipwrecks located off the coast of a given country come from a completely different area. The destruction of the BS2\_156 shipwreck would reduce the resources of the international cultural heritage of the marine areas.

During the geotechnical surveys and construction works, new, so far undiscovered archaeological items may be found, which due to lack of knowledge about their existence at this stage were not included in the impact assessment presented in the EIA report. Therefore, the content of this decision obliges the Investor to inform the relevant authorities about all archaeological discoveries made.

It was concluded that all potential impacts of the Polenergia Bałtyk II OWF on the discovered shipwrecks shall be of negligible to moderate significance.

The results of the assessment showed that the project consisting in the construction of the Polenergia Bałtyk II OWF shall not have a significant negative impact on the items of great importance for the protection of cultural heritage in any of the considered options of the project, at any of the stages, i.e. construction, operation and decommissioning, provided that the recommended minimizing measures are applied.

Due to the local character of the potential impacts of the OWF and the location of the found shipwrecks, it was stated that the accumulation of impacts of the Polenergia Bałtyk II OWF and other projects is unlikely.

Impacts of the Polenergia Bałtyk II OWF shall not have a cross-border effect on other archaeological items located within the boundaries of the Exclusive Economic Zones of other countries, due to the local character of these impacts.

In order to minimize the possible impact of the project on the elements of cultural heritage, this Decision imposes an obligation on the Investor to take measures to minimize this impact by designating protection zones around the shipwrecks discovered.

In the area of the planned Polenergia Bałtyk II OWF no risk of impact on the items of great importance for the protection of cultural heritage was found, thus there is no justification for indicating monitoring measures in this respect.

If there is a significant movement of sediments identified during the post-investment monitoring stage, the areas where the sediment layer has been washed out should be reassessed for possible revision of the areas excluded from anchoring and other operations.

***Impact of the option selected for implementation and the reasonable alternative option on the fisheries:***

For the assessment of the impact of the project on fisheries, the assumption was made that the area occupied by the farm shall be completely excluded from fishing from the commencement of construction works, but the Investor does not plan to apply to the relevant Maritime Office for such exclusion at the stage of farm operation. The impact of the farm on fisheries shall be similar regardless of the analyzed alternative.

In order to determine with the greatest possible accuracy the impact of the investment on fisheries (determination of potential losses to fisheries) in the area occupied by the Polenergia Bałtyk II OWF (in case of complete exclusion of the farm area from fishing activities), the relative share of the area occupied by the farm in the total area of fishing squares was taken into account. The area of the Polenergia Bałtyk II OWF according to the Polish maritime areas (PSZW) is about 122 km<sup>2</sup>, whereas the area of the L8 fishing square – in part of which the farm shall be located – is 395 km<sup>2</sup>. Thus, the Polenergia Bałtyk II OWF occupies about 31% of the area of this square.

Fishing productivity (catch per area) in the area of the planned wind farm, as well as in its immediate vicinity, is low in relation to the average fishing productivity in the Polish maritime areas (PSZW). In 2009-2013, in the area of the L8 fishing square, fished between 26 (2009-2010) and 42 (2012) fishing vessels out of 802 (2009) and 795 (2012) of the total Baltic vessels registered in the Polish register. The main tools used for fishing in the analyzed area in 2009-2013 were gill nets and hooks that were used by as much as from 22 (2011) to 35 (2013) fishing vessels. Bottom trawl nets were used by a maximum of 4 fishing vessels and floating trawl nets by 5 vessels. The area under consideration was of limited importance for the fisheries of the above-mentioned vessels, which, in addition to the L8 square also fished in other, sometimes very distant, fishing grounds. Of the 40 vessels that fished in 2013 in the L8 square, 16 vessels reported activity over a total of 6 to 10 squares, 7 vessels fished in 11 to 15 squares and only 4 vessels fished in 5 or less Baltic squares. According to the 2013 data, only 6% of the total value of catches by vessels active in the L8 square came from the area of this square. This rate was higher for fishing boats – it was 12%, while for vessels bigger than 12 meters it was only 5%. Of the above-mentioned 40 vessels, which fished in the analyzed square, 27 received no more than 10% of their total value of annual catches.

All potential impacts of the Polenergia Bałtyk II OWF on fisheries shall be of minor or negligible significance or shall cause no change ("no change") . The EIA report states that the maximum fisheries losses determined by the amount of lost revenues calculated on the basis of actual data for 2009-2013 may amount to PLN 443,000 annually. As compared to the total fishery, these are negligible figures. In addition, it is expected that fishing vessels previously fishing in the area of the Polenergia Bałtyk II OWF shall move to other fishing areas.

The results of the assessment showed that the project consisting in the construction of the Polenergia Bałtyk II OWF shall not have a significant negative impact on fisheries at any stage of the project, i.e. construction, operation and decommissioning.

At the stage of obtaining a Building Permit, the Investor plans consultations with fishing communities in order to determine the rules of using the farm area by fishermen and the possible system of compensation for confirmed losses due to possible restrictions imposed by the competent

maritime administration authorities.

The assessment of cumulative impacts took into account the OWF power transmission infrastructure, adjacent offshore wind farms, concessions for exploration and prospecting of oil and natural gas deposits and shipping routes. It was concluded that in most cases there would be no or negligible accumulation of impacts. The exception is the possibility of cumulation of the impacts of the Polenergia Bałtyk II OWF with the impacts of other offshore wind farms in the most far-reaching scenario, i.e. construction and exclusion from the possibilities of fishing of the areas of the Polenergia Bałtyk II OWF, BSIII OWF, Baltica 2 OWF and Baltica 3 OWF. The cumulative effect of the four adjacent wind farms was assessed as moderate. The fishing grounds taken by these projects are of minor importance for the fisheries and the vessels fishing there shall be able to move easily to other fishing areas. Nonetheless, a significant negative effect of the impact of wind farms on fisheries may occur if a sufficiently wide shipping lane between the farms is not ensured. The absence of such a corridor would significantly lengthen the route of fishing vessels to fishing grounds, thus increasing operating costs.

No cross-border impacts of the Polenergia Bałtyk II OWF on the fisheries sector of other countries were found.

This Decision does not impose any monitoring obligations on the Investor. The fishing activities of the fleet are monitored by the fishing administration on an ongoing basis. There is no need to collect additional information.

***Impact of the option selected for implementation and the reasonable alternative option on other users:***

The term **other users of the maritime areas** covers the following:

- coastal tourism,
- recreational fishing,
- water sports,
- military operations,
- radiolocation and communication systems,
- civil and military aviation,
- maritime navigation,
- survey, exploration and exploitation of mineral resources of the seabed and the earth's interior underneath,
- maritime industry,
- human health and life.

An element of the assessment of the impact on other users is also the assessment of the possibility of social conflicts.

**Coastal tourism**

Coastal tourism is an important branch of the tourism industry in Poland. Due to the proximity of the sea coast, coastal boroughs and municipalities are considered as areas of high natural value, which are an attraction for both domestic and foreign tourists.

