JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
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CONTENTS

A. General description of the project

B. Baseline

C. Duration of the project / crediting period

D. Monitoring plan

E. Estimation of greenhouse gas emission reductions

F. Environmental impacts

G. Stakeholders' comments

Annexes

Annex 1: Contact information on project participants

Annex 2: Baseline information

Annex 3: Monitoring plan

Annex 4: Additionality information

SECTION A. General description of the project

A.1. Title of the project:

"Wind Park Novoazovskiy in Ukraine"

The sectoral scope: (1) Energy industries (renewable/non-renewable sources)

The version number of the document: 2.1

The date of the document: 29th of September 2011.

A.2. Description of the project:

Proposed project is the construction and operation of the modern wind power park in the Donetsk region of Ukraine. This wind power park will be utilising modern wind turbines with not less than 2.5 MW capacity. The plans exist to install at least 43 such turbines at the project site.

In Ukraine, thermal power plants (coal, oil, natural gas,) account for nearly 46% of total electricity production, with nuclear power generating another 48%, while other sources (mainly hydroelectric power plants) make up the remaining 6.0%. The total installed generation capacity is 53.1 GW[1], which is more than enough to satisfy the current demand for electricity, albeit the thermal capacity is old and outdated (around 40 years in operation, on average).

In present the base load of Ukrainian electricity grid is provided by the nuclear power plants. Nuclear plants account for the largest share in electricity generation with 48% of the total electricity production of around 185 TWh in 2008[2]. The following major power generation companies exist in Ukraine at present:

- 5 thermal power generation companies – Centrenergo, Donbasenergo, Dniproenergo, Skhidenergo and Zahidenergo comprising 14 powerful thermal power plants with total installed capacity of 27.3 GW;
- 4 nuclear power plants with total installed capacity of 13.8 GW united in the State Enterprise Energoatom;
- 2 hydro power generation companies - Ukrhydroenergo and Dniester HPSP[3] comprising cascades of hydro power plants at Dnieper and Dniester rivers with total installed capacity of 4.6 GW.

Besides there is a number of combined heat & power plants (CHPs). Some of them are being operated by local power distribution companies and other institutions while others became separate enterprises. In addition, small electricity producers (small hydro and wind power plants) operate in Ukraine, but their share of total electricity production is insignificant.

The Ukrainian electricity system is characterized by a large overcapacity mainly in the thermal power plants sector. Expansion plans for generation in Ukraine are based on new nuclear power plants which are part of the low-cost/must-run plants.

First steps into the modern technologies in the field of environmentally friendly electricity production were made in Ukraine in 1997 with implementation of "Comprehensive Programme to build Wind Parks to 2010" adopted by the Ukrainian Government. As of now the outcome of this Program is represented by 89 MW of installed capacity in Ukraine as of beginning of 2008. In February 2006, the Government approved a fixed annual budget of about 13 million Euro. Due to a lack of sufficient funding the goal of this Program – which is 1900 MW of installed capacity by 2010 – is severely and irrevocably delayed. In

[1] http://www.ukrenergo.energy.gov.ua/ukrenergo/control/uk/publish/article?art_id=87570&cat_id=35061

[2] www.ebrd.com/downloads/sector/eecc/Ukraine_English.pdf

[3] Hydro power storage plant

2007 the Control and Auditing Service of Ukraine performed a review of this Programme and found it inefficient and failing to achieve any of the identified targets[4].

In the **baseline scenario** it is assumed that the common practice will continue and the most of electricity consumption of Ukraine shall be supplied from the existing generation power plants on the grid. This assumption is supported by the fact that the large overcapacity makes investment into new generation sources unattractive. The introduction of the "green tariff" for electricity produced from renewable sources has attracted investors into this sector of economy. A few utility-scale WPP[5] projects were started in Ukraine.

The project is aimed at construction and operation of the new WPP with a total installed capacity of not less than 107.5 MW in Donetsk Region of Ukraine by the company LLC "Wind Park Novoazovskiy". The development anticipates the installation of 43 advanced wind turbines (with rated capacity of 2.5 MW) depending on the selected manufacturer and wind turbine type, construction of access roads and maintenance base as well as the construction of electricity infrastructure (WPP substation, cable lines, overhead transmission lines).

The project site in Donetsk Region of Ukraine is considered promising for wind energy generation due to favorable wind conditions, nearby interconnection infrastructure and limited environmental impact. Territories that are important for residential purposes, industry and agriculture are located at a sufficient distance to avoid any disturbances from noise and visual influence.

The purpose of the project is to generate environmentally sound electricity with "zero" GHG emissions. The project will also support the Ukrainian Government's objectives of:

- Facilitating and encouraging the development of new renewable energy sources with one of the key renewable technologies – wind.
- Reducing reliance of electricity and fossil fuel imports and developing indigenous power resources which will have added economic benefits.

Therefore, in the **project scenario** the electricity produced on this WPP will partly substitute the electricity from the Ukrainian electricity grid, decreasing respective carbon emissions from fossil fuel combustion on thermal power plants.

The technological process is environmentally sound and does not require the use of hazardous materials.

Brief summary of project history including its JI component

The process of applying for all necessary permits to build, operate and maintain the wind power plant has been initiated by LLC "Wind Park Novoazovskiy" in 2010. Preparation of the business plan has also commenced at that time taking into account Joint Implementation (JI) mechanism as a source of additional project cash-flow. The National Energy Regulatory Commission of Ukraine has granted LLC "Wind Park Novoazovskiy" the electricity production license on the 24th of March 2011.

A.3. Project participants:

[4] http://www.ac-rada.gov.ua/control/main/uk/publish/article/934671;jsessionid=68576180BA5028F2BE9205AD224CE19E

[5] Wind Power Park

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ukraine (Host Party)	• LLC "Wind Park Novoazovskiy"	No
Netherlands	• Global Carbon B.V.	No

A.4. Technical description of the project:

A.4.1. Location of the project:

The project site of the LLC "Wind Park Novoazovskiy".

A.4.1.1. Host Party(ies):

Ukraine

A.4.1.2. Region/State/Province etc.:

Donetsk Region.

A.4.1.3. City/Town/Community etc.:

Village of Bezimenne of the Donetsk Region of Ukraine.

A.4.1.4. Detail of physical location, including information allowing the unique identification of the project (maximum one page):

Figure 1 Location of the project site

Figure 2 Layout of wind farm

The wind farm construction site is located near the village of Bezimenne of the Donetsk Region of Ukraine. The village of Bezimenne is the nearest settlement to the proposed wind farm. Population is 2 638 people. The distance to the city of Novoazovsk is 14 km, and to the city of Mariupol is 32 km. The distance to the region's main city Donetsk is 98.7 km.

Geographical coordinates of the project site are:

47° 8'22.72"N

37°54'22.23"E.

A.4.2. Technology(ies) to be employed, or measures, operations or actions to be implemented by the project:

In the year of 2010 wind energy has continued the worldwide success story as the most dynamically growing energy sources demonstrating the rate of 23.6%. In 2010 it reached 196 630 MW installed capacity, the turnover of the wind sector worldwide reached 40 billion Euro. Based on accelerated development and further improved policies World Wind Energy Association "sees a global capacity of 600 000 Megawatt as possible by the year 2015 and more than 1 500 000 Megawatt by the year 2020."[6]

Unfortunately, Ukraine's input in this progress was not very noticeable. "Comprehensive Programme to build Wind Parks to 2010", adopted by the Ukrainian Government in 1997, has resulted only in 89 MW being installed in Ukraine as of beginning of 2008. Also one should mention that WTs[7] installed in Ukraine are quite old from technological point of view – WTs of 107,5 kW and 600 kW capacity produced by "WindEnergo" Ltd. These machines turned out to be insufficient for the Ukrainian wind conditions, showing WT capacity factor lower than those of the modern WTs.

Capacity of modern WTs ranges between 1.5 to 3 MW. Moreover, there are some pilot WTs of 5-6 MW capacity for offshore wind farms that are under testing and approvals. International wind experts consider WTs of 2–3 MW capacity to remain the most popular and of high demand at least for a couple of years. It is unlikely that technology will be replaced by other or more efficient technologies within the project period.

The technical purpose of the project is to install and operate appropriate amount of wind turbines and supportive infrastructure to serve as a single WPP with at least 107.5 MW installed capacity. The project will utilize advanced wind turbines of 2.5 MW capacity produced by the German wind turbine manufacturer Fuhrländer AG. This technology will not be changed during the project period.

Final choice of WTs considers option of Fuhrländer FL 2500-100 2.5 MW wind turbine. Considered manufacturer – Fuhrländer is the well-known technology provider in wind turbine manufacturing, installation and operation.

Technical data of WT

The advanced 2.5 MW turbine FL 2500 with variable speeds is reliable, modern and easy to maintain: due to the possible rotor diameters of 80, 90 and 100 m, it can cater to all locations and wind conditions in the best way possible. Tubular towers of 65, 85 and 100 m as well as lattice towers of up to 160 m form the prerequisite for a very economic efficient and reliable production of wind power. As a reward for the high hub heights, inland locations like woodland can be utilized even more.

FL 2500 meets the latest grid connection requirements and is therefore compatible with international power grids. The unique drive unit concept with its large rotor bearing, the shaft coupling and the compact gearbox provides for even more safety and longer service life. That is also valid for the specially designed hub with its enclosed service area. With its service crane concept the FL 2500 facilitates the replacement of all main components without the need for an expensive mobile crane – greatly reducing the time and expense of repairs.

