JOINT IMPLEMENTATION PROJECT

CONSTRUCTION OF "BOTIEVSKA WPP" POWER PLANT
WITH 200 MW CAPACITY

(project name)

	Position of the head of organization, institution, facility – document developer	
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Donetsk, October 2012

JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect as of: 15 June 2006

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Annexes

SECTION A. General description of the project

A.1. Title of the project:

Construction of “Botievska WPP” power plant with 200 MW capacity.

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

The version number of the document: 2.0.

The date of the document: 10th of October 2012.

A.2. Description of the project:

The project is aimed at achieving GHG emission reductions by substituting the carbon intensive electricity from Ukrainian power grid with renewable energy produced by new wind power plant (WPP) which is built as a project activity. The new WPP with planned installed capacity of 200 MW is constructed in Zaporizhzhya region of Ukraine. It is planned to install in total 65 wind turbines 3.075 MW each. The project is realized in two stages which consist of installation of 30 and 35 wind turbines.

Situation before the project

In Ukraine, the total installed generation capacity is 53.1 GW[1] (thermal power plants (coal, oil, natural gas fired) account for nearly 63.5% of total installed capacity, nuclear power plants account for nearly 26%, while other sources (mainly hydroelectric power plants) make up the remaining 10.5 %). This is more than enough to satisfy the current demand for capacity which is lower than 20 GWh, thus the capacity load factor is below 50%. The thermal capacity is mainly outdated and low efficient (around 40 years in operation, on average), which makes its use carbon-intensive and costly, therefore the load factor of thermal capacities is low compared to nuclear power plants.

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]. Thermal power plants covering the peak and halve peak load supply the second largest share of power output, amounting to an almost equal share of 46%. The other sources (mainly hydroelectric power plants) make up the remaining 6%.

The following major power generation companies exist in Ukraine at present:

- 5 thermal power generation companies – Centrenergo, Donbasenergo, Dniproenergo, DTEK-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 Hydro Power Storage Plant 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 in total electricity production is insignificant.

[1]URL: http://www.ukrenergo.energy.gov.ua/ukrenergo/control/uk/publish/article?art_id=87570&cat_id=35061 (last reference 05/08/2012)

[2] URL: www.ebrd.com/downloads/sector/eecc/Ukraine_English.pdf, section 2.1, page 10 (last reference – 05/08/2012)

The Ukrainian electricity system is characterized by a large overcapacity mainly in the thermal power plants sector. Expansion plans for energy 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 of Wind Parks construction to 2010" adopted by the Ukrainian Government. As of now the outcome of this Program is represented by 151 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 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[3].

At present the considerable development of renewable energy sector in Ukraine is associated with introduction of the "green tariff" for electricity produced from renewable sources and recognition of benefits due to participation in the JI mechanism. This has attracted investors into this sector of economy and few utility-scale WPP projects were started in Ukraine.

Baseline scenario

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 project anticipates the installation of 65 advanced wind turbines (with capacity of 3.075 MW) including construction of electricity infrastructure (WPP substation, cable lines, overhead transmission lines), maintenance base as well as access roads where required.

The project site in Priazovskiy Region of Zaporizhzhya oblast of Ukraine is considered promising for wind energy generation due to favorable wind conditions and limited environmental impact.

The purpose of the project is to generate environmentally friendly 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 by this WPP will partly substitute the electricity from the Ukrainian electricity grid, decreasing respective carbon emissions from fossil fuel combustion at thermal power plants.

Overall, the realization of the project is environmentally and socially beneficial. The technological process is environmentally sound and does not require the use of hazardous materials. Operation of the project will lead to creation of new work places which will contribute to economic development of the region.

Brief summary of project history including its JI component

Before project implementation, territories under project boundary were used for agricultural purposes. The idea of wind park was under discussion from 2009. Substantial investments needed for purchase and installation of wind turbines delayed the beginning of the project. The final decision about project implementation was taken in April , 2010. The frames of Botievska WPP were approved, and technical

[3]URL:http://www.acrada.gov.ua/control/main/uk/publish/article/934671;jsessionid=68576180BA5028F2BE9205AD224CE19E (last reference – 24/07/2012)

conditions for temporary connection of Botievska WPP 1 stage to Ukrainian unified electricity system were received in July of 2011. In September of 2011 the technical and economical description of the project, and EIA were obtained. The wind measurement reports and update to wind farm energy yield assessment were conducted on December 2011 – January 2012. The project has been initiated in June, 2011. First stage of Botievska WPP will be commissioned in October 2012 and by now the first stage of project construction is being in progress. The Joint Implementation mechanism (JI) was one of the drivers for the project from the start and financial benefits provided by the JI mechanism were considered as one of the reasons to start the project and are crucial in the decision to start the operations. The possibility of building third stage of WPP is under discussion.

Table 1. Schedule of project realization

Phase of project realization	Period
Project Design	12/2009 – 12/2011
WPP's infrastructure construction (transformer substations, administrative and control point, roads)	07/2011 – 07/2014
1st stage turbines delivery	06/2012 – 09/2012
2nd stage turbines delivery	03/2014 – 07/2014
1st stage turbines construction	06/2012 – 10/2012
2nd stage turbines construction	03/2014 – 07/2014
1st stage turbines commissioning	09/2012 – 12/2012
2nd stage turbines commissioning	04/2014 – 10/2014
Turbines lifetime	20 years

The process of applying for all necessary permits to build, operate and maintain the wind power plant has been initiated by LLC "Wind Power" in 2010.

Wind turbines will be commissioned and taken out of service according to the schedule, described in the table below.