It was concluded that the OWF could potentially cause the following types of impacts on coastal tourism:

- 1) at the construction stage: impact on the landscape due to increased vessel traffic involved in the construction of the farm and the appearance of individual farm facilities in the progressing construction process of the project, emission of surface noise in connection with construction activities;
- 2) at the operation stage: impact of wind turbines and other farm elements on the landscape (e.g. transformer stations, metering and research station), emission of surface noise by wind



- turbines and vessels servicing the farm, light phenomena (shadow flickering, light marking);
- 3) at the decommissioning stage: impact on the landscape due to increased vessel traffic involved in disassembly of the farm elements, emission of surface noise due to disassembly works, disappearance of a tourist attraction in the form of an OWF.

The impact assessment was commenced by defining project scenario which shall potentially have the greatest impact on coastal tourism (the furthest reaching scenario). It was considered that the most far-reaching scenario can occur in a reasonable alternative option.

It was stated that the impact of the Polenergia Bałtyk II OWF on coastal tourism shall be most closely related to the impact of this project on the landscape. The Polenergia Bałtyk II OWF can potentially have a visual impact on the coastal section stretching from Ustka on the western side to Łeba on the eastern side. The receptor of the impact of the Polenergia Bałtyk II OWF was, thus, the coastal tourism on the entire section.

The importance of coastal tourism (as a receptor on which the Polenergia Bałtyk II OWF may have an impact) has been categorized as moderate. It was stated that the potential impact of the Polenergia Bałtyk II OWF on coastal tourism related to the visual impact of the project on the landscape at all stages shall be negligible.

The results of the assessment showed that the project consisting in the construction of the Polenergia Bałtyk II OWF shall not have a significant negative impact on coastal tourism in any of its considered options, at any of the stages, i.e. construction, operation and decommissioning, or in the cumulation with other projects.

Additionally, it should be emphasized that visual issues are very subjective – what some see as a disturbance of the landscape leading to a decrease in the tourist attractiveness of the region, others may perceive even as an attraction in itself. Therefore, the impact of the Polenergia Bałtyk II OWF may also be positive – the farm may become an additional tourist attraction of the region.

### **Recreational fishing**

Relying on the results of vessel traffic monitoring included in the EIA report, it cannot be excluded that the area of the Polenergia Bałtyk II OWF is a place of recreational fishing. There is no data available, however, that would make it possible to determine the exact intensity of such activities. The analysis of the impact on commercial fisheries carried out for the purposes of this project did not show any particularly valuable fishing grounds within the limits of the Polenergia Bałtyk II OWF. On this basis, it was considered that this is also not a particularly attractive fishing ground for recreational fishing. It was found that at all its stages, i.e. construction, operation and decommissioning, OWF may potentially cause the following types of impacts on recreational fishing

- 1) the need to change the existing fishing routes,
- 2) the need to transfer to other fishing grounds,
- 3) emission of surface noise.

At the stage of operation, attractive fishing areas may be created at the perimeters of the farm due to the so-called artificial reef effect – this is a positive impact.

The impact assessment was commenced by defining project scenario which shall potentially have the greatest impact on coastal tourism (the furthest reaching scenario). Complete exclusion of the farm area from the possibility of vessel traffic, including vessels offering sea angling services, was considered to be such a scenario.

It was found that in the Polenergia Bałtyk II OWF project all of the above-mentioned impacts may potentially occur, with the reservation that the impact consisting in the emission of surface noise concerns only the construction stage and the possible decommissioning of the farm.

The importance of recreational fishing (as a receptor of impacts) for the needs of the assessment of the significance of impacts of the Polytechnic Baltic II OWF has been categorized as low. It was found that the demonstrated potential impacts of the Polenergia Bałtyk II OWF on recreational fishing

at all stages shall be of negligible significance. The results of the assessment showed that the project consisting in the construction of the Polenergia Bałtyk II OWF shall not have a significant negative impact on recreational fishing in any of the considered options of the project, at any of the stages, i.e. construction, operation and decommissioning, or in the cumulation with other projects. It should be stressed that in connection with the execution of the Polenergia Bałtyk II OWF, positive impacts may occur – the effect of the so-called artificial reef may lead to an increase in the resources of fish species being the subject of recreational fishing, and the farm as a tourist attraction may cause an increase in interest in fishing trips, if the offer of such trips also includes an opportunity to see the OWF up close.

### **Water sports**

**Windsurfing and kitesurfing** are sports that are practiced in the coastal zone, usually up to 1 nautical mile from the shore. It was found that the Polenergia Bałtyk II OWF shall not be a source of impacts on windsurfing and kitesurfing (also in combination with other projects) in any of the considered alternatives.

No separate assessment of the impact of the Polenergia Bałtyk II OWF on **sea sailing** was carried out – the impact of the Polenergia Bałtyk II OWF on marine navigation was found to be similar to that of other types of vessels of similar size and with similar navigation devices.

It was not found that the Polenergia Bałtyk II OWF could be the source of potential impacts on **shipwreck diving** (also in cumulation with other projects) in any of the considered options.

### **Military operations**

The Polenergia Bałtyk II OWF does not occupy water bodies used for naval manoeuvres. Hence, no impact assessment has been carried out in this respect.

### **Radiolocation and communication systems**

In order to meet the formal requirements resulting from the provisions of the Permit for erection and use of artificial islands, structures and devices in the Polish maritime areas (PSZW), the expert opinion on the impact of the Polenergia Bałtyk II OWF on the communication systems and radar systems of the Border Guard, Navy, Maritime Search and Rescue Service, Global Maritime Distress and Safety System and the National Maritime Safety System was prepared for the needs of the project. This is a document independent of the EIA report. The EIA report presents only conclusions resulting from the expert opinion.

It has been concluded that offshore wind farms have the potential to cause the following types of impacts on communication and radiolocation systems:

- 1) no signal of coastal and vessel communication systems and radar systems – turbines are a physical obstacle to waves, thus blocking the signal of transmitter/receiver stations,
- 2) impediments to the correct location of vessels by shore-based radar stations due to radar echoes,
- 3) impediments to the proper functioning of shipborne radar systems,
- 4) communication difficulties caused by interference in communication systems – interference caused by radio waves reflected by wind turbines.

Where, based on simulations performed for the most far-reaching scenario assuming the maximum number of turbines being 200, it was found that negative impacts reached beyond a 2-kilometer zone from the turbine boundary, corrective actions were proposed being the installation of additional transmitting devices on chosen turbines. Those devices would compensate for, e.g. lack of signal or interference caused by the OWF presence. The zone width of 2 km was adopted on the basis of a risk analysis, review of publications and simulation results contained in the expert opinion. Possible keeping of the distance of 2 km from the wind farm by vessels will eliminate all hazards with a risk level defined as high and very high. It should be emphasized that the expert opinion will be

updated at a later stage of the project, once the final number and parameters of wind turbines are known together with their layout. Then, on the basis of the results of the updated expert opinion, possible mitigation measures will be consulted with competent administrative authorities, if necessary.