Fuhrländer FL 2500-100 2.5 MW

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[6] http://www.wwindea.org/home/images/stories/pdfs/worldwindenergyreport2010_s.pdf

[7] Wind Turbine

Rated power	2500 kW
Rotor	
Rotor diameter	100 m
Number of rotor blades	3
Swept area	7854 m^2
Tower	
Hub height	100 m
Operating data	
Cut-in speed	3.5-4 m/s
Rated power speed	12-13 m/s
Cut-out speed	25 m/s
Generator	
Type	Dubble fed asynchronous with slip-ring rotors
Nominal output	2500 kW
Frequency	60 Hz
Control	
Speed regulation	electronic pitch system

The rotor bearing is a triple row roller bearing optimally designed for the prevailing load conditions. The shaft coupling to the flange ring of the gearbox is provided by 24 elastomer elements. It provides good structure-borne noise isolation while also absorbing drive train impacts. In endurance tests the elastic elements have reached a twelvefold service life without incurring any damage. If necessary, they can be very easily replaced.

The FL 2500‘s unique drive train concept has many objectives: It allows for a smaller and quieter system. Instead of a heavy main shaft, a new hardened slip less rotor bearing is used between rotor hub and machine carrier. Cross and thrust forces of the rotor are directly transferred over the strengthened machine carrier to the tower and do not load the gearbox bearing. This positively affects the service life of the gearbox. Rotor torque is transferred over a shaft coupling (weighing about 1.9 tons) to the gearbox.

The complete 360° bolting of the gearbox to the machine carrier provides optimal torque support at its center of gravity. This torsional resistant design minimizes the misalignment of the gearbox under extreme loads, such as strong gusts of wind. The reaction forces on the generator coupling and bearing are also reduced. This also allows service personnel to access the hub without leaving the turbine house – the turbine house and hub form a single air-conditioned service room.

The pitch system of the FL 2500 uses an intelligent control method to reduce the typical peak load-producing windward-tipping of the tower head that occurs during quick, positive blade adjustment processes. The process also reduces the stress produced during braking procedures and during reaction to gusts. The “Pitch Logic Unit” (PLU) located in the hub allows early detection of overspeed situations as well as avoiding high turbine thrusts. All pitch functions are combined in the PLU. Adaptation to different bus systems is possible. A few simple interfaces lead to robust standard industrial units. Capacitors guarantee a highly available, durable and maintenance-free backup over a wide range of temperatures. In contrast to standard systems brake choppers or connecting units are required. The very good energy weight ratio permits high safety and availability in the event of power failure.

The FL 2500 offers a new type of safety system that already meets the requirements of the European Machine Directive and Germanischer Lloyd (GL) specifications. For the first time the safety concept was designed on the basis of a risk analysis in order to increase the safety of both personnel and system. The design meets category 3 of the European Machine Directive. The safety system reacts selectively to equipment and signal triggering such as emergency off, vibration switch, performance and speed limit relays, overload protection, switched wiring, pitch system and operational defects, transformer and fire protection. An event-driven, differentiated triggering at the actuator level reduces the stresses and torques of extreme loads, which results in significantly lower mechanical wear of assemblies such as brakes and gearbox. This provides a longer service life as well as cost savings.

The FL 2500 is equipped with a sophisticated Condition Monitoring System. The acceleration values of the components are recorded and evaluated by means of broadband audible sensors on the rotor bearing, gearbox and generator. This provides for comprehensive system monitoring.

The data above show that WT proposed for the project reflects state of the art technology; its technical and operating characteristics are much better comparing to the commonly used wind technologies in Ukraine.

The internal electricity network will use 35 kV cable connections. Energy is delivered into the 110 kV grid via the transformer substation. Automated electronic alarm and monitoring system will be used to control and operate the wind farm with information delivery to the wind farm control station. There are also plans to build a repair base in the wind farm.

The domestically available workforce is in general well trained and the necessary civil, mechanical and electrical engineering knowledge and skills needed are domestically or locally available. The project doesn't require extensive initial training and maintenance efforts in order to work as presumed during the project period. Wind turbine producer will provide operational training for the owner of the wind farm. They will also provide full service and maintenance for the operating period of the wind park. Operational risks will be reduced by the establishment of a permanently employed maintenance crew to perform any tasks according to the manufactures specifications. Due to the project size it is likely that the wind power plant maintenance sector will become a sustainable industry sector. A maintenance base will be set up in the vicinity of the site and local staff employed and suitably trained.

There is no inherent risk to humans or the environment connected to the technology employed and wind turbine design related risks will be assessed and appropriate action taken.

Indicatory project development schedule is the following:

#	Project Development Stage	Period
1	Receiving License for electricity generation	March 2011
2	Start of operation for 6 wind turbines	April 2011
3	Start of operation for 4 wind turbines	April 2011
4	Start of operation for 13 wind turbines	December 2011
5	Start of operation for 10 wind turbines	January 2013
6	Start of operation for 10 wind turbines	January 2014

Based on the fact that it will be the first large scale (over 100 MW) and privately owned wind power plant in Ukraine using advanced modern wind technology (2.5 MW WTs), the project is a pioneer one therefore it is of special importance to set a positive precedent for future similar project developments, both from the point of view of the state of Ukraine and foreign investors. Hence, the modalities and relations need to be carefully crafted, clear and transparent, in order to encourage future developments.

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

The anthropogenic greenhouse gas emission reductions will be generated by this project due to the fact that greenhouse gas emissions that will occur in the absence of the proposed project, i.e. in the baseline scenario are higher than greenhouse gas emissions associated with the project scenario.

The **baseline scenario** for this project assumes that electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. The project boundary includes the project power plant and all power plants connected physically to the electricity system that the JI project power plant is connected to and is in fact the Ukrainian electricity grid. Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. Please, refer to section B of this PDD for details on baseline setting.

In the **project scenario**, electricity is produced by the grid-connected wind power plant. Electricity produced by the wind power plant is considered to cause no emissions of greenhouse gases.

Emission reductions, therefore, are generated by the project through the displacement of grid electricity that is associated with the CO2 emissions in fossil fuel fired power plants by the greenhouse gas emissions-free electricity generated by the wind power plant.

The project scenario is not likely to occur in the business-as-usual practice as the investment into the construction of a large scale industrial wind power plant in Ukraine cannot be supported by the electricity tariffs and general investment climate. Such project also faces prohibitive barriers. Please, refer to section B.2. of this PDD for details.

A.4.3.1. Estimated amount of emission reductions over the crediting period:

Table 1 Estimated amount of emission reductions during the part of the crediting period within the first commitment period

	Years
Length of the crediting period	2
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
Year 2011	72 243
Year 2012	185 204
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	257 447
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	147 113

Table 2 Estimated amount of emission reductions for the part of the crediting period after the end of first commitment period

	Years
Period after 2012, for which emission reductions are estimated	26
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
Year 2013	267 878
Year 2014	345 495
Year 2015	345 495
Year 2016	345 495
Year 2017	345 495
Year 2018	345 495
Year 2019	345 495
Year 2020	345 495
Year 2021	345 495
Year 2022	345 495
Year 2023	345 495

Year 2024	345 495
Year 2025	345 495
Year 2026	345 495
Year 2027	345 495
Year 2028	345 495
Year 2029	345 495
Year 2030	345 495
Year 2031	345 495
Year 2032	345 495
Year 2033	345 495
Year 2034	345 495
Year 2035	345 495
Year 2036	160 291
Year 2037	160 291
Year 2038	77 617
Total estimated emission reductions over the period indicated (tonnes of CO_2 equivalent)	8 266 967
Annual average of estimated emission reductions over the period indicated (tonnes of CO_2 equivalent)	314 932

A.5. Project approval by the Parties involved:

The project has been officially presented for endorsement to the Ukrainian authorities. Letter of Endorsement for the project #1709/23/7 from 30.06.2011 has been issued by the State Environmental Investment Agency of Ukraine.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

A baseline for the JI project has to be set in accordance with Appendix B to decision 9/CMP.1 (JI guidelines)[8], and with further guidance on baseline setting and monitoring developed by the Joint Implementation Supervisory Committee (JISC). In accordance with the Guidance on Criteria for Baseline Setting and Monitoring (version 2)[9] (hereinafter referred to as Guidance), the baseline for a JI project is the scenario that reasonably represents the anthropogenic emissions by sources or anthropogenic removals by sinks of GHGs that would **occur in the absence of the proposed project**. In accordance with the Paragraph 9 of the Guidance the project participants may select either: an approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI specific approach); or a methodology for baseline setting and monitoring approved by the Executive Board of the clean development mechanism (CDM), including methodologies for small-scale project activities, as appropriate, in accordance with paragraph 4(a) of decision 10/CMP.1, as well as methodologies for afforestation/reforestation project activities. Paragraph 11 of the Guidance allows project participants that select a JI specific approach to use selected elements or combinations of approved CDM baseline and monitoring methodologies or approved CDM methodological tools, as appropriate.

Description and justification of the baseline chosen is provided below in accordance with the "Guidelines for users of the Joint Implementation Project Design Document Form", version 04[10], using the following step-wise approach:

Step 1. Indication and description of the approach chosen regarding baseline setting

Project participants have chosen the following approach regarding baseline setting, defined in the Guidance (Paragraph 9):

- An approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI specific approach).