Table 2. Amount of wind turbines in operation during the project lifetime

month/year	2012	2013	2014	2015-2031	2032	2033	2034
Jan	0	28	30	65	65	37	35
Feb	0	30	30	65	65	35	35
Mar	0	30	34	65	65	35	31
Apr	0	30	38	65	65	35	27
May	0	30	42	65	65	35	23
Jun	0	30	44	65	65	35	21
Jul	0	30	50	65	65	35	15
Aug	0	30	50	65	65	35	15
Sept	0	30	58	65	65	35	7
Oct	0	30	65	65	65	35	0
Nov	12	30	65	65	53	35	0
Dec	20	30	65	65	45	35	0

A.3. Project participants:

Table 3. Project participants

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 Power"	No
The Netherlands	• Global Carbon B.V.	No

LLC "Wind Power" is the project owner. The company was started in 2008 to become one of the leading producers of renewable energy in Ukraine. Its economic activity lies in the fields of energy generation and distribution, construction of power generating facilities and transmission lines. LLC "Wind Power" is a property of "DTEK Skhidenergo" holding. LLC "Wind Power" is a project participant.

Global Carbon B.V. is a leading expert on environmental consultancy and financial brokerage services in the international greenhouse emissions trading market under the Kyoto Protocol. Global Carbon has developed the first JI project that has been registered at the United Nations Framework Convention on Climate Change (UNFCCC). The first verification under JI mechanism was also completed for Global Carbon B.V. project. The company focuses on Joint Implementation (JI) project development in Ukraine and Russia. Global Carbon B.V. is responsible for the preparation of the investment project as a JI project including PDD preparation, obtaining Party approvals, monitoring and transfer of ERUs. Global Carbon B.V. is a potential buyer of the ERUs generated under the proposed project. Global Carbon B.V. is a project participant.

A.4. Technical description of the project:

A.4.1. Location of the project:

The project site of the LLC "Wind Power".

A.4.1.1. Host Party(ies):

Ukraine.

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

Zaporizhzhya region.

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

Between Botieve village and Primorskiy Posad village.

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

The wind farm construction site is located between Botieve and Primorskiy Posad villages within the central-southern Ukraine, Zaporizhzhya region.. It is situated approximately 300 m northward from the Azov sea coast. Also nearby towns include Melitopol (45 km), and Berdyansk (71 km). Population of Botieve makes 1 615[4] people, population of Primorskiy Posad is stated as 455[5] people (official data for 2001).

Geographical coordinates of the project site are +46° 38' 7.90" E +35° 50' 9.09" N.

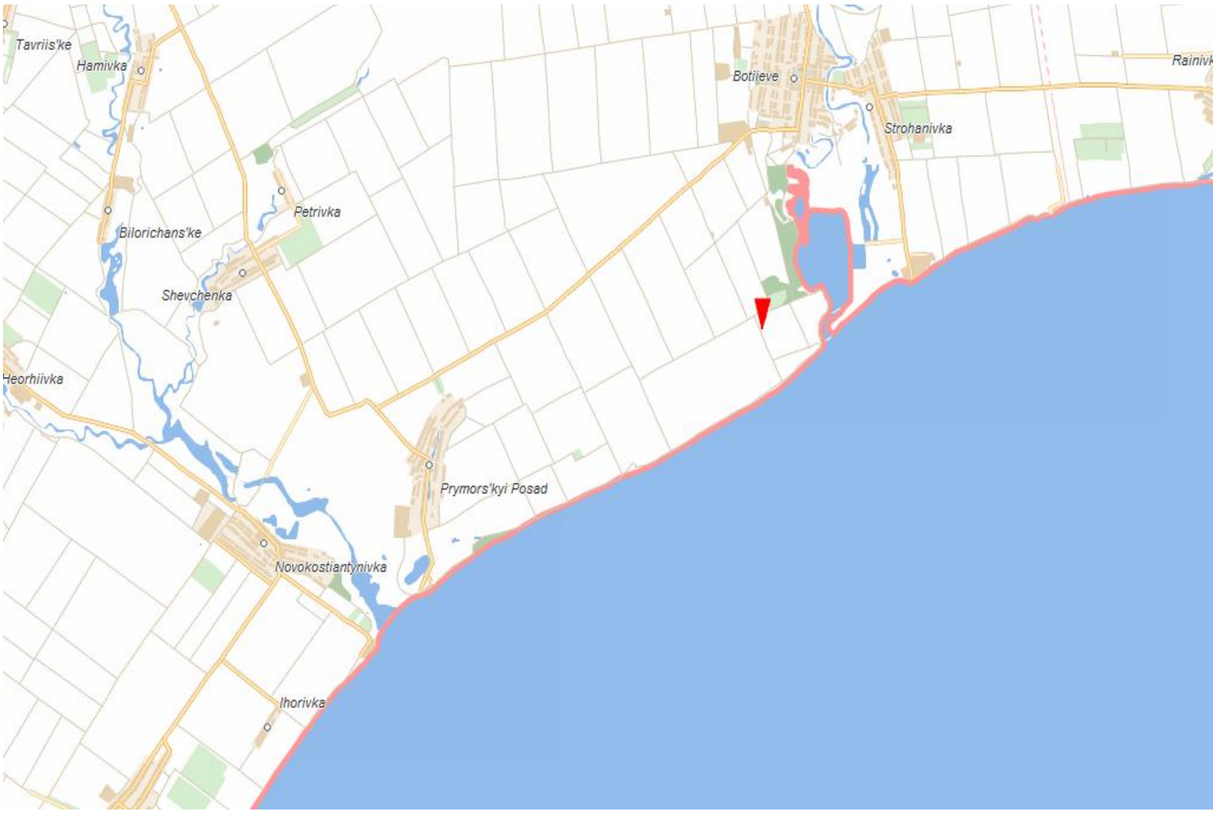

Figure 1. Location of the project site[6]. (Source:maps.visicom.ua)

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 continued the worldwide success story as the most dynamically growing energy source demonstrating the grow rate of 23.6%. In 2010 it reached 196 630 MW of 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."[7]

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 151 MW

[4] URL: http://w1.c1.rada.gov.ua/pls/z7502/A005?rdat1=09.06.2009&rf7571=12816 (last reference 05/08/2012)

[5] URL: http://w1.c1.rada.gov.ua/pls/z7502/A005?rdat1=09.06.2009&rf7571=12860 (last reference 05/08/2012)

[6] URL: maps.visicom.ua

[7] URL: http://www.wwindea.org/home/images/stories/pdfs/worldwindenergyreport2010_s.pdf (last reference – 24/02/2012)

being installed in Ukraine as of the beginning of 2008. Also one should mention that WTs (wind turbines) 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 inefficient in 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 an amount of wind turbines and supportive infrastructure to serve as a single WPP with up to 200 MW of installed capacity. The project will utilize advanced wind turbines of 3.075 MW capacity produced by the Danish wind turbine manufacturer Vestas A/S. This technology will not be changed during the project period.