### **Civil and military aviation**

It was found that offshore wind farms could potentially affect civil and military aviation primarily during the operation stage, resulting in the following impacts:

- 1) wind turbines (under construction or constructed) may, due to their height, be a physical obstacle for aviation (including for helicopters operating drilling rigs or participating in rescue actions),
- 2) components of the offshore wind farm (in particular turbines) may cause disturbances in the operation of radar systems used in aviation.

Based on the approval of the planned project location by the President of the Civil Aviation Authority and positive opinion by the Military Air Traffic Service Office of the Polish Armed Forces, it was determined that the Polenergia Bałtyk II OWF will not affect the civil and military aviation in any of the options of the project considered in the report. In accordance with the content of the permit for erection and use of artificial islands, structures and devices in the Polish maritime areas (PSZW) obtained, the Investor was obliged to supplement the design documentation within the scope of projects concerning the elimination of safety risk in aviation tasks by the Polish Air Force. Accumulation of impacts of the Polenergia Bałtyk II OWF and other OWFs is potentially likely to occur, primarily at the stage of operation of those projects. However, it should be remembered that for all subsequent offshore wind farms, the location of the project will also have to be consulted with the relevant civil and military aviation services, which will verify the threats to air transport posed by the subsequent projects in the course of their opinions.

### **Maritime shipping**

Based on the results of vessel traffic monitoring in the Polenergia Bałtyk II OWF area, it was found that the planned project is located outside the area of intensive shipping traffic. Many vessels passed through the Polenergia Bałtyk II OWF area in all directions, although the distribution was clearly denser in the area south of the planned project, which is related to the Traffic Separation Scheme established in this area – Słupsk Bank, and east and north of the OWF, where the usual shipping route for tankers and large bulk cargo vessels (planned as the future deep-water route D, set for the largest merchant ships and for tankers) passes.

It was found that due to the increase in vessel traffic in the area of the project at all stages (i.e. construction, operation and decommissioning), compared to the original situation - i.e. the pre-investment stage, offshore wind farms might potentially have a negative impact on maritime shipping, causing:

- disturbance of the existing order and restriction or hindrance to shipping, which necessitate changes to the existing vessel routes (if they passed through the farm area). An increase in vessel traffic volume is particularly evident at the construction stage (or the potential decommissioning of the farm). At the operation stage the situation stabilizes, the traffic volume of vessels involved in the farm operation decreases, and the traffic is characterized by certain regularity and predictability resulting from the schedule of maintenance works;
- electric shock hazard in case of emergency anchor dropping by the vessel and cable damage. However, that risk is minimized because substations are equipped with protection automation which switches off the cable in case of damage;
- disrupted operation of radar and communications systems.

OWFs may also be a source of positive impacts:

- generating additional revenues in ports handling ships involved in the

- construction/operation or possible decommissioning of the farm;
- OWF components may be a place of refuge for castaways;
- assisting navigation and allowing for better spatial orientation (thanks to marked farm components).

It was found that due to the increase in vessel traffic volume, the Polenergia Bałtyk II OWF might be a source of impacts on maritime shipping as described above, including on existing and planned shipping routes, however, those impacts would not be significant. In case of restriction of the right of passage through the farm area, it will be necessary to change customary routes of some vessels and direct them to the north or south of the Polenergia Bałtyk II OWF area, depending on planned destination. Based on results of a complex navigation expert opinion to be developed at a later stage of the project, the Investor will implement, in consultation with the maritime administration and in compliance with the applicable legal regulations, appropriate actions aimed at minimizing the navigational risk (e.g. marking farm components, marking the farm on maps, messages).

Therefore, it is assumed that possible collisions between vessels or between vessels and farm components will be unplanned events, caused mainly by human error, mechanical failure (resulting, e.g. in the loss of vessel steerability) or difficult weather conditions. Consequently, this decision imposes on the Investor obligations related to the necessity to ensure environmental safety in case of unplanned events and the necessity to ensure safety of navigation at all stages of the project in question.

Simultaneous construction of two OWFs or construction of an OWF near another OWF being operated or decommissioned may necessitate bigger changes to shipping routes. At the current stage, however, there is no actual data on other planned OWFs that would allow for a precise estimation and assessment of such a risk.

#### **Exploration, prospection and exploitation of mineral resources of the seabed and the inside of the Earth underneath it**

In order to meet the formal requirements resulting from the provisions of the Permit for erection and use of artificial islands, structures and devices in the Polish maritime areas, an expert opinion has been prepared at the request of the investor on the impact of the Polenergia Bałtyk II OWF on the safety of exploration, prospection and exploitation of mineral resources of the seabed and the inside of the Earth underneath it. This is a document independent of the EIA report. The report discusses the conclusions of that expert opinion.

It was stated that offshore wind farms might limit the possibilities of exploration, prospection and exploitation of mineral resources of the seabed and the inside of the Earth underneath it in the case when in the area of the OWF the process of installation of particular components of the farm has started or the farm has been already built. Then, traditional methods of prospection are not used, and the possibility of setting up a drilling rig (in order to identify a deposit) or a production rig is limited, due to the need to maintain certain safety zones.

The area intended for the Polenergia Bałtyk II OWF is located in the area covered by the license for Słupsk-E. The common part of both projects is a total of 98.67 km<sup>2</sup>. This represents 80.9% of the Polenergia Bałtyk II OWF area and 8.7% of the licensed area for oil and gas prospection and extraction. Considering the above, no significant impact of the Polenergia Bałtyk II OWF on the possibilities of exploration, prospection and exploitation of mineral resources of the seabed and the inside of the Earth underneath it was found at any stage of the project or in accumulation with other planned OWFs, provided that preventive measures and recommendations indicated in the above soil survey expert opinion are applied.

#### **Maritime industry**

An important factor in the development of service and logistics back-up facilities for the Polenergia Bałtyk II OWF will be the close distance between potential centers which might perform

such functions and the area of the planned project. Both the cost of maritime transport and downtimes related to the need to take into account weather conditions are of great importance. An important factor ensuring construction capacity of the offshore wind energy market is the availability of specialized vessels for transport and construction of offshore wind turbines. There are currently more than 35 such vessels on the European market, and the demand is still growing.

If the extension and modernization of Polish ports are carried out properly, it is estimated that they may play the role of both production ports and construction ports. At the farm operation stage, smaller ports and back-up facilities located on the central coast (Ustka, Darłowo) will gain importance.

On the Polish market there are currently several manufacturers of OWF components for export. Those are mainly steel structures with low process requirements, such as foundations and wind towers. Due to the demand for qualified personnel, the offshore wind energy sector may have a significant impact on the directions of education and the labor market in Poland, especially in the shipbuilding, electrical machinery and maritime construction sectors, and lead to the creation of a number of new jobs.

### **Human life and health**

None of the impacts of the Polenergia Bałtyk II OWF were identified as likely to have a significant adverse impact on health and life of people on the basis of the studies carried out. A hazard to health and life of people may occur mainly in the event of a collision of vessels or vessels with OWF components, but such situations are classified as so-called unplanned events, which are very unlikely to occur.