The Guidance applies to this project as the above indicated approach is selected as mentioned in the Paragraph 12 of the Guidance. The detailed theoretical description of the baseline in a complete and transparent manner, as well as a justification in accordance with Paragraph 23 through 29 of the Guidance should be provided by the project participants.

The project participants decided to use to the extent possible within this JI specific approach elements of the approved CDM baseline and monitoring methodology "Approved consolidated baseline and monitoring methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" Version 12.1.0"[11] which is the latest version at the time of setting the baseline for this project. Project participants used all the elements of this methodology in order to establish the baseline, demonstrate additionality and establish the monitoring plan for this project except for the use of "Tool to calculate the emission factor for an electricity system"[12]. The emission factor for Ukrainian electricity grid has been selected based on the analysis of available carbon emission factors studies for Ukraine.

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[8] http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=2

[9] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

[10] http://ji.unfccc.int/Ref/Documents/Guidelines.pdf

[11] http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L Hereinafter referred to as "ACM0002"

[12] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.1.0.pdf

The use of the elements of the ACM0002 methodology is justified through the assessment of the methodology's applicability criteria presented in the table below:

Table 3 Applicability criteria of the ACM0002

Applicability criteria of the ACM0002	***Application in the context of the project***
This methodology is applicable to grid-connected renewable power generation project activities that: (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); (d) involve a replacement of (an) existing plant(s).	The project will be realized close to the site of existing wind power park that utilizes outdated equipment. The proposed wind park will not replace the existing wind park directly and it will remain in operation. In the context of this applicability condition, this project can be seen as a "greenfield" project (option a).
The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: - hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), - wind power plant/unit, - geothermal power plant/unit, - solar power plant/unit, - wave power plant/unit or tidal power plant/unit	The project activity is the installation of the wind power plant.
In the case of capacity additions, retrofits or replacements: the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity	The project activity is the installation of the new wind power plant.
In case of hydro power plants, one of the following conditions must apply: - The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or - The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions	The project activity is the installation of the new wind power plant.

section, is greater than 4 W/m^2; or - The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	
The methodology is not applicable to the following: - Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; - Biomass fired power plants; - Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m2.	The project activity is the installation of the new wind power plant.
In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance"	The project activity is the installation of the new wind power plant.

Consideration of the project activity impact on the existing Novoazovskaya Wind Power Plant

The proposed project activity is located very close to the site of the existing Novoazovskaya Wind Power Plant. The existing Novoazovskaya Wind Power Plant is located near the village of Bezimenne of the Donetsk Region on the Azov Sea coast. Its operation started in 1998. This wind power plant has been constructed as part of the state development program "Comprehensive Programme to build Wind Parks to 2010" which was adopted in 1997. Public financing was used to build the wind park according to this programme[13]. However, the existing wind park has been constructed using technically obsolete equipment that does not provide necessary performance parameters. Currently, the wind farm has 186 USW 56-100 wind turbines (produced by WindEnergo LTD under "WindPower" license) with a nominal capacity of 107.5 kW, and 3 T 600-48 wind turbines (produced by Belgian company TurboWinds) with nominal capacity of 22 MW. Average capacity utilization factor has remained low – being not more than 5%[14]. As the public financing for the wind parks construction is not available after 2010 the existing wind park will not be retrofitted or replaced by the new equipment. The proposed project activity will not interfere with the existing equipment and does not require dismantling or replacement of such. Electricity produced by the project activity will be metered separately from the electricity produced by the existing power plant. Therefore, the proposed project can be seen as a "greenfield" development.

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[13] http://www.ac-rada.gov.ua/control/main/uk/publish/article/934671;jsessionid=68576180BA5028F2BE9205AD224CE19E

[14] http://dt.ua/articles/28149

The conclusion from the table above is that elements of the ACM0002 methodology can be used in order to identify and describe the baseline.

Detailed theoretical description of the baseline methodology in a complete and transparent manner can be found at http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L .

According to the ACM0002 if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system"[15].

Justification of the baseline chosen in accordance with the Guidance is provided below:

1) The baseline covers **emissions from all gases, sectors and source categories** listed in Annex A and anthropogenic removals by sinks, within the project boundary and is established in accordance with the Appendix B of the JI guidelines. Section B.3 of this PDD provides information on the coverage of emissions within the project boundary by the baseline of this project.
2) The baseline is established using **multi-project emission factor.** The emission factor selected to describe the baseline of this project is based on analysis of the available baseline carbon emission factor studies for the Ukrainian electricity grid.
3) The baseline is **established in a transparent manner with regard to the choice of approaches, assumptions, methodologies, parameters, data sources and key factors.** The project participants use elements of the approved CDM baseline and monitoring methodology ACM0002 to establish the baseline. All assumptions, parameters, data sources and key factors are referenced by the reputable sources.
4) The baseline is established **taking into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector**. Key factors have been assessed and their impact is summarized below:
    a. *Sectoral reform policies and legislation*. On the 28th of September, 2008, the Ukrainian parliament passed laws[16] introducing "green tariff" in Ukraine. "Green tariff" was defined as a special tariff at which electricity produced from the alternative sources of energy must be purchased. This tariff exceeded several times the purchase price for electricity produced from traditional sources of energy. The introduced legislation, however, was vague and lacked the practical mechanisms for implementation. The suggested level of "green tariff" also did not allow for the reasonable return on possible investment. Therefore, on April, 1, 2009 the changes in the "green tariff" legislation were adopted[17]. The changes introduced state guarantees by 2030 for power plants utilizing the "green tariff" and mandatory adjustment of the "green tariff" as a result of the fluctuation of the Euro exchange rate. Also it was prohibited to deny the access to transmission and distribution grid for "green electricity producers". The changes also fixed the amounts of minimal "green tariff" for electricity produced from certain types of alternative energy which varies depending on the source of energy, power capacity of

[15] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.0.pdf

[16] Law of Ukraine On Changes To Some Laws of Ukraine About The Introduction of "Green" Tariff http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=601-17

[17] Law of Ukraine On Changes To The Law of Ukraine On Electric Energy About The Incentives To Use Alternative Energy Sources http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1220-17

equipment and other factors. However, certain key regulations which shall govern the following issues of green tariff projects implementation are still missing:

i. the procedure of the access of electricity generating plants to the grid;
ii. the compensation of expenses incurred during construction, reconstruction, and grid modernization to get the access to the grid;
iii. the procedure on conclusion of electricity purchase contract with the respective state company other practical aspects for project implementation.

The Energy Strategy of Ukraine for the period until 2030[18] does not emphasize the expansion of alternative energy and wind energy use in particular as the key growth and development area. The increasing demand for electric energy will be met by the commissioning of new and capacity improvements on the existing nuclear and thermal power plants mostly according to this document.

b. *Economic situation/growth and socio-demographic factors in the relevant sector as well as resulting predicted demand.* Demand for electric energy in Ukraine is expected to grow significantly according to the Energy Strategy of Ukraine for the period until 2030[19]. However, main investments required to meet this demand will be channeled into the upgrades of transmission lines and rehabilitation of the thermal power plants and nuclear power plants.

c. *Availability of capital (including investment barriers)*. Ukraine has been always considered a high-risk country for investments and doing business. Table below summarizes key indicators of business practices in Ukraine.

Table 4 International ratings of Ukraine[20]

Indicators	2006	2007	2008	2009	Note
Corruption index of Transparency International	99 position from 163	118 position from 180	134 position from 180	-	Index of corruption
Rating of business practices of The World Bank (The Doing Business)	124 position from 155	118 position from 179	139 position from 178	145 position from 181	Rating of conduct of business (ease of company opening, licensing, staff employment, registration of ownership, receipt of credit, defense of interests of investors)
The IMD World Competitiveness Yearbook	46 position from 55	46 position from 55	54 position from 55	56 position from 57	Research of competitiveness (state of economy, efficiency of government, business efficiency and state of infrastructure)
Index of Economic Freedom of Heritage Foundation	99 position from 157	125 position from 161	133 position from 157	152 position from 179	Determination of degrees of freedom of economy (business, auction, financial, monetary, investment, financial, labor freedom, freedom from Government, from a corruption, protection of ownership rights)
Global Competitiveness Index of World Economic Forum	69 position from 125	73 position from 131	72 position from 134	-	Competitiveness (quality of institutes, infrastructure, macroeconomic stability, education, development of

[18] http://mpe.kmu.gov.ua/fuel/control/uk/doccatalog/list?currDir=50505

[19] http://mpe.kmu.gov.ua/fuel/control/uk/doccatalog/list?currDir=50505

[20] Data by the State Agency of Ukraine for Investments and Innovations, 2010

					financial market, technological level, innovative potential)

Risks of doing business in Ukraine significantly impact the availability of capital in the country. Commercial loan rates in Euro in Ukraine for the period of over 5 years fluctuated in March – October 2010 between 8% and 10.4% according to the official statistics of the National Bank of Ukraine[21]. For the reference similar rates in Germany for this period fluctuated between 2.3% to 3.6% according to the European Central Bank[22]. Cost of debt financing in Ukraine is at least twice as high than in the Eurozone. The risks of investing into Ukraine are additionally confirmed by the country ratings provided by the Moody's international rating agency and the associated country risk premium. The table below compares country risk premiums for Russia and Ukraine[23]:

Total Risk Premium, %	**2008**	**2009**	**2010**
Russia	6.52	8	6.9
Ukraine	10.04	14.75	12.75

As it is demonstrated by this table, Russia, while offering a comparable set of investment opportunities, is a significantly less risky country for investing in than Ukraine.High interest rates and shortness of the resources of financial institutions make it hard to finance any big infrastructure projects. Such projects are looking upon direct public financing or partnerships between private investors, international financial organizations and government. Large scale privately financed infrastructure projects in Ukraine are hard to come by.

d. *Local availability of technologies/techniques, skills and know-how and availability of best available technologies/techniques in the future*. The proposed wind turbine generators of 2.5 MW scale have never before been installed in Ukraine. Most of the country's installed wind power is based on the 107.5 kW an 600 kW wind turbines that were produced locally under licenses from American and European manufacturers. Local production covered the needs of the governmental wind power development program that directly financed construction of the wind parks in Ukraine. Production of the larger single capacity wind turbines was attempted but never got out of the conceptual planning phase. However, Ukraine has significant industrial potential for the production of conventional thermal power technologies and nuclear power technologies. General electric networks technologies, transformer production, cabling manufacturing is present in the country.
e. *Fuel prices and availability*. In terms of fuel, Ukraine's primary energy consumption pattern has been historically dominated by natural gas 41% (39% in 2005) compared with the average of 21% for other world economies; Ukraine's average oil consumption has made up 19%, coal - 19%, uranium - 17%, and the consumption of hydro- and other renewable energy sources has totaled 4%. Over the period from 2000 to 2005, the energy dependence of Ukraine on imports of organic fuels, including conventionally primary nuclear fuel, was 60.7% compared with an average of 51% for the EU countries[24]. Only supply of coal is not dependent on foreign sources, all other fuels are mostly imported.

[21] Statistical Release. Interest Rates. March 2011
http://www.bank.gov.ua/control/uk/publish/category?cat_id=84961

[22] Germany, Harmonised long-term interest rates for convergence assessment purposes
http://www.ecb.europa.eu/stats/money/long/html/index.en.html

[23] Data from Aswath Damodaran, Ph.D., Stern School of Business NYU http://pages.stern.nyu.edu/~adamodar/

[24] The Energy Strategy of Ukraine for the period until 2030
http://mpe.kmu.gov.ua/fuel/control/uk/doccatalog/list?currDir=50505

Prices are on the international level for oil and oil products and in the recent year the price of the natural gas imported from Russia has been pushed to the level of average European prices. The price of coal in Ukraine is low and does not compensate production costs in most of the cases[25].

5) The baseline is established **in such a way that ERUs cannot be earned for decreases in activity levels outside the project activity or due to force majeure.** The project activity suggests that emission reductions will be earned only for the amount of electricity generated and delivered to the grid from the renewable source such as wind energy.
6) The baseline is established **taking account of uncertainties and using conservative assumptions**. The project participants followed all of the elements of the approved CDM baseline and monitoring methodology ACM0002 to establish the baseline. All data necessary to establish the baseline where taken from open and publicly available sources. The emission factor chosen to establish the baseline is calculated based on conservative assumptions:
    - The grid emission factor is calculated based on actual activity data of the thermal power plants, grid operator and electricity supply companies
    - Simple operating margin calculation method has been used for emission factor calculation;
    - The emissions of methane and nitrous oxide have not taken into consideration, which is in line with ACM0002. This is conservative.

Carbon emission factor for the Ukrainian electricity grid

The following studies on the baseline carbon emission factor for the Ukrainian electricity grid are available:

1) *Operational Guidelines for Project Design Documents of Joint Implementation Projects. Ministry of Economic Affairs of the Netherlands, May 2004*[26] *(ERUPT Baseline)*. The ERUPT baseline was based on the following main principles: based mainly on indirect data sources for electricity grids (i.e. IEA/OECD reports); inclusion of grid losses for reducing JI projects; an assumption that all fossil fuel power plants are operating on the margin and in the period of 2000-2030 all fossil fuel power plants will gradually switch to natural gas. The weak point of this approach is the fact that the date sources are not specific. For example, the Net Calorific Value (NCV) of coals was not determined on installation level but was taken from IPCC default values. Furthermore the IEA data included electricity data until 2002 only. ERUPT assumes that Ukraine would switch all its fossil-fuel plant from coal to natural gas. In Ukraine such an assumption is unrealistic as the tendency is currently in the opposite direction. This study is very conservative and is outdated. It has been used only for the most early of JI projects and generally is not accepted for verification of emission reductions.
2) *Standardized emission factors for the Ukrainian electricity grid, Version 5, 2007, Global Carbon B.V. (Global Carbon Baseline)*. This study has been developed for the specific purpose of the baseline setting in JI projects. It has been based on quite a few conservative assumptions such as fixing the grid emission factor when it has been actually expected to grow due to the tendency to switch from gas to coal; hydro power plants have been included in the operating margin. TUV SUD has conducted the assessment of the approach outlined in this study and has found it acceptable for the determination of carbon emission factor in JI projects. This emission factor has been used in a number of JI projects approved by Ukraine and whose determination has been deemed final and accepted by the JISC: project 0104 “Improvement of the Energy efficiency at

[25] According to the Report of the Ministry of Coal Industry of Ukraine the price of 1 ton of coal produced by the state enterprises in October 2009 was 442.3 UAH while production costs where 717.25 UAH. Informational and analytical report on the development of coal sector of Ukraine for January-October of 2009. http://www.mvp.gov.ua

[26] http://ji.unfccc.int/CallForInputs/BaselineSettingMonitoring/ERUPT/GuidVol1.doc

Energomashspetsstal (EMSS), Kramatorsk, Ukraine"[27], project 0035 "Utilization of Coal Mine Methane at the Coal Mine named after A.F. Zasyadko"[28];

3) *Development of the electricity carbon emission factors for Ukraine[29], 2010, Lahmeyer International, (EBRD Baseline)* A study to develop the electricity carbon emission factors for Ukraine was finalized in October 2010. The results of the study were based on a power system simulation model that was specifically developed to incorporate the expected changes in efficiency and carbon emissions on a year to year basis for the period of 2009 – 2020. TUV SUD, an accredited independent entity under the Joint Implementation Supervisory Committee (JISC) reviewed the study and the underlying model and confirmed their conformity with relevant UNFCCC methodology. This study has been based on a more recent set of data and balances conservativeness with reasonableness. It has not been used in JI projects whose determination has been deemed final by the JISC;
4) *Specific carbon emission factors for the production of electricity, National Environmental Investment Agency of Ukraine (NEIA), 2011, (DFP Baseline)*[30]. This methodology and the resulting carbon emission factor have been developed by the DFP of Ukraine for the application in JI projects. Carbon emission factors for the years 2008, 2009, 2010 and 2011 estimate are available[31]. It is established that actual ex-post emission factors will be calculated and published every year for the previous year before the 1st of March. Calculation is based on actual power plant data. Results of this study correlate closely with the results calculated according to the EBRD Baseline.

The most recent carbon emission factor for this project has been selected (DFP Baseline). This emission factor is accepted by the DFP and is based on actual power plant data. For ex-ante estimations in this project design document the most recent available carbon emission factor is used for the whole estimation period. Ex post emission factor will be used if available for the calculation of emission reductions. If such carbon emission factor is not available the most recent available factor will be used instead.

Step 2. Application of the approach chosen

Theoretical approach described above supports the use of ACM0002 to identify the baseline. As per this approach the baseline for the project activity in question is:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources.

The project participants will draw baseline emissions factor from the study of specific carbon emission factors for the production of electricity by the DFP of Ukraine as substantiated above.

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

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27 http://ji.unfccc.int/JI_Projects/DB/VY889VYDTR7YGFRYTY9TXLB4AWBLUR/Determination/Bureau%20Veritas%20Certification1246891334.73/viewDeterminationReport.html

28 http://ji.unfccc.int/JI_Projects/DB/DA22OPURGI092XUFLIK0INB5GIYEGA/Determination/TUEV-SUED1207051469.52/viewDeterminationReport.html

29 http://www.ebrd.com/downloads/sector/eecc/Ukraine_English.pdf

30 http://www.neia.gov.ua/nature/doccatalog/document?id=125381

31 http://neia.gov.ua/nature/control/uk/publish/category;jsessionid=FE36697EAC52DD187E792363BB3FDE46?cat_id=111922

$$BE_y = EG_{PJ,y} \times EF_{grid,produced,y},$$ (Equation 1)

Where:

BE_y - Baseline emissions in year *y* (tCO_2);

$EG_{PJ,y}$ - Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the JI project activity in year *y* (MWh);

$EF_{grid,produced,y}$ - Specific CO_2 emission factor for power generation at Ukrainian grid connected thermal power plants in year *y* (tCO_2/MWh).

Key information and data used to establish the baseline (variables, parameters, data sources etc.) is provided here in tabular form

Data/Parameter	$EG_{PJ,y}$
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*.
Time of determination/monitoring	Continuous measurement and at least monthly recording
Source of data (to be) used	Data from certificates and receipts compiled from the measured data of the electricity meters as a part of the wind park commercial metering system.
Value of data applied (for ex ante calculations/determinations)	As provided by the estimation of electricity generation.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured for the commercial purposes by the electricity meters of the automated system for commercial metering of electricity on site.
QA/QC procedures (to be) applied	Cross check measurement results with records for sold electricity.
Any comment	No

Data/Parameter	$EF_{grid,produced,y}$
Data unit	tCO_2/MWh
Description	Specific CO_2 emission factor for power generation at Ukrainian grid connected thermal power plants
Time of determination/monitoring	Ex-post as provided by the DFP on the annual basis
Source of data (to be) used	NEIA calculation for 2011 (Order #75 dated 12/05/2011): http://www.neia.gov.ua/nature/doccatalog/document?id=127498
Value of data applied (for ex ante calculations/determinations)	1.063
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This emission factor is the latest carbon emission factor for Ukrainian electricity grid approved by the DFP of Ukraine.