Final choice of WTs considers option of Vestas V112-3.0 wind turbine. Considered manufacturer – Vestas is the well-known technology provider in wind turbine manufacturing, installation and operation.

The project activity is planned to be implemented in two stages:

First stage:	It is planned to install 30 wind turbines 3.075 MW each. Total planned installed capacity is approximately 95 MW. Commissioning of the first 12 turbines from the first stage will be performed in November 2012. Commissioning of the next 18 turbines is planned on December 2012.
Second stage:	It is planned to install 35 wind turbines 3.075 MW each. Total installed capacity is approximately 105 MW. Expected date of commissioning is March 2014.

Technical data of WT

The advanced 3.075 MW turbine Vestas V112-3.0 with variable speed rates is reliable, modern and easy to maintain. Rotor diameter turbine of this type is 112 m. It can cater to various locations and wind conditions in the best way possible. Tubular towers 94 m high form the prerequisite for a very economic, efficient and reliable production of wind power.

Designed for limit of wind speed from 3 m/s to 25 m/s, the V112-3.0 MW turbine delivers a highly competitive cost of energy. The turbine delivers high productivity due to its large swept area, higher rotor efficiency and better serviceability and reliability, which improve availability. Its reliability is assured through Vestas state-of-the-art testing centre.

The turbine design blends new, yet proven, technical advancements with established Vestas concepts from other platforms. A new concept is power system technology which provides excellent grid compliance for existing and future requirements, lower balance of plant costs and better system optimisation possibilities leading to higher production.

Vestas V112-3.0 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 Vestas V112-3.0 facilitates the replacement of all main components without the need for an expensive mobile crane – greatly reducing the time and expense of repairs.

Table 4. Specifications of wind turbine Vestas V112 3.0MW

Figure 2. Vestas V112-3.0 turbine

Rotor	
Rotor diameter	112 m
Number of rotor blades	3
Tower	
Hub height	94 m
Type	Tubular steel tower
Operating data	
Cut-in wind speed	3 m/s
Rated wind speed	12 m/s
Cut-out wind speed	25 m/s
Generator	
Type	Vestas MAGPower 3.3MW DGIPM 560-12m
Rated power	3075 kW
Frequency	50 Hz±6%
Lifetime	
Design life time	20 years

The V112-3.0 is designed for smooth integration with current and future grid/plant configurations with no need for expensive substation equipment. The turbine's advanced grid compliance system provides fast and powerful active and reactive power regulation to maintain grid stability, as well as excellent fault ride-through capabilities in the event of a grid disturbance.

The V112-3.0 MW applied on Botievo wind farm include such special options:

- Aviation lights;
- Transformer 35 kV.

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.

The environmentally friendly CoolerTop technology cools the water used in the turbine's cooling system by channeling wind into the heat exchanger. This boosts reliability, not least by reducing the number of moving parts and electrical components in the cooling system. CoolerTop reduces the turbine's own energy consumption and keeps sound levels low, making the V112-3.0 an exceptionally neighbour-friendly turbine.

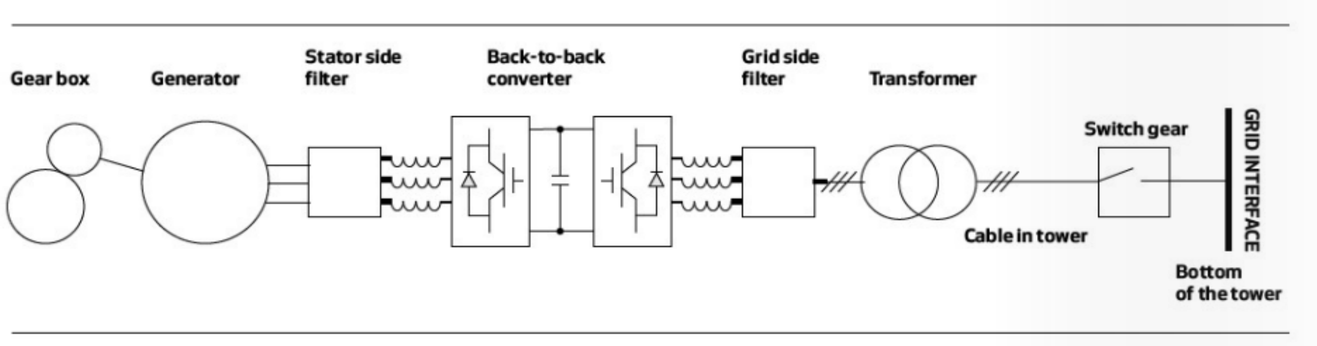

Figure 3. Elements of the Vestas V112-3.0 turbine.

Load reduced operation provides extra security at complex sites, where narrow sectors with extreme gusts and other abnormal wind conditions can occur. Load reduced operation enables the turbine to automatically protect itself against needless wear, which can damage the turbine and shorten the service life of some components.

Figure 4. Vestas V112-3.0 turbine

The pitch system of the V112 3.0 is founded on the highly reliable and proven technology. Permanent magnet generator and full-scale converter are developed by experienced generator technologists. The V 112-3.0 is equipped with a microprocessor controlled pitch control system called OptiTip. Based on the prevailing wind conditions, the blades are continuously positioned to the optimum pitch angle. The pitch mechanism is placed in the hub. Changes of the blade pitch angle are made by hydraulic cylinders, which are able to rotate the blade 95°. Every single blade has its own hydraulic pitch cylinder.