### **Unplanned impacts**

Unplanned impacts are a result of sudden unplanned events or failures which are not related to activities included in the project execution schedule. The EIA report identified the following potential unplanned events that may occur in relation to the implementation of the Polenergia Bałtyk II OWF:

- spill of oil-derivative substances during normal operation or as a result of collision, failure or construction disaster,
- accidental release of municipal waste or domestic sewage to the environment,
- accidental release to the environment of construction materials or waste from construction, operation or decommissioning of the farm,
- pollution of water column and seabed sediments with antifouling agents.

Unplanned events may directly contaminate the abiotic environment, especially marine waters and, to a lesser extent, bottom sediments. Indirectly, those events may also have an impact on living organisms that inhabit or otherwise use the seabed, the water column and the sea surface.

Each turbine contains a certain amount of mineral oils, the amount of which depends on the size and type of the turbine. The estimated quantities may be as follows: gear oil – 750-1000 l/turbine, hydraulic oil – 250 l/turbine, transformer oil – 1500-2500 l/turbine, lubricating oil – 20 l/turbine. The oil-immersed transformer in the offshore transformer substation may contain up to 80 m<sup>3</sup> of transformer oil.

Additionally, during normal operation of vessels, leakages of various types of oil derivative substances (lubricating and diesel oils, petrol) may occur. It should be assumed that these will be small (1<sup>st</sup> degree) spills, up to 20 m<sup>3</sup>. A leakage may also occur as a result of a vessel failure or collision, construction disaster at one of the farm facilities, and during maintenance works. In the event of a collision or crash of vessels, a 3<sup>rd</sup> degree spill, i.e. one exceeding 50 m<sup>3</sup>, may be expected.

A visible effect of an oil spill is an oil stain which, under the influence of gravity and surface tension, spreads at a speed depending on the type of oil and ambient conditions. The influence of factors such as oil volume, density, viscosity, temperature, wind speed and time determine the size of the spill. The estimated speed of oil stain movement in large water bodies is about 2-3% of wind speed. The oil film formed on the water surface may cause:

- impeded gas exchange, especially of oxygen, between water and atmosphere
- decrease in light intensity under the water surface by 5-10 % (mainly due to the presence of heavy fractions of oil and sulfur) limiting photosynthesis,
- increase in the temperature of water during the day as a result of the absorption of light by the oil layer.

As part of the BRISK project([www.brisk.helcom.fi](http://www.brisk.helcom.fi)) the risk of a collision in the Baltic Sea area was estimated, where more than 5,000 tonnes of oil contamination would be released into the marine environment (e.g. unsealed tanker cargo). Throughout the Baltic Sea the risk was estimated at 1 case in 26 years, including the most vulnerable areas being the Danish Straits (1 case in 65 years) and the South Western Baltic Sea (1 case in 97 years). For the South-Eastern Baltic Sea area, which includes the area of the Polenergia Bałtyk II OWF, the risk of such collision was estimated at 1 case in 1060 years, including the most vulnerable areas being those in the area of Wolin and Rügen islands and Hel Peninsula. As a result of risk analysis of the BRISK project, the largest hazards that may cause the release of oil contaminants comprise vessel-to-vessel collisions, which are approx. 100 times more dangerous than vessel sinking. Fires, explosions on vessels and their collisions with offshore systems (offshore wind farms, platforms, etc.) and oil releases from these systems were considered in the above risk analyses, but they were identified as much less likely.

In order to protect the hulls of vessels against fouling, biocidal substances are used, which may include e.g. copper, mercury, and organotin compounds (e.g. tributyltin - TBT). Those substances may pass into the water column and eventually be retained in the sediment. It should be assumed that emissions of those compounds will be limited by dilution in water column. Among the listed substances, organotin compounds are the most harmful (toxic) to aquatic organisms. The use of TBT (the most harmful substance) in antifouling paints is currently prohibited, but the presence of those compounds in older vessels cannot be ruled out. Therefore, it was recommended to use at each stage of the project vessels whose hulls were not coated with antifouling paint containing TBT.

The places at highest risk, due to the distance from the OWF area and the direction of the spread of contamination, are the Słupsk Bank and the coastal area, approximately between Rowy and Białogóra, which are tourist destinations, and a small tourist and fishing port in Łeba.

Areas particularly sensitive to potential contamination are protected natural areas, including those belonging to the Natura 2000 network, established on the basis of the Act of April 16, 2004 on nature conservation. The Polenergia Bałtyk II OWF will not be located in the protected areas, however, it will be located in the immediate vicinity of the PLC990001 Ławica Słupska Natura 2000 site, about 24.4 km from the boundary of the PLB990002 Przybrzeżne Wody Bałtyku Natura 2000 site and about 32.7 km from the PLH220023 Ostoja Słowińska Natura 2000 site together with the Słowiński National Park (the Park also includes the offshore strip along the coast of the width of 2 nautical miles – Baltic protection district with an area of 11,171 ha). The sensitive area is also the Baltic Sea coast as a place for leisure, with numerous tourist centers and beaches between Rowy and Białogóra.

It was found that unplanned events and failures in the area of the Polenergia Bałtyk II OWF do not pose a direct hazard to coastal tourism (an oil spill, considering its most probable range, will not reach the shoreline). Potential oil spills will be a direct constraint on recreational fishing and water sports, and they will prevent such activities within the range of the spill. However, the likelihood of such unplanned events and failures is very low, from 1 in every 100 years (50% chance of an

occurrence within 50 years) up to 1 in every 10,000 years (1/200 chance of an occurrence within 50 years).

During the construction of a wind farm, on vessels and in the construction site back-up facilities located on land (in the port handling the project) and in the place where the project is to be carried out, mainly municipal waste and others, not directly related to the construction process, as well as domestic sewage will be generated. Those may include, e.g. damaged parts of farm components being installed, cement, grouts, mortar, binders used to join the foundation and turbine components, and other chemical substances used during construction works. Waste and sewage may be accidentally released to the sea while during their collection from vessels by another vessel and in the event of a failure, resulting in a local increase in nutrient concentrations and deterioration in the quality of water and sediments. However, the contaminants should be quickly dispersed, and thus they will not contribute to a permanent deterioration of the environment in the project area.

During operation of the farm, its facilities will be maintained, and small amounts of waste or operating fluids may be released to the sea, while during the decommissioning of the farm, bottom sediments may be contaminated with waste from this process. The magnitude of this impact will depend on the adopted method of carrying out works, and the greatest pollution may occur in case of the necessity to crush gravitational foundations.

In order to reduce the impacts related to the above-mentioned unplanned events, this decision imposes on the Investor obligations to take actions both during the construction stage and subsequent operation of the project in question in order to minimize such impacts. It was recommended to update the preliminary contamination and risk prevention plans during the construction, operation and decommissioning of the farm, prepared for the purposes of the Polenergia Bałtyk II OWF. They should be updated before starting the construction of the first stage of the farm, i.e. at the moment when its final shape is known (at least for the first stage), including the locations of the facilities, the location of the construction port and the types and number of vessels and helicopters that will participate in construction works.