QA/QC procedures (to be) applied	Check on the updates of the emission factor.
Any comment	In the NEIA Order this parameter is provided in $kgCO_2/kWh$ measurement units that are equivalent to tCO_2/MWh. If the relevant emission factor data are absent for particular monitoring period the latest available emission factor is used.

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

The following step-wise approach is used to demonstrate that the project provides reductions in emissions by sources that are additional to any that would otherwise occur:

Step 1. Indication and description of the approach applied

As suggested by paragraph 2 (c) of the Annex 1 of the Guidance ***and*** by the ACM0002 the most recent version of the "Tool for the demonstration and assessment of additionality" approved by the CDM Executive Board is used to demonstrate additionality. The applicability of the ACM0002 is assessed in the section B.1. of this PDD. At the time of this document completion the most recent version of the "Tool for the demonstration and assessment of additionality" approved by the CDM Executive Board is version 05.2[32] and it is used to demonstrate additionality of the project activity.

Step 2. Application of the approach chosen

The following steps are taken as per "Tool for the demonstration and assessment of additionality" version 05.2

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

We will define realistic and credible alternatives to the project activity through the following Sub-steps:

Sub-step 1a: Define alternatives to the project activity

Table 5 Alternatives to the project activity

Alternative 1	**Continuation of the current situation** In Ukraine, thermal power plants (oil, natural gas, coal) account for nearly 46% of total electricity production, with nuclear power generating another 48%, while other sources, mainly hydroelectric power plants, make up the remaining 6.0%. The total installed generation capacity is 53.1 GW, which is more than enough to satisfy the current demand for electricity, albeit a big share of the thermal capacity is old and outdated (around 40 years in operation, on average) and is to be replaced rather in the nearest future. However, for some time, the Ukrainian power system may see no major changes in terms of new capacity being installed since the large overcapacity of thermal power plants is still operating in the system. This alternative suggests that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants
Alternative 2	**The proposed project activity undertaken without being registered as a JI project activity** Ukraine has a significant wind potential which is currently barely exploited. This

[32] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

	alternative suggests that the proposed wind park will be constructed without developing it as a JI project
Alternative 3	**Construction of a new coal-fired power plant** As Ukraine has substantial coal deposits, it is possible to replace existing fossil fuel plants with the new ones. However, the Ukrainian coal is costly to extract. It also requires transportation and preparation of coal. Coal fired power plant will also experience pressure from environmental groups as the large overcapacity of coal power plants exists in Ukraine. This alternative suggests that a new coal fired power plant will be constructed to produce electricity generated by the proposed project activity.

Outcome of Step 1a: We have identified three realistic and credible alternative scenarios to the project activity.

Sub-step 1b: Consistency with mandatory laws and regulations

All of the alternatives identified above are consistent with mandatory laws and regulations of Ukraine. The conventional power plants are operating within the legal framework of Ukraine. Pursuant to the article 5 of the Law of Ukraine «On Electrical Power Industry»[33], the state policy in the sphere of wind energy is as follows: support of development of wind energy industry as ecological and fuel-free energy sub-industry through purchase by energy market of all produced electricity with monetary payment without application of any offsets of debts as to payments for electricity. Further information on tariff policy is provided in the section B.1. of this PDD.

Outcome of Step 1b: We have identified three realistic and credible alternative scenarios to the project activities that are in compliance with mandatory legislation and regulations taking into account the enforcement in the Ukraine.

Step 2. Investment Analysis

The purpose of the investment analysis in the context of additionality is to determine whether the proposed project activity is not:

a) The most economically or financially attractive; or
b) Economically or financially feasible, without the revenue from the sale of emission reductions.

Sub-step 2a: Determine appropriate analysis method

The proposed alternatives will, apart from the JI benefits, generate economic benefits through the improvement of generation efficiency (Alternative 3) or will avoid investment costs (Alternative 1); therefore the simple cost analysis is not applicable. Either investment comparison analysis or benchmark analysis has to be applied in case of proposed activities.

Option III – benchmark analysis – has been chosen to conduct the investment analysis. The data necessary to make a careful and comparable estimation of the indicators for the Alternative 3 are not available to the project participants. Therefore, it is not feasible to conduct investment comparison analysis as per Option II. Besides, Alternative 3 cannot be regarded as realistic and credible due to the pressure of environmental regulations and government policy that may restrict construction of new coal fired power plants in the system with large overcapacity of such units, low tariffs that are available to electricity producers from conventional sources etc.

Sub-step 2b: Option III. Apply benchmark analysis

The proposed project which is the construction of the modern large-scale wind park is implemented by LLC "Wind Park Novoazovskiy". For the benchmark analysis of the project the indicator of Net Present Value (NPV) was used. The goal of analysis will be to show that the project activity not undertaken as a

[33] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=575%2F97-%E2%F0

joint implementation project (Alternative 2) will not be financially attractive and will lead to negative value of NPV. This benchmark has been selected for a number of reasons:

1. The project owner does not have formalized internal benchmark that is systematically applied during project evaluation;
2. No governmental approved benchmark is available for projects of this kind in Ukraine;
3. Positive/negative NPV is a generally accepted project evaluation benchmark. Its use is encouraged by many project finance professionals, while IRR is considered to be controversial and is not recommended as the single benchmark for project evaluation[34].

The analysis took in consideration the following assumptions:

1) Initial (1st stage) investment execution period is 2010.
2) Date of investment decision taking is October 2010.
3) Analysed operation period is 10 years.
4) Calculations have been done in EUR.
5) Fair value of the assets has been calculated for the last year of analysed operation period and applied as a positive cash flow.
6) Depreciation and any taxes (except for mandatory overhead payments) have not been taken into account.
7) Financing for the project is provided by equity investors 100%.
8) Calculation of the cash flows has been performed in constant prices using real discount rate.

The project investment costs include, inter alia:

- Purchase price for wind turbines;
- Reconstruction of electrical networks on site and upgrade of transformer capacity;
- Construction of tower fundaments and cable laying;
- Design, planning and supervisory expenses.

The project operating costs include, inter alia:

- Employee salaries;
- Mandatory overhead costs;
- General operating expenses (e.g. lease etc.);
- Maintenance expenses.

As an appropriate discount rate for the NPV calculation in this case the cost of equity was used. The discount rate is set at a level of 21.41% for the NPV calculation in case of equity financing for this project[35]. The project cash-flow modelling has been performed in order to calculate project's indicator and compare it with the benchmark.

Sub-step 2c: Calculation and comparison of financial indicators

The NPV for the operational period of ten (10) years of the proposed project activity has been calculated and produced results as follows:

Table 6 Financial indicators

Base case financing structure	**NPV, EUR** thousands
NPV	-9 140
Benchmark NPV	>0

[34] *Principles of Corporate Finance* 7th edition, Richard A. Brealey, Stewart C. Myers, McGraw-Hill Higher Education, 2003 – p. 105

[35] See Annex 4

In this case the NPV does not reach the positive value. Therefore, the investment to the proposed project activity cannot be justified.

Sub-step 2d: Sensitivity analysis

The NPV values for the change in total investment cost and electricity production estimates which are the most important variables that influence the final results are shown in the table below. Changes in the electricity tariff are not included into the analysis as it is fixed by the law and as such it cannot vary. Changes in electricity production influence the same cash flow and this influence is analysed instead.

Table 7 Sensitivity analysis

Scenario	**NPV, EUR thousand**
Base Case	-9 140
Scenario 1 (Investment cost -10%)	-195
Scenario 2 (Electricity production +10%)	-286
Scenario 3 (Investment cost +10%)	-9 231
Scenario 4 (Electricity production -10%)	-26 939

Sensitivity analysis demonstrates that in every case NPV of the project does not reach the benchmark. Considering such NPV calculation listed in table above, it can be concluded that the results of financial analysis stated above are robust.

Outcome of Step 2: After the sensitivity analysis it is concluded that the proposed JI project activity is unlikely to be financially/economically attractive.

Step 3: Barrier analysis

This step is optional and is provided to strengthen the additionality argument. In this step we determine whether the proposed project activity faces barriers that:

a) Prevent the implementation of this type of proposed project activity; and
b) Do not prevent the implementation of at least one of the alternatives.

The identified barriers are only sufficient grounds for demonstration of additionality if they would prevent potential project proponents from carrying out the proposed project activity undertaken without being registered as a JI project activity.