Variable speed ensures a steady and stable electric power production from the turbine. The variable speed system consists of an asynchronous generator with wound rotor, slip rings and power converter. A power converter is connected to the rotor to control the generator at variable speed. The variable speed and the OptiTip system ensure energy optimization, low noise operation and reduction of loads on all vital components.

The system controls the current in the rotor circuit of the generator. This gives precise control of the reactive power, and gives a smooth connection sequence when the generator is connected to the grid. All functions of the wind turbine are monitored and controlled by microprocessor based control units called VMP (Vestas Multi Processor). The VMP controller consists of several individual sub controller systems. Each system has separate operation tasks and communicates via an optical-based network (ArcNet).

The controller enclosures are located in the bottom of the tower, in the nacelle and in the hub.
The VMP-controller is equipped with a battery backup system.
It serves the following functions:

- Monitoring and supervision of the operation;
- Synchronising the generator to the grid during the connection sequence;
- Operating of the turbine during various fault situations;
- Automatic yawing of the nacelle in accordance to the wind direction;
- OptiTip - controlling the blade pitch;
- Reactive power control and variable speed;
- Noise emission control;
- Monitoring of ambient conditions (wind, temperature, etc.);
- Monitoring of the grid.

Figure 5. Vestas V112-3.0 turbines blade on the project site

In the nacelle two accelerometers are mounted for monitoring longitudinal and transverse oscillations.

Oscillations that may occur on the drive train can be monitored by measuring the number of revolutions and can be damped via an active control of the generator. If the oscillations exceed a certain limit, the system is activated in order to stop further escalation of the drive train oscillations.

The data above show that WT proposed for the project reflects state of the art technology; its technical and operating characteristics are much better compared to the other wind turbine suppliers presented on Ukrainian market.

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.

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.

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 would 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 CO_2 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. Therefore, the emission reductions similar to the project ones would not occur in the absence of the proposed project.

A.4.3.1. Estimated amount of emission reductions over the crediting period[8]:

Table 5. Estimated amount of emission reductions during the part of the crediting period within the first commitment period

	Years
Length of the crediting period	1[9]
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
Year 2012	22257
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	22257
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	[10]133542

Table 6. Estimated amount of emission reductions for the part of the crediting period after the end of the first commitment period

	Years
Length of the crediting period	22
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
Year 2013	247278
Year 2014	395310
Year 2015	538821
Year 2016	540297
Year 2017	538821
Year 2018	538821
Year 2019	538821
Year 2020	540297
Year 2021	538821
Year 2022	538821
Year 2023	538821
Year 2024	540297
Year 2025	538821
Year 2026	538821
Year 2027	538821
Year 2028	540297
Year 2029	538821
Year 2030	538821
Year 2031	538821
Year 2032	518040
Year 2033	291543
Year 2034	143511

[8] All values in this section were rounded to integer.

[9] November and December of 2012. Units are in correspondence with the table format.

[10] Annual average of estimated emission reductions over the crediting period is calculated this way: 22257/2*12=133542.

Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	10761543
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	489161

A.5. Project approval by the Parties involved:

The project obtained Letter of Endorsement (#2150/23/7 dated 14/12/2010) from National Environmental Investment Agency of Ukraine. Due to the Netherlands legislation, no LoE from the Netherlands is needed.

Letters of Approval will be obtained later.

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)[11], 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 03[12] , 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[13], 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 13.0.0"[14] 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"[15]. The emission factor for

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[11] URL: http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=2 (last reference – 26/07/2012)

[12] URL:http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf (last reference – 26/07/2012)

[13] URL:http://ji.unfccc.int/Ref/Documents/Guidelines.pdf (last reference – 26/07/2012)

[14]URL:http://cdm.unfccc.int/filestorage/D/Y/P/DYPFI935XBG274NWH6O8CM1KEZR0VU/EB67_repan13_ACM0002_ver13.0.0.pdf?t=N3R8bTkzZTNifDBwd_92GsEM3s639cwBCMBE(last reference – 21/08/2012) Hereinafter referred to as "ACM0002"

[15] URL:http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.1.0.pdf (last reference – 26/07/2012)

Ukrainian electricity grid has been selected based on the analysis of available carbon emission factors studies for Ukraine.

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 7. 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 proposed project activity is installation of a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant).
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 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 project activity is the installation of the new wind power plant.

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/m^2.	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.

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 URL http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L (last reference – 26/07/2012).

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 calculations described in the "Tool to calculate the emission factor for an electricity system".

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 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.

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 updated Energy Strategy of Ukraine for the period until 2030[18]. 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. 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 3 years fluctuated in January 2010 – June 2012 between 3.9 % and 9.8% according to the official statistics of the National Bank of Ukraine[19]. For the reference similar rates in Germany for this period fluctuated between 3.3% to 1.3% according to the European Central Bank[20]. 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[21]:

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[16]Law of Ukraine On Changes To Some Laws of Ukraine About The Introduction of "Green" Tariff URL:http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=601-17 (last reference – 05/08/2012)

[17]Law of Ukraine On Changes To The Law of Ukraine On Electric Energy About The Incentives To Use Alternative Energy Sources. URL: http://zakon1.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1220-17 (last reference – 05/08/2012)

[18] Energy Strategy of Ukraine for the period until 2030, Section 2. URL: http://mpe.kmu.gov.ua/fuel/doccatalog/document;jsessionid=4FF22C71E1C76857BA510C382CF9FFC4?id=222032 (last reference – 05/08/2012)

[19] Statistical Release. Archive, Interest Rates, 2012. URL: http://www.bank.gov.ua/doccatalog/document?id=66235 (last reference – 03/08/2012)

[20] Germany, Harmonised long-term interest rates for convergence assessment purposes URL: http://sdw.ecb.europa.eu/browse.do?node=bbn642 (last reference – 03/08/2012)