### **Analysis of potential social conflicts**

The process of analyzing and assessing the risk of social conflicts included three stages, described below. The first stage consisted in the examination of the possibility of occurring significant negative spatial, environmental and economic conflicts and took place at the stage of selecting the location for the Polenergia Bałtyk II OWF.

The second stage consisted in the identification of all social and professional groups and areas of activity using the sea resources, which are exposed to potential impacts from the Polenergia Bałtyk II OWF, and the assessment of the impact of the project on the existing forms of using the marine space.

At the third stage of the analysis, the sensitivity of local communities to potential factors triggering conflicts related to the feeling of threat to changes in the quality and comfort of life, as well as the susceptibility of local communities to protests related to investment activity in their neighborhood were analyzed.

The analysis covered the following boroughs: urban and rural boroughs of Darłowo, Postomino, urban and rural boroughs of Ustka, Smołdzino, Słupsk, Łeba, Wicko, Choczewo, Krokowa.

Within the framework of the analysis, the following factors triggering conflicts were analyzed:

- 1) visibility of the Polenergia Bałtyk II OWF from places of permanent occupation (view of the sea from places of residence, rest or work),
- 2) the impact (noise, EMF) of the transmission infrastructure,
- 3) restricted access to fishing areas,
- 4) restricted access to tourist shipping areas,

- 5) restricted access to the use of beaches by tourists,
- 6) impact on tourism revenue – significance of the impact
- 7) impact on fisheries revenue – significance of the impact,
- 8) impact on coastal and marine protected areas (national parks, Natura 2000 sites),
- 9) impact on landscape protection areas (landscape parks and protected landscape areas).

It was found that the risk of potential social conflicts caused by the preparation and construction of the Polenergia Bałtyk II OWF will be different depending on the borough. The risk seems to be greater in boroughs where there have already been social protests or special interest groups. Such boroughs include the boroughs of Łeba, Ustka (urban borough) and Choczewo. The lower risk of social conflicts concerns boroughs which derive income from existing onshore wind farms or other power sector projects and/or whose inhabitants are highly aware of such projects. This group includes the boroughs of Postomino, Smołdzino, Wicko, Krokowa.

The topic of offshore wind energy has been disseminated in the region due to the communication and social education campaign conducted for the Bałtyk Środkowy III Offshore Wind Farm (BSIII OWF). As part of the campaign's activities, a series of educational meetings with students of primary and junior high schools took place in the following localities: Bierkowo, Objazda, Łeba, Darłowo, Gąbino, Zaleskie and Ustka. In addition, Investor meetings were held with representatives of the following fisheries groups: Sea Fishermen Association – Producer Organization, “Łebscy Rybacy” Association, Łeba Fishing Group, Central Pomerania Fishing Group, the Management Board of Ustka Port, National Chamber of Fish Producers, Polish Fishermen Association, during which the concerns and doubts of the fishing community were discussed. During the activities carried out within the framework of the campaign, on-topic materials containing information not only on the planned BSIII OWF, but also on this type of projects in general were disseminated.

### ***Cumulative impact***

In the analyses of potential cumulative impacts, the Polish OWF projects, which are likely to be implemented in the foreseeable future, i.e. by ca. 2026, were taken into account in the first place. These are Bałtyk Środkowy III, Polenergia Bałtyk II, Baltica 3 and Baltica 2, as the owners of these four farms concluded grid connection agreements ensuring the collection of generated energy. In addition, other, more hypothetical projects were taken into account in ornithological analyses to verify the most far-reaching scenarios, even if they are very unrealistic. When evaluating the impact of the project on birds, the following farms were also considered: Baltic Power OWF, C-Wind OWF and Baltic II OWF, which do not have the conditions for connection, but they border directly with the above 4 projects on the east and west, forming one “group” of farms located in the north-eastern part of the Słupsk Bank.

Besides, the analyses took into account other types of projects than wind farms, such as the most important maritime shipping routes, licenses for exploration and prospecting of oil and natural gas deposits (LOTOS “Gaz Południe”, “Słupsk E”, “Słupsk W”), line investments (subsea cables) and major shipping routes, in particular the future deep water route D, Słupsk Bank TSS and the customary shipping route between Lübeck and Ventspils.

Moreover, due to its nature and location, there is no risk that the Polenergia Bałtyk II OWF could cause the failure to achieve the environmental objectives included in the river basin management plan.

It is estimated that the project at the construction, operation and decommissioning stage will not have a significant impact on exacerbating the climate change. The potential impacts of the Polenergia Bałtyk II OWF on the climate should be considered in two aspects – as negative impacts and positive impacts. Negative impacts of the Polenergia Bałtyk II OWF on the climate will be mainly



related to the emission of air pollutants, especially at the stage of construction, when particularly intensive vessel traffic is expected. During projects located in the area that will be affected by the project;

- the project may also have adverse impact on the areas that require special protection due to occurrence of species of plants and animals or their habitats or natural habitats that are subject to protection, including the Natura 2000 sites and other forms of protection of nature.

The factual circumstances that support the need for the re-assessment in this case are, in the opinion of the Regional Director for Environmental Protection in Gdańsk: optioneering of the technical solutions adopted in the functional and spatial concept plan being the basis for the assessment in the EIA report, and therefore the need to confirm the conclusions regarding the magnitude and intensity of the environmental impact, as well as the lack of significant negative impacts of the project on the Natura 2000 sites on the basis of the final solutions adopted in the construction and process engineering design, and the additional survey results; there is no detailed hydrogeological survey at the stage of the current assessment.

Pursuant to Article 135 section 1 of the Environmental Protection Law Act, the creation of a limited use area is permissible provided that, in total: 1) the project concerns or concerned a wastewater treatment plant, municipal waste landfill, composting plant, transport route, airport, power line and substation, and radio communication, radio navigation and radio location systems; with this list being exhaustive; 2) the environmental review or the assessment of the environmental impact or the post-development analysis shows that despite the use of available technical, technological and organizational solutions, the environmental quality standards cannot be met outside the area of the plant or other facility. Wind turbines are not included in the list of plants for which a limited use area can be created. This means that the investor's legal title should include an area which guarantees the observance of the environmental quality standards along the borders of this area. The limited use area can be created only for power lines and stations, in the event of exceeding the standards concerning electromagnetic fields or noise in the environment. It is not expected that any environmental quality standards could be breached by these facilities, and therefore there is no need to establish a limited use area for the project.

In accordance with Article 3, sections 23, 24 and 48 of the Act of April 27, 2001 - Environmental Protection Law, the serious failure means an event, in particular emission, fire or explosion, taking place during an industrial process, storage or transport, in which one or more hazardous substances occur, leading to the immediate hazard to life or health of people or to the environment or the delayed occurrence of such a hazard. A major industrial failure means a major failure in a plant. A plant means one or more systems together with the land to which the operator holds a legal title and the equipment located thereon.