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed JI project activity:

Technological barriers:

- This project is the ***first of its kind*** in Ukraine. The proposed project activity envisages construction of the wind park of a scale never before attempted in Ukraine. The wind power station of this size will have a significant impact on the grid. The stochastic character of the wind power plant energy output requires a highly manoeuvrable reserve power generation capacity to be available on the grid and the grid operator must have fast-response controls and switches at his disposal in order to manage the grid load safely and effectively under such conditions. Introduction of such large scale wind park onto the grid has not been tried before in Ukraine. The large scale wind power failure risk in the local circumstances is significantly greater than for other technologies, for example coal-fired power plants.
- Construction of such wind park with a height of the turbine above 100m is a technologically challenging task, especially in Ukraine, where no wind park construction with equipment of this

scale has been completed or started as of now. Special construction equipment, including the assembling crane, is scarce in Ukraine. There is no local skills and knowledge on the assembly of high-capacity wind turbines. Infrastructure, such as access and public roads are not adequate to the task of transportation and installation of the massive equipment like wind turbines. This leads to an unacceptably high risk of equipment being damaged during transportation or construction.

Outcome of Step 3a: We have identified barriers that may prevent Alternative 2 to occur.

Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)

Alternative 1 is not affected by the identified barriers as it is the continuation of the already existing situation.

Alternative 3 is also not affected by any of the identified barriers as the coal-fired power generation technology is well-known in Ukraine:

- It is the majority of the grid-connected power-plants;
- Technology is produced locally;
- Does not require any specific arrangements in order to be introduced into the grid;
- Construction expertise is available locally.

Both sub-steps 3a and 3b are satisfied.

Step 4: Common practice analysis

Sub-step 4a: Analyze other activities similar to the proposed project activity:

The proposed project activity is the first large scale modern wind power development in Ukraine to enter construction stage. Small scale wind power has been developed in Ukraine through the direct financing from the state. Under this initiative the largest wind turbine so far being connected to the Ukrainian NPG is 600 kW capacity, while the majority of wind turbines being only of 107.5 kW and below, all of them being produced in Ukraine. Total wind potential of Ukraine is estimated at 30-42 TWh (16000 MW installed capacity), while the total installed capacity of wind power comes close to 90 MW (in 2008 they produced 6.7 million kWh).

Sub-step 4b: Discuss any similar Options that are occurring:

Other, comparable to this project activity, projects have been developed in Ukraine only through the utilization of JI mechanism – like the "Portfolio of Wind Power Plants in the Autonomous Republic of Crimea (WPP-300)"[36]. Most of the projects, however, did not proceed with construction. Ukraine has no experience in operating large wind turbines or large wind parks. All wind power plants were constructed as state-owned enterprises; while the main goal was to carry out conversion of the former military production existed in the Soviet Union. From this perspective proposed project activity will be the first private investment in Ukraine into such a large wind power project (over 100 MW), therefore, the project is not regarded as a common practice. Similar projects are not widely observed and commonly carried out.

Both sub-steps 4a and 4b are satisfied.

Therefore, based on the requirements of the "Tool for the demonstration and assessment of additionality" version 05.2, the proposed project is additional.

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[36] http://ji.unfccc.int/JI_Projects/DB/ZYXHPSBM2ZDNCD22JT73V6KWD8UL7Q/PublicPDD/C34A1HSSBI85SLR5F9EXZ6HR7RGJ0Z/view.html

B.3. Description of how the definition of the project boundary is applied to the project:

The project boundary for this particular project is defined in line with the approach chosen regarding the baseline setting. Elements of the ACM0002 were used to define the project boundary. Applicability of the ACM0002 is discussed in the section B.1. of this PDD. According to ACM0002 the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the JI project power plant is connected to.

In accordance with the recommendations of ACM0002, the project boundary is the Ukrainian Power Grid, as shown in figure below. However, project participants have direct control only over the project power plant – wind power park as described in section A.4.2. Project activity is physically limited to the territory of the WPP constructed by LLC “Wind Park Novoazovskiy”.

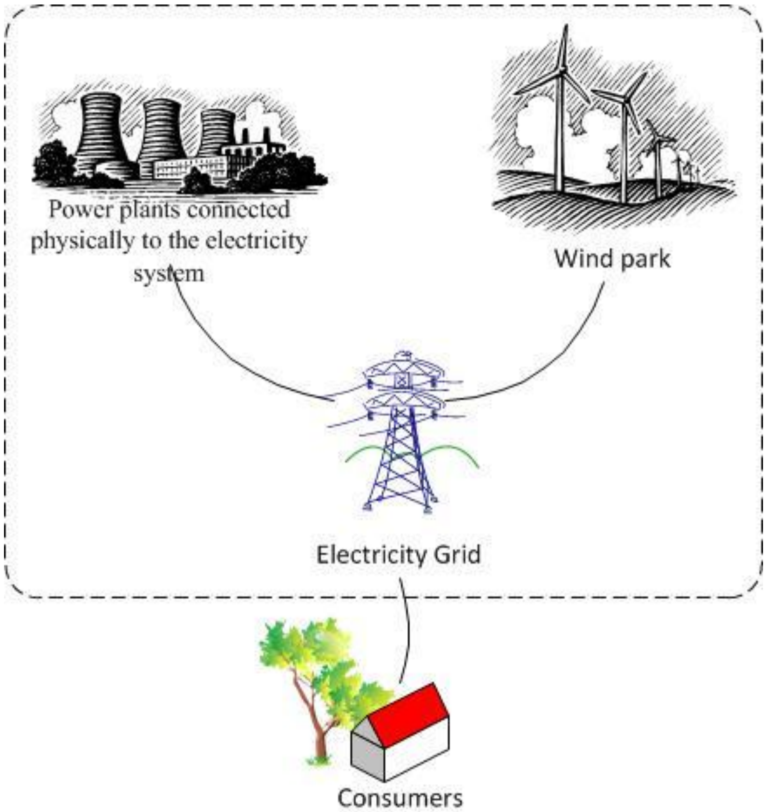

Figure 3 Project Boundary

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the table below.

Table 8 Emissions sources included in or excluded from the project boundary

Source		Gas	Included ?	Justification / Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Included	Main emission source.
		CH_4	Excluded	Excluded as minor emission source per ACM0002.
		N_2O	Excluded	Excluded as minor emission source per ACM0002.
Project scenario	No sources.	-	-	There are no sources of project emissions for the wind power plants according to ACM0002.

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

Date of the baseline setting: 02/09/2011

Name of person/entity setting the baseline:

Denis Prusakov

Global Carbon B.V.

The person/entity setting the baseline is also a project participant whose contact details are listed in Annex 1.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Starting date of the project is 24/03/2011. This is the date when the license for electricity generation has been received.

C.2. Expected operational lifetime of the project:

The operational lifetime of the project is 28 years or 336 months.

C.3. Length of the crediting period:

Start of the crediting period: 01/04/2011.

Length of the crediting period: 28 years or 336 months.

Length of the part of crediting period within the first commitment period of the Kyoto Protocol: 1 year and 9 months or 21 months.

Length of the part of crediting period after the first commitment period of the Kyoto Protocol: 26 years and 3 months or 315 months.

The status of emission reductions or enhancements of net removals generated by JI projects after the end of the first commitment period of the Kyoto Protocol may be determined by any relevant agreement under the UNFCCC.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

This monitoring plan is established in accordance with appendix B of the JI guidelines and further guidance on baseline setting and monitoring developed by the JISC. The description of the monitoring plan chosen is provided using the following step-wise approach:

Step 1. Indication and description of the approach chosen regarding monitoring

Project participants have chosen to apply the elements of the monitoring methodology contained in the ACM0002. The applicability of the ACM0002 to this project activity is discussed in the section B.1. of this PDD. The monitoring plan will provide for, inter alia:

- The collection and archiving of all relevant data necessary for estimating or measuring anthropogenic emissions by sources of GHGs occurring within the project boundary during the crediting period;
- The collection and archiving of all relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary during the crediting period;
- The identification of all potential sources of, and the collection and archiving of data on increased anthropogenic emissions by sources of GHGs outside the project boundary that are significant and reasonably attributable to the project during the crediting period.
- Quality assurance and control procedures for the monitoring process;
- Procedures for the periodic calculation of the reductions of anthropogenic emissions by sources by the proposed JI project, and for leakage effects, if any;

Step 2. Application of the approach chosen

The monitoring methodology contained in ACM0002 requires that all data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. 100% of the data should be monitored if not indicated otherwise in the sections below. All measurements should be conducted with calibrated measurement equipment according to relevant industry standards.

In Ukraine all large scale electricity producers are obliged to have Automated System for Commercial Metering of Electricity (ASCME). This system allows for metering of all electricity delivered to the grid and consumed from the grid allowing for transparent calculation of the net amount of electricity delivered to the grid. Detailed specifications of this system are provided by the Main Operator of the Wholesale Electricity Market of Ukraine – State Enterprise “Energorynok”[37].

The project activity will use Option I - Monitoring of the emissions in the project scenario and the baseline scenario. See sub-sections below for the further information on monitoring approach application.

[37] http://www.er.energy.gov.ua/doc.php?c=1228

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	PE_y - Project emissions in year y	According to ACM0002.	tCO_2	e	Fixed ex-ante.	100%	Electronic and Paper.	According to the ACM0002 for the wind power generation project activities, $PE_y = 0$

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

According to the ACM0002 for the wind power generation project activities,

$$PE_y = 0, \quad \text{(Equation 2)}$$

Where:

PE_y - Project emissions in year y (tCO_2).

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
2	$EG_{PJ,y}$ - Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the JI project activity in year *y*	Data from certificates and receipts compiled from the measured data of the electricity meters as a part of the wind park commercial metering system	MWh	m and c (data of direct measurement with electricity meters can be used for calculations – of total amount, net amount etc. for the period)	Continuous with monthly recording/reporting and annual aggregation/recording	100%	Electronic and Paper.	This parameter is used in the normal commercial activity of the facility. It is measured by the electricity meters within the automated system for commercial metering of electricity on-site.