[21] Data from Aswath Damodaran, Ph.D., Stern School of Business NYU URL: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html (last reference – 03/08/2012)

Table 8. Risk Premium

Total Risk Premium, %	2008	2009	2010
Russia	6.2	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 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 are of 3.075 MW scale. Most of the country's installed wind power is based on the 107.5 kW and 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% compared to the average of 21% for other world economies. In the 2010 -2015 period Ukraine's average oil consumption is expected to grow on 14%, coal – on 13%, uranium – on 5%[22]. Only supply of coal is not dependent on foreign sources, all other fuels are mostly imported. Prices are on the international level for oil and oil products and 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[23].

f. *National and/or subnational expansion plans for the energy sector, as appropriate*. The Energy Strategy of Ukraine for the period until 2030[24] does not emphasize the substantial 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.

g. National and/or subnational forestry or agricultural policies, as appropriate. According to Ukrainian Fifth National Communication on Climate Change[25], land distribution by types of land-use in Ukraine is the following: agricultural land (71%), forests (17.5%), built areas (4.1%), territories covered with water (4%), open wet lands (1.6%) and other (1.8%). Main regulatory documents in this field in Ukraine are Forestry Reformation and

[22] The updated Energy Strategy of Ukraine for the period until 2030, Section 2.1. URL: http://mpe.kmu.gov.ua/fuel/doccatalog/document?id=222032 (last reference – 03/08/2012)

[23] URL: http://www.parlament.org.ua/index.php?action=news&ar_id=2591&as=0 (last reference – 05/08/2012)

[24] The updated Energy Strategy of Ukraine for the period until 2030. Section 2.1 URL: http://mpe.kmu.gov.ua/fuel/doccatalog/document?id=222032 (last reference – 05/08/2012)

[25] Ukrainian Fifth National Communication on Climate Change, p.33

URL: http://unfccc.int/resource/docs/natc/ukr_nc5rev.pdf (last reference – 05/08/2012)

Development Concept, State Program "Forests of Ukraine"; Strategy for land-use and land-distribution in Ukraine is absent[26]. The project is realized at numerous small plots of land, allocation of which was approved by the appropriate governmental institutions.

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 (OM) 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[27] (ERUPT Baseline)*. The ERUPT baseline was based on the following main principles: based mainly on indirect data sources for electricity grids; 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. 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

[26]URL: http://www.uceps.org/ukr/files/category_journal/NSD107_ukr_1.pdf (last reference – 05/08/2012)

[27]URL: http://ji.unfccc.int/CallForInputs/BaselineSettingMonitoring/ERUPT/GuidVol1.doc (last reference – 05/08/2012)

the Energy efficiency at Energomashspetsstal (EMSS), Kramatorsk, Ukraine"[28], project 0035 "Utilization of Coal Mine Methane at the Coal Mine named after A.F. Zasyadko"[29].

3) *Development of the electricity carbon emission factors for Ukraine[30], 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)*[31]. 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[32]. 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.

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[28] URL: http://ji.unfccc.int/JI_Projects/DB/VY889VYDTR7YGFRYTY9TXLB4AWBLUR/Determination/Bureau%20Veritas%20Certification1246891334.73/viewDeterminationReport.html (last reference – 05/08/2012)

[29] URL: http://ji.unfccc.int/UserManagement/FileStorage/1E3ZT7ZUJQ04TYPH3SBEY8BTBDLF1L (last reference 26/07/2012)

[30] URL:http://www.ebrd.com/downloads/sector/eecc/Ukraine_English.pdf(last reference – 26/07/2012)

[31] URL: http://www.neia.gov.ua/nature/doccatalog/document?id=125381(last reference – 26/07/2012)

[32] URL: http://www.neia.gov.ua/nature/doccatalog/document?id=127171 (last reference 26/07/2012);
URL: http://www.neia.gov.ua/nature/doccatalog/document?id=127172 (last reference 26/07/2012);
URL: http://www.neia.gov.ua/nature/doccatalog/document?id=126006 (last reference – 26/07/2012);
URL: http://www.neia.gov.ua/nature/doccatalog/document?id=127498 (last reference – 26/07/2012)

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 "Calculation methodology for specific carbon dioxide emissions from electric energy production at thermal power plants and its consumption", National Environmental Investment Agency 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:

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

Where:

BE_y - Baseline emissions in period y (tCO_2e);

$EG_{PJ,y}$ - 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 period y, MWh;

$EF_{grid,produced,y}$ - Specific CO_2 emission factor for grid-connected thermal power plants electricity generation, 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 that is produced and fed into the grid as a result of the implementation of the JI project activity in period y
Time of determination/monitoring	Continuous measurement and at least monthly recording
Source of data (to be) used	Project activity site
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 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 grid-connected thermal power plants electricity generation
Time of determination/monitoring	Ex-post as provided by the DFP of Ukraine on the annual basis
Source of data (to be) used	NEIA estimate for 2011: URL:http://www.neia.gov.ua/nature/doccatalog/document?id=127498 (last reference – 24/02/2012)
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 dioxide 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.

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 06.0.0[33] 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 06.0.0.

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

[33] URL: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf(last reference – 14/08/2012)

Table 9. 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 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"[34], 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 power plants 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.

[34] URL: http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=575%2F97-%E2%F0(last reference – 05/08/2012)

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 Power". 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 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[35].

The analysis took in consideration the following assumptions:

1) Initial (1st stage) investment execution period is 2011. Date of investment decision taking is April 2010.
2) Analysed operation period is 10 years and 2 months.
3) Calculations have been done in EUR.
4) Fair value of the assets has been calculated for the last year of analysed operation period and applied as a positive cash flow.
5) Depreciation and any taxes (except for mandatory overhead payments) have not been taken into account.
6) Calculation of the cash flows has been performed in constant prices using real WACC(weighted average cost of capital). Revenue from sales of assets is assumed to be equal to depreciated value of project equipment at the end of the analyzed operation period.