In accordance with Article 248, section 1 of the Environmental Protection Law, a plant posing a hazard of a serious industrial failure, depending on the type, category and quantity of hazardous substance present in the plant, is considered to be a plant with an increased risk of failure or a plant with a high risk of failure, depending on the expected quantity of hazardous substance that may be present in it. The criteria for plant classification to one of the listed categories are specified in the Regulation of the Minister of Development of January 29, 2016 on the types and quantities of hazardous substances present in a plant, which decide on classification of a plant as a plant of increased or high risk of major industrial failure (Journal of Laws of 2016, item 138). At the same time, it should be noted that in accordance with Article 2 section 4 of the Environmental Protection Law, the principles of protection of the sea against pollution by vessels and administration authorities competent for such protection are determined in separate regulations. However, due to the relatively small quantities of hazardous substances, farm would not be classified into any of these categories.

Having analyzed the scope of the planned project and identified its impact on the environment along with their scale, it was found that the planned project shall not cause a transboundary environmental impact. Such impacts, taking into account the recommended actions in case of emergency situations, will not be caused by the identified possible unplanned/emergency situations. For these reasons, in this case it was not necessary to conduct the procedure on transboundary impact as referred to in Article 104 and the following of the EIA Act, or to specify the conditions related to such impact in the contents of this decision.

Prior to the issue of the decision, by virtue of the letter with ref. No. RDOŚ-Gd-WOO.4211.26.2015.KSZ.16 of December 22, 2016, and once again, due to the explanation submitted by the Investor, by virtue of the letter with ref. No. RDOŚ-Gd-WOO.4211.26.2015.KSZ.19 of February 7, 2017, the parties to the procedure were informed, pursuant to Article 10 of the Code of Administrative Procedure, that the evidence gathering was completed, the case files are available for review and the parties could provide its comments on the gathered evidence and materials. Within the set timeframe no comments or requests were submitted.

The implementation of the project pursuant to this decision and the subsequent operation of the facilities resulting from the project does not absolve the Investor from the following obligation, regardless of the provisions of this decision:

- to follow the regulations concerning the technical conditions laid down under Article 7 of the Construction Law of July 7, 1994 (*consolidated text, Journal of Laws of 2016, item 290, as amended*);
- to obtain the required permits, opinions and approvals;
- to perform the obligations resulting directly from the law, including in particular the obligations related to proper management of water defined in the provisions of the Act of July 18, 2001 - Water Law (*consolidated text, Journal of Laws of 2015, item 469, as amended*);
- in the field of proper operation of the equipment specified in the provisions of the Act of April 27, 2001 - Environmental Protection Law (*consolidated text, Journal of Laws of 2017, item 529*); waste management, defined in the Act of December 14, 2012 (*Journal of Laws of 2013, item 21, as amended*);

these obligations as existing and binding by law, are not subject to the re-imposition and disclosure in the decision.

Therefore, the decision should be as formulated herein.

The decision is subject to announcement on publicly accessible data list.

This decision may be appealed against to the General Director for Environmental Protection through the Regional Director for Environmental Protection in Gdańsk within 14 days following its receipt, pursuant to Articles 127 and 129 of the Code of Administrative Procedure.

For the issuance of this decision, a stamp duty in the amount of PLN 205 was paid (Appendix No. 1, part I, item 45 of the Act of November 16, 2006 on stamp duty (*consolidated text, Journal of Laws of 2016, item 1827, as amended*)).

Regional Director for  
Environmental Protection in  
Gdańsk

*Danuta Makowska*

## INSTRUCTION

The decision on environmental conditions does not replace the permit issued pursuant to Article 56 of the Environmental Protection Act. Any possible destruction of habitats of species, disturbance or transfer of species under protection should be granted a permit pursuant to Article 56 section 1 of the Act of April 16, 2004 on environmental protection (consolidated text, Journal of Laws of 2018, item 2134, as amended).

Before commencing the performance of the project, the investor is obliged to obtain the consent of the Director of the Maritime Office in Słupsk to occupy the body of water for the duration of the works, in conjunction with Article 217 of the Act of July 18, 2001 – Water Law (consolidated text, Journal of Laws of 2015, item 469, as amended), and Article 42 section 2 of the Act on maritime areas of the Republic of Poland and maritime administration (Journal of Laws of 2016, item 2145, as amended).

To be received by:

1. Maciej Stryjecki, Polenergia Bałtyk II sp. z o.o., ul. Krucza 24/26, 00-526 Warsaw – Representative
2. Marta Porzuczek, Polenergia Bałtyk II sp. z o.o., ul. Krucza 24/26, 00-526 Warsaw – Representative
3. Minister of Development, Plac Trzech Krzyży 3/5, 00-507 Warsaw
4. Minister of Infrastructure and Construction, ul. Chałubińskiego 4/6, 00-928 Warsaw
5. Minister of Maritime Economy and Inland Navigation, ul. Nowy Świat 6/12, 00-400 Warsaw
6. Minister of State Treasury, ul. Krucza 36 / ul. Wspólna 6, 00-522 Warsaw
7. Minister of Agriculture and Rural Development, ul. Wspólna 30, 00-930 Warsaw
8. Minister of National Defence, ul. Klonowa 1, 00-909 Warsaw
9. Minister of the Environment, ul. Wawelska 52/54, 00-922 Warsaw
10. Minister of Energy, Plac Trzech Krzyży 3/5, 00-507 Warsaw
11. Minister of Culture and National Heritage, ul. Krakowskie Przedmieście 15/17, 00-071 Warsaw
12. Commander of the Maritime Regional Unit of the Border Guard, ul. Oliwska 35, 80-917 Gdańsk 17
13. Lotos Petrobaltic S.A., ul. Stary Dwór 9, 80-758 Gdańsk
14. PSE Operator S.A., ul. Warszawska 165, 05-520 Konstancin Jeziorna
15. Elektrownia Wiatrowa Baltica-2 Sp. z o.o., ul. Ogrodowa 59A, 00-876 Warsaw
16. Baltic Trade and Invest, ul. Kilińskiego 45, 76-200 Słupsk
17. to files

For the attention of:

1. Director of the Maritime Office in Gdynia, ul. Chrzanowskiego 10, 81-338 Gdynia
2. Director of the Maritime Office in Słupsk, Al. Sienkiewicza 18, 76-200 Słupsk
3. State Border Sanitary Inspector in Gdynia, ul. Kontenerowa 69, 81-155 Gdynia

**REGIONAL DIRECTOR  
FOR ENVIRONMENTAL  
PROTECTION IN GDAŃSK**

**APPENDIX NO. 1**

**To decision No. RDOŚ-Gd-WOO.4211.26.2015.KSZ.20**

*pursuant to Article 84 section 2 of the Act of October 3, 2008 on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments (consolidated text, Journal of Laws of 2016, item 353, as amended)*