3	$EF_{grid,produced,y}$ - Specific CO_2 emission factor for power generation at Ukrainian grid connected thermal power plants	Official information of DFP. (For the 2011 it is 1.063 tCO_2/MWh. Order of NEIA of Ukraine #75 dated 12/05/2011)	tCO_2/MWh	e (applied according to the data of the DFP of Ukraine)	Ex-post as provided by the DFP on the annual basis	100%	Electronic and paper	This emission factor is the latest carbon emission factor for Ukrainian electricity grid approved by the DFP of Ukraine. In the NEIA Order this parameter is provided in $kgCO_2/kWh$ measurement units that are equivalent to tCO_2/MWh. If the relevant emission factor data are absent for particular monitoring period the latest available emission factor is used.

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

According to the ACM0002 for the wind power generation project activities the baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,produced,y}, \quad \text{(Equation 3)}$$

Where:

BE_y - Baseline emissions in year *y* (tCO_2);

$EG_{PJ,y}$ - Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the JI project activity in year *y* (MWh);

$EF_{grid,produced,y}$ - Specific CO_2 emission factor for power generation at Ukrainian grid connected thermal power plants in year y (tCO_2/MWh).

D. 1.2. Option 2 – Direct monitoring of emission reductions from the project (values should be consistent with those in section E.):

This section is left blank on purpose.

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

This section is left blank on purpose.

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

This section is left blank on purpose.

D.1.3. Treatment of leakage in the monitoring plan:

According to the ACM0002 no leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). These emissions sources are neglected.

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Not applicable.

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

Not applicable.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

According to the ACM0002 emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y\ . \qquad \text{(Equation 4)}$$

Where:

ER_y - Emission reductions in year y (tCO_2);

BE_y - Baseline emissions in year y (tCO_2);

PE_y - Project emissions in year y (tCO_2).

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

The procedures to collect and archive information on the environmental impacts of the project will be established by the final environmental impact assessment report in accordance with The State Construction Norms[38] which will be reviewed and approved by the relevant authorities of Ukraine.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:

Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
#1, Table D.1.1.1.	Low	Fixed ex-ante as per ACM0002
#2, Table D.1.1.3.	Low	The quantity of electricity exported and the quantity of electricity imported will be measured by electric meters. The transmission of the amount of electricity exported/imported to the control room shall be made online. Registration shall be made monthly, by the operator in charge. The data measured are used for the commercial transactions of the company, therefore they are well verified. Cross check measurement results with records for sold electricity will be done periodically.
#3, Table D.1.1.3.	Low	The emission factor is calculated by NEIA of Ukraine on the annual basis and made public not later than 1st of March every year for the previous year.

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

The monitoring plan will be executed within the existing operational and management structure of the company. The monitored parameters will be cross-checked with the data from the automated system for commercial metering of electricity of the facility. Data from the Supervisory Control And Data Acquisition system will also be used to check the results.

The overall operational and management structure that the project operator will apply in implementing the monitoring plan is provided in the figure below:

[38] *State Construction Standard DBN A.2.2.-1-2003 :"Structure and Contents of the Environmental Impact Assessment Report (EIR) for Designing and Construction of Production Facilities, Buildings and Structures"* State Committee Of Ukraine On Construction And Architecture, 2004

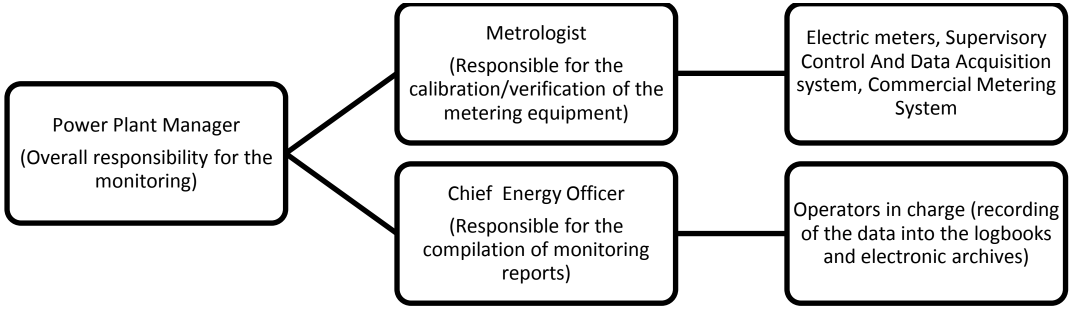

Figure 4 Operational and Management structure

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

Name of person/entity setting the baseline:

Denis Prusakov

Global Carbon B.V.

The person/entity establishing the monitoring plan is also a project participant whose contact details are listed in Annex 1.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

According to the ACM0002 for the wind power generation project activities project emissions are equal to zero.

E.2. Estimated leakage:

No leakage identified as per ACM0002. Please, refer to Section D.1.3. for details.

E.3. The sum of E.1. and E.2.:

This sum is equal to zero.

E.4. Estimated baseline emissions:

Table 9 Estimated baseline emissions during the part of the crediting period within the first commitment period

Parameter	Unit	2011	2012	Total
Baseline Emissions due to grid connected power generation	tCO_2	72 243	185 204	**257 447**
Total Baseline emissions during the part of the crediting period within the first commitment period	tCO_2	72 243	185 204	**257 447**

Table 10 Estimated baseline emissions for the part of the crediting period after the end of 2012

Parameter	Unit	2013-2038	Total
Baseline Emissions due to grid connected power generation	tCO_2	8 266 967	**8 266 967**
Baseline emissions for the part of the crediting period after the end of 2012	tCO_2	8 266 967	**8 266 967**

E.5. Difference between E.4. and E.3. representing the emission reductions of the project:

Table 11 Estimated emission reductions during the part of the crediting period within the first commitment period

Parameter	Unit	2011	2012	Total
Emission reductions during the part of the crediting period within the first commitment period	tCO_2	72 243	185 204	**257 447**

Table 12 Estimated emission reductions for the part of the crediting period after the end of 2012

Parameter	Unit	2013-2038	Total
for the part of the crediting period after the end of 2012	tCO_2	8 266 967	**8 266 967**

E.6. Table providing values obtained when applying formulae above:

Table 13 Estimated balance of emissions under the proposed project over the part of the crediting period within the first commitment period

Year	Estimated Project Emissions (tonnes CO_2 Equivalent)	Estimated Leakage (tonnes CO_2 Equivalent)	Estimated Baseline Emissions (tonnes CO_2 Equivalent)	Estimated Emissions Reductions (tonnes CO_2 Equivalent)
2011	0	0	72 243	72 243
2012	0	0	185 204	185 204
Total (tonnes CO_2 Equivalent)	**0**	**0**	**257 447**	**257 447**

Table 14 Estimated balance of emissions under the proposed project for the part of the crediting period after the end of 2012

Year	Estimated Project Emissions (tonnes CO_2 Equivalent)	Estimated Leakage (tonnes CO_2 Equivalent)	Estimated Baseline Emissions (tonnes CO_2 Equivalent)	Estimated Emissions Reductions (tonnes CO_2 Equivalent)
2013	0	0	267 878	267 878
2014	0	0	345 495	345 495
2015	0	0	345 495	345 495
2016	0	0	345 495	345 495
2017	0	0	345 495	345 495
2018	0	0	345 495	345 495
2019	0	0	345 495	345 495
2020	0	0	345 495	345 495
2021	0	0	345 495	345 495
2022	0	0	345 495	345 495
2023	0	0	345 495	345 495
2024	0	0	345 495	345 495
2025	0	0	345 495	345 495
2026	0	0	345 495	345 495
2027	0	0	345 495	345 495
2028	0	0	345 495	345 495
2029	0	0	345 495	345 495
2030	0	0	345 495	345 495
2031	0	0	345 495	345 495
2032	0	0	345 495	345 495
2033	0	0	345 495	345 495
2034	0	0	345 495	345 495
2035	0	0	345 495	345 495
2036	0	0	160 291	160 291
2037	0	0	160 291	160 291
2038	0	0	77 617	77 617
Total (tonnes CO_2 Equivalent)	**0**	**0**	**8 266 967**	**8 266 967**

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party:

A full scale EIA[39] has been started following the strict environmental guidelines of the Ukrainian State Construction Standard DBN A.2.2.-1-2003[40] (Title:"Structure and Contents of the Environmental Impact Assessment Report (EIA) for Designing and Construction of Production Facilities, Buildings and Structures").

Annex F of this standard contains a list of "types of projects or activities which constitute higher environmental risk" for which full EIA is mandatory, and the Ministry of Environment and Natural Resources of Ukraine being the competent authority. Wind power plants with internal electricity transmission cables are not included in the list of types of activities or facilities which present an increased environmental hazard. The operation of WPP with internal electricity transmission lines does not produce waste and does not cause particle or liquids emissions into the environment, and does not result in non-reversible or critical changes in the atmo-, hydro-, or lithospheres.

Transboundary effects

The project does not have any transboundary impact, as this project is implemented only in the Donetsk region of Ukraine and does not foresee any impact that can manifest within the area of any other country.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to supporting documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The environmental impacts are not considered significant by the host Party. This section describes the most important impact of the project on the environment. All anticipated environmental effects and mitigation measures will be described in EIA. The EIA is undergoing final development process and will be subject to approval by the relevant Ukrainian authorities mandated by the Ministry of Environment and Natural Resources of Ukraine.