The project investment costs include, inter alia:

- Purchase price for wind turbines;
- Construction of substation, construction 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;

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

- General operating expenses (e.g. office expenses etc.);
- Maintenance expenses.

As an appropriate discount rate for the NPV calculation in this case the cost of equity was used. The WACC is set at a level of 15.63% for the NPV calculation. 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 10. Financial indicators

Base case financing structure	**NPV, EUR** thousands
NPV	-69 489
Benchmark NPV	>0

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 11. Sensitivity analysis

Scenario	**NPV, EUR thousand**
Base Case	-69 489
Scenario 1 (Investment cost -10%)	-46 811
Scenario 2 (Electricity production +10%)	-52 056
Scenario 3 (Investment cost +10%)	-92 167
Scenario 4 (Electricity production -10%)	-112 281

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

According to the "Tool for the demonstration and assessment of additionality" version 06.0.0 this step is optional and can be omitted.

Step 4: Common practice analysis

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

Total wind potential of Ukraine is estimated at 30-42 TWh , while the total installed capacity of wind power comes close to 151 MW.

The proposed project activity is one of five large scale modern wind power development constructed in Ukraine - Ochakovskiy WPP (installed capacity 300 MW), Priazovskiy WPP (installed capacity 500 MW), Sivashskiy WPP (installed capacity 350 MW), and Mangush WPP (installed capacity – 700 MW). All of these wind power plants are using benefits of JI mechanism. The first WPP of such kind was built in Novoazovsk, Donetsk region. PDD of the project "Wind Park Novoazovskiy in Ukraine" is published at UNFCCC web-page[36] and has received a positive determination opinion.

In Ukraine the turbines of 3.075 capacity were not previously used for such projects. The first and only operating turbine of type V112-3.0 MW in Ukraine is located near Novorossiyske village, Khersonska oblast. According to the "Tool for the demonstration and assessment of additionallity" version 06.0.0, as this project totally consists of Vestas turbines of 3.075 capacity, which is new technology for Ukraine, it cannot be considered as a part of common practice.

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)"[37]. Most of the projects, however, did not proceed with construction. Ukraine has very limited experience in operating large wind turbines or large wind parks. Most of 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. 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 06.0.0, the proposed project is additional.

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.

[36] URL:http://ji.unfccc.int/JI_Projects/DB/ZRW4ODNCBPRNPTMKBTHODJNIUAKVDD/PublicPDD/VJWRWVD1TM0UOSHOZ7GC44P8SE897T/view.html (last reference – 05/08/2012)

[37] URL:http://ji.unfccc.int/JI_Projects/DB/ZYXHPSBM2ZDNCD22JT73V6KWD8UL7Q/PublicPDD/C34A1HSSBI85SLR5F9EXZ6HR7RGJ0Z/view.html (last reference – 26/07/2012)

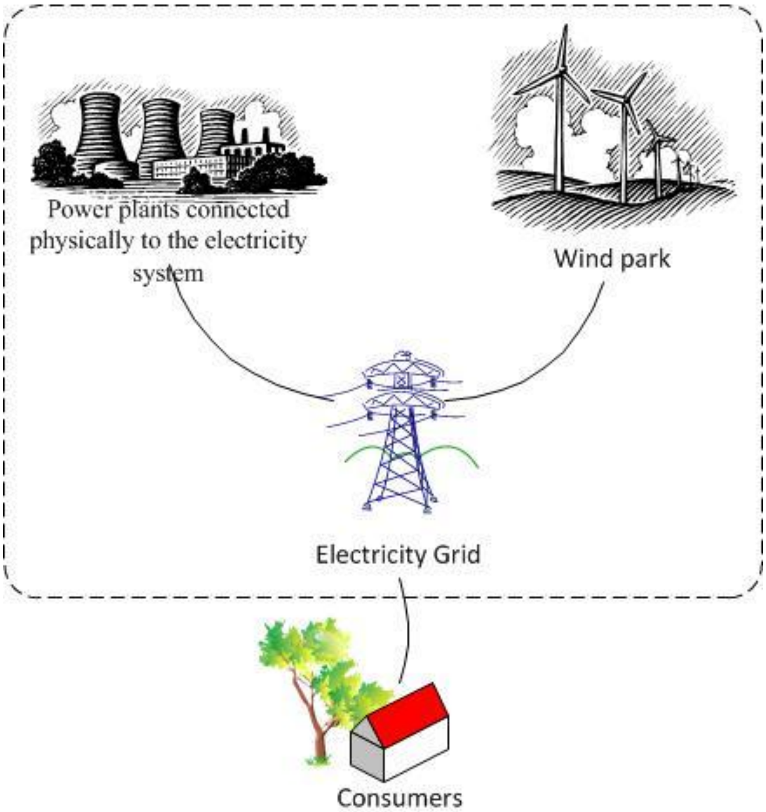

Figure 6. Project Boundary

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

Table 12. Emissions sources included in or excluded from the project boundary

Source		Gas	Included	Justification / Explanation
Baseline	CO_2 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 baseline setting: 26/07/2012

Name of person/entity setting the baseline: Natallia Belskaya JI Consultant Global Carbon B.V.
Phone: +38 050 410 26 79
E-mail: belskaya@global-carbon.com

Global Carbon B.V. is the project participant and contact details are available in Annex 1.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Starting date of the project is 16/04/2010. This is the date when the rental agreement was signed.

C.2. Expected operational lifetime of the project:

The operational lifetime of the project is 21 year and 11 months or 263 months.

C.3. Length of the crediting period:

Start of the crediting period: 01/11/2012.

End of the crediting period: 30/09/2034.

Length of the crediting period: 21 years and 11 months or 263 months.

Length of the part of crediting period within the first commitment period of the Kyoto Protocol: 0 years and 2 months or 2 months (01/11/2012-31/12/2012).