**CHARACTERISTICS OF THE PROJECT**

The subject of the project is construction of the Polenergia Bałtyk II offshore wind farm, with a capacity of 1200 MW. The project will be located *in the southern part of the Baltic Sea, in the Polish Exclusive Economic Zone (“EEZ”), approximately 37 km north of the coastline, at the level of Smołdzino Borough (Pomeranian Voivodship). The total area of the Polenergia Bałtyk II OWF is about 122 km<sup>2</sup>. The geographical coordinates of the project are presented in the table below:*

**Table 1. Geographical coordinates of the project**

Point	WGS 84 DD MNPSS.sss”	
	Latitude	Longitude
A	55°00'50,524”	16°58'30,687”
B	55°02'06,260”	16°51'35,533”
C	55°02'07,171”	16°50'52,962”
D	55°06'08,711”	16°46'23,733”
E	55°06'11,836”	16°46'19,179”
F	55°07'06,218”	16°44'36,995”
G	55°07'25,002”	16°47'08,284”
H	55°07'54,264”	16°50'28,666”
I	55°08'05,318”	16°53'34,432”
J	55°08'17,668”	16°55'19,642”
K	55°08'12,077”	16°56'59,967”

The *Polenergia Bałtyk II* OWF will consist of:

- 1) up to 120 wind turbines (“**WT**”), the basic components of which are: foundation, tower, nacelle with a generator, and rotor,
- 2) up to 6 internal offshore substations (“**OS**”),
- 3) up to 200 km of submarine power and telecommunication cables connecting:
  - a. individual WF together (into cable circuits),
  - b. WF groups with internal offshore substations,
  - c. internal offshore substations with one another,
  - d. internal OWF with an external (being a part of another project) offshore substation (optional).

The Investor holds a permit for erection and use of artificial islands, structures and devices in the Polish maritime areas (PSZW) for the project Bałtyk Środkowy EI OWF – decision of the Minister of Transport, Construction and Maritime Economy No. MFW/2/2013 of January 15, 2013,

amended by decision No. MFW/2a/13 of April 29, 2013.

In the course of the administrative procedure aimed at the issuance of this decision on environmental conditions, the name of the project was changed from **“Bałtyk Środkowy U”** to **“Polenergia Bałtyk II”**. Parameters, location and the entire submitted documentation for the planned offshore wind farm remain unchanged.

The area intended for implementation of the Polenergia Bałtyk II OWF is, according to the PSZW permit, about 122 km<sup>2</sup>. Components of the OWF may not be located in the buffer of 500 m from the internal border of the area intended for the farm construction. All structural components of the farm have to be located within the boundaries of the specified area, so it determines the maximum external range of the rotor, which additionally limits the area where foundations can be laid. The size of this limitation depends on the rotor radius. This means that, according to the PSZW permit, the area where the farm facilities may be located is the area specified in the PSZW permit, reduced by the buffer zone of the rotor width in a given option of the project ("gross covered area").

Moreover, as a result of the analysis of potential impacts of the project on the environment, additional restrictions were made on the use of the gross covered area according to the PSZW permit:

- 1) due to the possibility of negative impact of the project on seabirds, the southern part of the area, directly adjacent to the Słupsk Bank, of approx. 16.59 km<sup>2</sup> in the option selected for implementation and approx. 16.89 km<sup>2</sup> in the reasonable alternative option, was excluded from the construction plans, while maintaining the possibility of including other components of the farm, e.g. cables or substations,
- 2) due to the necessity to protect two shipwrecks discovered within the project area, a further 0.3 – 1 km<sup>2</sup> of its surface will be excluded from the construction plans.

Moreover, the provisions of the PSZW permit indicate that the building permit design have to include the layout of internal structures and cables guaranteeing that none of the planned structures or cables is located closer than 2 nautical miles from the existing shipping routes.

Considering all of the above, the report on the impact of the said project on the environment (hereinafter referred to as EIA report – Environmental Impact Report) assumes that:

- the total area of the farm is approx. 122 km<sup>2</sup>, but:
- buffer area No. 1 (500 m) covers approx. 23 km<sup>2</sup>,
- buffer area No. 2 (500 m + rotor radius) covers from approx. 26.5 km<sup>2</sup> (500 m + 100 m in the alternative option) to approx. 27.5 km<sup>2</sup> (500 m + 125 m in the option selected for implementation), so:
- the area actually possible to be built up is approx. 94–95 km<sup>2</sup>, of which the area for the wind turbine foundation is approx. 77–78 km<sup>2</sup> (depending on the option).

At this stage of the project, it is not possible to present the final layout of the wind turbines. It will be prepared at the stage of the building permit design.

The wind turbines will be laid out with the objective to obtain the maximum possible energy yield, particularly considering such factors as:

- data on the seabed structure from geotechnical surveys,
- wind speed test results (available after wind measurements),
- dimensions of the selected wind farm model and type of foundations,
- the need to avoid the *"wake effect"*.

The Polenergia Bałtyk II OWF does not include the infrastructure for transmitting electricity generated by the farm to the land. A separate project, the Offshore Transmission Infrastructure ("OTI"), will serve this purpose. It is subject to a separate procedure for the issuance of a decision on

environmental conditions. This project will consist in construction and operation of the electricity transmission grid between onshore substations, being components of the National Power System ("NPS") and offshore substations, constituting elements technologically related to offshore wind farms.

The wind turbine parameters will depend on the selected power output (the higher the power output, the higher the tower and the longer the wing span is required). The basic boundary parameters of the wind turbines planned for installation at the Polenergia Bałtyk II OWF are presented in the table below.

**Table 2. Basic boundary technical parameters of wind turbines according to the option selected for implementation**

Parameter	Option selected for implementation
Maximum total height of the wind turbine a.s.l. [m]	300 m
Minimum clearance between the lower position of the wing and the sea surface (defined as the mean sea level) [m]	20 m
Maximum rotor diameter [m]	250 m
Maximum zone for a single rotor [m <sup>2</sup> ]	49,087 m <sup>2</sup>

One or more wind turbine models can be installed on the farm.

**The arrangement of wind turbines is not known yet.** The specific locations will be determined after the seabed geotechnical surveys and wind speed measurements to be carried out at the building permit design stage. Nevertheless, it was decided to reduce the number of wind turbines and their area, while maintaining the maximum power output of the farm by using turbines with a higher unit capacity, which requires a certain increase in their structure. This resulted in the most environmentally-friendly option. It assumes the construction of up to 120 wind turbines with a maximum rotor diameter of up to 250 m, scattered over an area of approx. 77–78 km<sup>2</sup>. Approximately 16.59 km<sup>2</sup> of the farm area, located in the immediate vicinity of the Słupsk Bank Natura 2000 area, has been excluded from the wind farm construction plans (the remaining components of the farm infrastructure – offshore substations, cables, etc. – will be allowed in this area).

The wind turbine towers will be constructed of steel, concrete or reinforced concrete rings, joined together. The basic structural material of the wings will be plastics (fiberglass).