Constructional period

Geology and Geomorphology

One of the most important impacts is the road construction. In order to mitigate this impact, the project owner will try to make maximum use of the existing roads. If needed, the new roads will be built in such manner so that the geology and geomorphology of the sites will suffer minimum damages.

Another possible impact is produced by the excavations. An important volume of soil will be excavated. Part of it (the most fertile) will be combined with fertile soil and used to cover the WTGs[41] foundations. The other part will be used for the rehabilitation of other damaged sites in the area. Excavation work will take into account the wind turbine manufacturer's instructions and local groundwater conditions, so while reducing the environmental impact to guarantee the safety of wind turbines.

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[39] Environmental Impact Assessment

[40] *State Construction Standard DBN A.2.2.-1-2003 :"Structure and Contents of the Environmental Impact Assessment Report (EIR) for Designing and Construction of Production Facilities, Buildings and Structures"* State Committee Of Ukraine On Construction And Architecture, 2004

[41] Wind Turbine Generator

During the construction considerable areas will be removed for temporary use of mounting equipment (cranes, auxiliary equipment), turbine parts sites, etc. These areas will be temporarily covered with concrete or asphalt surfacing.

Collection grid will be done by cable lines, i.e these cables will be laid at a depth of 1 meter. The topsoil will be removed in order to later restore the very soil and vegetation.

Fauna

Ornithology study will be included into the scope of EIA in order to evaluate impact on bird populations in the area and on the migrating birds. Special focus will be on the endangered species and at risk groups.

Visual impact

As any other construction activity, the construction of the Project (material storage sites, road development, excavation works, etc.) will temporarily change the landscape.

Noise

The construction phase includes a wide range of activities, including access road construction, grading, drilling and blasting (for tower foundations), construction of auxiliary buildings, cleanup and vegetation restoration.

Levels of noise generated by the work of construction equipment vary significantly depending on such factors as the type, model, size and condition of equipment, schedule of works and condition of the area where the works have been carrying on.

In addition to daily variations in activities, major project objects are performed during several different stages. Each stage has a special set of equipment, depending on the types of work performed. Most building works are carried out during the day when the noise is perceived not as sharp due to the masking effect of background noise. Noise levels at night are likely to decline to the background noise level of the project area.

Construction work will continue during the short time (1 to 2 years maximum) in comparison with the operation of wind turbines, and consequently, their potential impacts will be of temporary and faltering nature.

Cultural heritage

Vibration created by construction can impact on the cultural heritage. The mitigation measures can be taken only by a construction company in terms of reducing vibrations of the equipment and by use of vibration absorbers while installing WTGs.

Project Lifetime

Visual impact

Due to their large size, the turbines will be visible at a distance. Visual impact of wind turbines cannot be avoided, reduced, or concealed, owing to their size and exposed location; therefore, effective mitigation is limited. In any case turbine arrays and the turbine design will be integrated in the surrounding landscape.

Noise

Some noise will be generated during operation of the wind turbines. All the requirements for the location of required sanitary zone and turbine equipment will be met and the noise will be maintained at a level lower than the legally permitted limits.

Land use impact

Earth will be removed for the turbines being erected, auxiliary assembly sites for small crane, tanget towers, access roads, wind power plant and interconnection substations for permanent use.

To minimize the land use impact design of wind turbines provides internal transformers and cable connections will be used for collecting electricity within the wind field to avoid setting too many overhead transmission lines.

All land procedures conducted by the project owner will strictly follow the Ukrainian legislation and provide necessary compensation.

Biodiversity

Wind turbines, transmission lines and substations will affect birds, wild flora and flora of the region. Groups of scientists will conducted ornithological, theriological (for mammals) and botanical studies to assess environmental impacts and the results of their efforts will be made public and carefully reviewed in order to avoid any harmful effects or compensate for them.

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

Project participants have organized meetings with the local stakeholders during the project development period. Specifically, such meeting has been organized on 25.11.2010. Detailed accords of these meetings are available from the project participants.

No negative comments were received during the public hearings. PDD will be made publicly available for the global stakeholder meeting commenting period and any comments received will be taken into account.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

Table containing the key elements of the baseline

#	Parameter	Data unit	Source of data
1	$EG_{PJ,y}$ - Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the JI project activity in year y	MWh	Data of project owner based on wind parameters measurement and estimation
2	$EF_{grid,produced,y}$ - Specific CO2 emission factor for power generation at Ukrainian grid connected thermal power plants.	tCO_2/MWh	NEIA estimate for 2011: http://www.neia.gov.ua/nature/doccatalog/document?id=127498

Annex 3

MONITORING PLAN

Please, refer to section D of this PDD.

Annex 4

ADDITIONALITY INFORMATION

Discount rate for NPV calculations

An access to the international and domestic financial market for a project similar to the proposed JI activity in Ukraine is very limited. Currently, investment climate is weak in Ukraine, especially in comparison with the neighbouring countries. An example of Fitch sovereign credit ratings for Ukraine compared to some other countries of Eastern Europe:

- Ukraine	B
- Poland	A-
- Hungary	BBB
- Slovak Republic	A+
- Russia	BBB

The benchmark discount rate is based on the cost of equity for comparable projects in the developed economies and can be calculated as follows based on the general approach of the Capital Asset Pricing Model (CAPM). According to this model the discount rate for investment decision can be presented as the return that investors require from it. This expected return is estimated as[42]:

$$ExpectedReturn = RiskFreeRate + \sum_{j=1}^{k} \beta_j (RiskPremium_j)$$

Where:

β_j – is the Beta of investment specifically relative to factor j.

From the point of view of the investor the expected return will consist of the risk-free rate increased by the suitable risk premiums. The risk-free rate taken for this assessment is the minimum cost of equity for comparable projects in the developed economies. The suitable risk premiums in our case will include:

- Country risk premium. This portion of the risk reflects unique risks of investment being made in Ukraine. The additional return (premium) is required to cover political uncertainty, ownership risks, profit repatriation risk etc.

- The equity risk premium. Which is derived from the long-term historical returns on equity in the US market relative to the return of bonds.

- Technological or Expected return risk premium. This risk is associated with failure to reach projected income due to primarily technical, technological and organizational decisions of the project, as well as random fluctuations in production volumes and prices of products and resources. Correction for this kind of risk is determined by taking into account the technical feasibility and merits of the project, detailed design decisions, the availability of the necessary research and state of the proposed technology. This project does carry some unpredictability in production volumes and utilizes first-of-its-kind technology in Ukraine.

Even though it may be argued that on-shore installation of wind turbines of 2,5MW is proven, low-risk and widely employed technology for certain markets and locations it has to be mentioned that it is not the case for Ukraine. The reasons for it are:

[42] Investment Valuation: Tools and Techniques for Determining the Value of Any Asset, Second Edition, A. Damodaran, 992 pages Publisher: Wiley; 2nd edition (January 18, 2002), page 218.

- Risks for the grid stability. Ukrainian power grid is not suited for receiving power from a highly variable large-scale producer (such as a big wind park). This may potentially lead to grid failure and discontinuation of the project.
- O&M unavailability. This project is the first attempt at introduction of the large-scale wind power plant in Ukraine. Required service and maintenance capacity is not readily available in the country. This results in long lead times for spare parts delivery, longer overhaul time periods and potential risk of increased unavailability of the capacity.
- Lack of data and operational history. In Ukraine long-term data on wind conditions are mostly unavailable. Without these data it is not possible to establish reliable long-term production forecast for a wind park. Any forecast will be based on short-term (up to 1 year) wind data thus reducing the reliability of calculations.

On the whole, it also should be taken into account that while on-shore wind turbines of 2+ MW class have been widely installed throughout the world in the few recent years the technology itself is not more than 10 years old (http://www.wind-energy-the-facts.org/en/part-i-technology/chapter-3-wind-turbine-technology/evolution-of-commercial-wind-turbine-technology/growth-of-wind-turbine-size.html). Therefore long-term effects associated with its operation have not been studied yet.

Taking this into account, we suggest that this project in Ukraine has a considerably high amount of technological risk associated with it and appropriate risk adjustment factor should be used.

Table – Calculation of discount rate

Rate description	**Level p.a.**	**Source:**
Risk-free rate (long term returns on US Government bonds)	3.00%	http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf Appendix Default values for the expected return on equity Para 2
Equity risk premium (long-term historical returns on equity in the US market relative to the return of bonds)	6.5%	http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf Appendix Default values for the expected return on equity Para 3
Country risk premium for Ukraine	8.25%	http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem09.xls Value as of January 2010
Expected return risk (introduction of the new technology for Ukraine)	13%	http://www.libinfo.org/nsi/index.php?file=z0711009&down=z0711009.rar Page 56 (Low to Average risk, lower value from the range of 6-7%)
Equals to nominal discount rate	23.75%	
Real discount rate for Ukraine can be derived as follows:	(1+23.75%)/(1+1.93%)-1=21.41%	
Where:		
Inflation in Euro Area (Average 1997 - 2010)	1.93%	http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=en&pcode=tsieb060&tableSelection=1&footnotes=yes&labeling=labels&plugin=1

The figure of 21.41% serves as the discount rate for NPV calculation of the project.

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