Length of the part of crediting period after the first commitment period of the Kyoto Protocol: 21 years and 9 months or 261 months (01/01/2013-30/09/2034).

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, 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 metering of all electricity delivered to the grid and consumed from the grid also 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"[38]. 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.

[38] URL:http://www.er.energy.gov.ua/doc.php?c=1228 (last reference – 26/07/2012)

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 period y	According to ACM0002	tCO_2e	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 period y (tCO_2e).

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 period *y*	Project activity site	MWh	m	Continuous wit monthly recording	100%	Electronic and Paper.	This parameter is used in the normal commercial activity of the facility.
3	$EF_{grid,produced,y}$ - Specific CO_2 emission factor for grid-connected thermal power plants electricity generation	Official information of Ukrainian DFP	tCO_2/MWh	e	Ex-post as provided by the Ukrainian DFP on the annual basis	100%	Electronic and paper	This emission factor is the latest carbon dioxide emission factor for Ukrainian electricity grid approved by the DFP of Ukraine.

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 period y, tCO_2e;

$EG_{PJ,y}$ - 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 period y, MWh;

$EF_{grid,produced,y}$ - Specific CO_2 emission factor for grid-connected thermal power plants electricity generation, 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:

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

Where:

ER_y - Emission reductions in period *y* (tCO_2e);

BE_y - Baseline emissions in period *y* (tCO_2e);

PE_y - Project emissions in period *y* (tCO_2e).

Results of the emissions calculations above are presented in metric tons of carbon dioxide equivalent (tCO_2e). The metric ton of carbon dioxide equivalent is equal to the metric ton of carbon dioxide (tCO_2). Therefore 1 tCO_2e = 1 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[39] 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

[39] *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

#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 Ukrainian DFP on the annual basis and made public.

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 of commercial accounting 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:

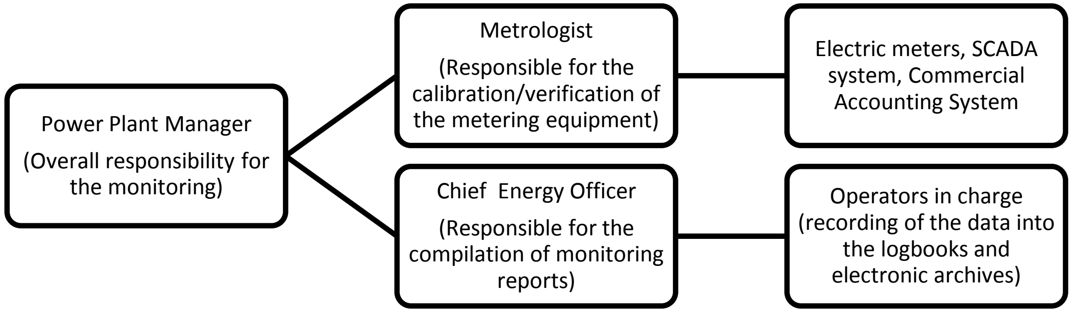

Figure 5. Operational and Management structure

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

Date of establishing the monitoring plan: 14/10/2011

Name of person/entity establishing the monitoring plan: Natallia Belskaya JI Consultant Global Carbon B.V.
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E-mail: belskaya@global-carbon.com

Global Carbon B.V. is the project participant and contact details are available in Annex 1.

SECTION E. Estimation of greenhouse gas emission reductions[40]

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 13. Estimated baseline emissions for the part of crediting period within the first commitment period of the Kyoto Protocol

Parameter	Unit	2012[41]	Total
Baseline emissions due to grid connected power generation	[tonnes of CO_2 equivalent]	22257	22257
Total Baseline emissions during the crediting period	[tonnes of CO_2 equivalent]	22257	22257

[40] All values in this section are rounded to integer.

[41] Crediting period covers November and December of 2012

Table 14. Estimated baseline emissions for the part of the crediting period after the end of 2012

Year	Baseline emissions due to grid connected power generation, tonnes of CO_2 equivalent	Baseline emissions after the crediting period, tonnes of CO_2 equivalent
2013	247278	247278
2014	395310	395310
2015	538821	538821
2016	540297	540297
2017	538821	538821
2018	538821	538821
2019	538821	538821
2020	540297	540297
2021	538821	538821
2022	538821	538821
2023	538821	538821
2024	540297	540297
2025	538821	538821
2026	538821	538821
2027	538821	538821
2028	540297	540297
2029	538821	538821
2030	538821	538821
2031	538821	538821
2032	518040	518040
2033	291543	291543
2034	143511	143511
Total	**10761543**	**10761543**

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

Table 15. Estimated emission reductions for the part of crediting period within the first commitment period of the Kyoto Protocol

Parameter	Unit	2012	Total
Emission reductions during the crediting period	tonnes of CO_2 equivalent	22257	22257

Table 16. Estimated emission reductions for the part of the crediting period after the end of 2012

Year	Emission reductions after the crediting period, tonnes of CO_2 equivalent
2013	247278
2014	395310
2015	538821
2016	540297
2017	538821
2018	538821
2019	538821
2020	540297
2021	538821
2022	538821
2023	538821
2024	540297
2025	538821
2026	538821
2027	538821
2028	540297
2029	538821
2030	538821
2031	538821
2032	518040
2033	291543
2034	143511
Total	**10761543**

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

Table 17. Estimated balance of emissions under the proposed project over the part of crediting period within the first commitment period of the Kyoto Protocol

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emissions reductions (tonnes of CO_2 equivalent)
Year 2012	0	0	22257	22257
Total (tonnes of CO_2 equivalent)	0	0	22257	22257