The wind turbine towers will be mounted on foundations which, in turn, will be placed on the seabed. Currently, it is possible to use 4 types of foundations: monopiles, gravity foundations, jacket type foundations (truss foundations) and tripod type foundations (tripods). The towers will be connected to the foundation with a steel sleeve, known as the "transition piece", protruding approx. 10 m above the water surface and reaching approx. 10 m below the water surface.

**Steel monopile** is made of steel, welded cylinders. A monopile usually protrudes 5 to 12.5 m above the sea level (defined as the mean sea level) and is connected to the tower with a *transition piece* of varying length, mounted outside the monopile (the most common solution) or inside it. At the connector, there are also additional elements, such as the place of anchoring of service vessels, ladders, intermediate platform, working platform, as well as elements of power infrastructure (flexible cable shields, so-called *J-tubes* and power and telecommunication cables). Monopiles are up to 120 m long. They are currently the most popular type of foundations used at the OWF. Reinforced concrete monopiles have also appeared on the market.

**Jacket foundation** is made of four steel legs connected and reinforced by brackets made

of cross-mounted pipes. In its upper part, there is a connector (transition piece), which enables the connection of the foundation with the wind turbine tower. These foundations are usually fixed to the sea bottom using 4 piles with a diameter of 1.8–3 m and a length of up to 70 m. In the above-surface part of the jacket type foundation, there are also additional elements such as the place of anchoring of service vessels, ladder, intermediate platform, working platform as well as elements of power infrastructure (*J-tubes*, cables).

The structure of the **tripod foundation** consists of 3 legs supporting one central leg which forms the basis for the connector and the tower. The tripod legs are equipped with sleeves for pile fixing. In the bottom part of each leg of the foundation, there are also special mats (*mud mats*) to keep the structure in the right position on the sea bed and prevent the structure from settling before it is fixed to the sea bed with 3 piles with a diameter of up to 2.5 m and a length of up to 60. There are also additional elements on the foundation, such as *J-tubes*, places of anchoring of boats, transition platform, ladder, etc.

**Gravity-base foundation** is a structure made of reinforced concrete. It consists of a main body and a base. The base can be conical or flat (in the shape of an octagon, hexagon, circle, etc.) and it will have a maximum diameter of 50 m. The gravitational foundation is filled with ballast. During its installation, cement mortar is injected below the base of the foundation in order to ensure constant contact between the foundation and the bearing surface.

For all types of foundations (particularly gravity-base and monopiles, less frequently for other foundations), a protective layer against scouring can be applied. It is usually a layer of stones with a width of a few to several meters, laid around the foundation.

Wind turbines will be connected by means of a grid of 33 kV or 66 kV power cables to the substations. It is planned to lay up to 200 km of cables inside the farm. Their length will depend on the number of turbines and their layout inside the farm. The cables will be buried in the seabed up to a depth of 3 m. If the technical conditions do not allow for them to be buried, they will be covered with a layer of stones or other specially adapted loads.

Electricity generated by the wind turbines belonging to the Polenergia Bałtyk II OWF will be prepared on the farm for further transmission. For this purpose, a maximum of 6 **internal offshore substations ("OS")** will be built within the boundaries of the farm. Construction of substations allows for the reduction of the number of export cables carrying electricity from the wind farm to the land, and significantly reduces transmission losses.

The following types of the OS can be built within the framework of the Polenergia Bałtyk II OWF:

1. transformer - receiving *alternate current* (AC) from wind turbines and then converting its voltage (33 or 66 kV) to a correspondingly higher level, enabling its further transmission in the alternating current technology;
2. converter (AC/DC) - converting alternating current (AC) into *direct current* (DC), enabling its further transmission in the direct current technology;
3. combining both functions.

At the present stage of the project, no decision has yet been taken on whether to transmit electricity to the shore in the direct current or alternating current technology.

All internal OS will be located within the borders of the Polenergia Bałtyk II OWF. At the present stage of the project, their exact location are unknown.

**Infrastructure for the transmission of electricity to the land** (i.e. offshore and onshore export cables, onshore substation and possible additional OSs) will form a separate, independent project to construct the offshore transmission infrastructure ("OTI"), subject to a separate

environmental impact assessment procedure.

**AC offshore transformer station** will be built on a platform based on monopile, jacket, tripod or gravity-base foundations. The necessary power and staff welfare infrastructure will be installed on the working platform. A typical power output of the station is 150 to 350 MW. Typical parameters of the station with the above-mentioned power are 30 x 30 m, 15–20 m in height, and weight of 1000–1500 Mg.

Typical OS AC equipment consists of the following components: an indoor switchgear, power transformers, MV and HV switchgears, reactive power compensation reactors and capacitors, transformers or power generators to provide backup power, earthing system, control panel of internal systems, low-voltage distribution equipment for auxiliary equipment and protection, control and instrumentation systems, UPS uninterruptible power supply, SCADA equipment, service staff accommodation, rest and welfare rooms, material storage, workshop, boat landing, helideck, occupational health and safety as well as emergency equipment including Diesel generators, emergency lighting, lifeboats. The substation can also be used as a place for installation of equipment for environmental measurements and monitoring, e.g. meteorological data or wave information.

**Offshore AC/DC converter station** will be built as an additional station, in addition to the transformer stations described above, if the Investor decides to use DC transmission technology. The station can be constructed as a separate facility or as an additional element of an AC station. The AC/DC converter station will be built on the basis of a platform based on monopile, jacket, tripod or gravity-base foundations. The necessary power infrastructure, in particular equipment for converting alternating current into direct current, will be installed on the working platform. The main components of the converter station include: converter transformers, converter thyristors, harmonic filters, capacitor batteries, reactive power compensation reactors, and a cooling system. A typical transmission capacity of the station is 600 to 900 MW. The working platform will be 70–100 m long, 40–60 m wide and up to 40 m high.

Implementation of the Polenergia Bałtyk II OWF project is planned in stages, which results primarily from the connection agreement concluded by the Investor and enabling the connection of 600 MW to the National Power System by 2025 in the area of the Polenergia Bałtyk II OWF. However, after 2025 it is possible to obtain additional connection capacity and extension of the Polenergia Bałtyk II OWF. However, it depends on the wind measurement campaign, geotechnical surveys of the seabed, and obtaining the project financing.

Construction of the first stage of the Polenergia Bałtyk II OWF is planned for the years 2023–2026, whereas the second stage – after the investor has obtained additional connection capacity. As the offshore wind energy industry is developing very dynamically, and new models of wind turbines and other equipment appear every year, so the project may use models of turbines that are not currently available on the market. For the above reasons, the environmental impact assessment was carried out on the basis of the envelope of technical parameters, which defined the most far-reaching scenarios of environmental impacts of particular technological solutions. Also, the final technical parameters of every individual piece of equipment cannot be specified at this stage of issuing the decision on environmental conditions, but only upon issuing the building permit. However, the authority responsible for issuing the building permit shall be bound by the provisions of this decision on environmental conditions.

Regional Director for  
Environmental Protection in  
Gdańsk

*Danuta Makowska*