Table 18. 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 of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emissions reductions (tonnes of CO_2 equivalent)
Year 2013	0	0	247278	247278
Year 2014	0	0	395310	395310
Year 2015	0	0	538821	538821
Year 2016	0	0	540297	540297
Year 2017	0	0	538821	538821
Year 2018	0	0	538821	538821
Year 2019	0	0	538821	538821
Year 2020	0	0	540297	540297
Year 2021	0	0	538821	538821
Year 2022	0	0	538821	538821
Year 2023	0	0	538821	538821
Year 2024	0	0	540297	540297
Year 2025	0	0	538821	538821
Year 2026	0	0	538821	538821
Year 2027	0	0	538821	538821
Year 2028	0	0	540297	540297
Year 2029	0	0	538821	538821
Year 2030	0	0	538821	538821
Year 2031	0	0	538821	538821
Year 2032	0	0	518040	518040
Year 2033	0	0	291543	291543
Year 2034	0	0	143511	143511
Total (tonnes CO_2 equivalent)	0	0	10761543	10761543

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:

First stage of EIA[42] has been done following the strict environmental guidelines of the Ukrainian State Construction Standard DBN A.2.2.-1-2003[43] (Title: "Structure and Contents of the Environmental Impact Assessment Report (EIA) for Designing and Construction of Production Facilities, Buildings and Structures").

Annex E 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 Environmental Protection 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 Zaporizhzhya 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 are described in EIA made by Donbass National Construction and Architecture Academy's Scientific Research and Project Development Laboratory "Urban and Land Development" which gave a positive conclusion about reasonableness of constructing the WPP on the proposed territories. The EIA is under approval by the relevant Ukrainian authorities mandated by the Ministry of Environmental Protection of Ukraine.

Main environmental impacts are considered in EIA and mitigation measures as follows:

1) ***Impact on land use***: The territory of Botievska WPP does not seize nature reserve areas, national parks and any other protected territories. Land plots allocated for construction of WPTs were used for agricultural purposes. As this land will be taken out of the traditional agricultural use, special land compensating procedures are planned on the territory. The fertile soil layer will be taken off and saved for recultivation and territory planning purposes. All wind turbines will be situated along the tree belt areas. The construction works are supposed to minimize the influence on floristic consortiums during building and operation of WPTs and use of temporary facilities. According to EIA, physical constructions, built under the project, do not have a significant effect on flora of the allocated land. Mitigation measures described in EIA were found satisfactory.

2) ***Noise and infrasound:*** this impact was found within permitted levels regarding remoteness of the WTGs from populated areas and mitigation measures provided for in project design and operation instructions.

[42] Environmental Impact Assessment

[43] *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

3) ***Negative impacts during construction:*** these impacts are to be compensated by mitigation measures provided for in project documentation regarding construction phase, which was developed meeting the requirements of local legislation on sanitary norms and soil recultivation, as was mentioned above.

4) ***Blade reflection.*** Turbines are oriented in such way, that the shadows of WPTs do lay over houses, situated in the thin sectors (South East and SouthWest from the towers), where the stroboscobic shade and light effect can be observed.

5) ***Impact on birds and bats:*** According to the shore and swamp birds migration periods special exploitation regime for the wind power turbines, situated close to the shore, will be established if needed. It is recommended by EIA to provide ornithological complexes seasonal dispersion monitoring after WPP installation.

SECTION G. Stakeholders' comments

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

Information about plans to launch the project was published in newspaper "Melitopolskie vedomosti" on 27/07/2010 (URL: http://www.mv.org.ua/?news=23476). Project participants have also organized meetings with the local stakeholders during the project development period. Specifically, such meeting has been organized on 03/08/2010. 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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Mobile:	
Personal e-mail:	AinbinderGA@dtek.com
EDRPOU Code (Code in the State Unified Register of Companies and Enterprises of Ukraine):	36168821
Types of operations according to KVED (Classifier of Economic Operations):	40.11.0 Electrical power production 40.12.0 Electrical power delivery 45.21.5 Construction of power generation facilities, extraction and refining industry 45.21.4 Construction of local pipelines, telecommunication and power transmission lines 45.21.3 Construction of long distance pipelines, telecommunication and power transmission lines

Organisation:	Global Carbon B.V. (registration date 30/08/2004)
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Personal e-mail:	focalpoint@global-carbon.com

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 period *y*	MWh	Data of project owner based on wind parameters measurement and estimation
2	$EF_{grid,produced,y}$ - specific emissions factor for grid-connected thermal power plants electricity generation	tCO_2/MWh	Specific indirect carbon dioxide emission factor from electricity consumption by the 2nd class electricity consumers according to the Procedure for determining the class of consumers, approved by the National Electricity Regulatory Commission of Ukraine from August 13, 1998 # 1052 NEIA estimate for 2011: URL:http://www.neia.gov.ua/nature/doccatalog/document?id=127498(last reference – 05/08/2012)

Annex 3

MONITORING PLAN

Please, refer to section D of this PDD.

Annex 4

ADDITIONALITY INFORMATION

WACC 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 weighted average cost of capital (WACC) is the weighted average of the cost of equity and the cost of debt based on the proportion of debt and equity in the company's capital structure. The proportion of debt and equity in the described project is represented as 50/50. The WACC can be used as a discount rate for a project's projected cash flows.

The WACC is calculated by the following formula:

$$WACC = Equity\_Ratio \times Real\_ROE\_Rate + Debt\_Ratio \times Real\_Lending\_Rate$$

Where

$Equity\_Ratio$ – equity ratio in the projects investment structure

$Debt\_Ratio$ - debt ratio in the projects investment structure

$Real\_ROE\_Rate$ - amount of net income returned as a percentage of shareholders equity. Return on equity measures a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested.

$Real\_Lending\_Rate$ - average commercial foreign currency lending rate in Ukraine in 2005-2008

Even though it may be argued that on-shore installation of wind turbines of 3.075 MW 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:

- 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 one of the first large-scale wind power plants 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 3+ MW class have been widely installed throughout the world in the few recent years the technology itself is not more than 10 years old (URL: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 (last reference – 05/08/2012))

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.

Rate description	Level p.a.	Source:
Risk-free rate (long term returns on US Government bonds)	3.00%	URL:http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf (last reference – 05/08/2012) 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)	6.50%	URL:http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf (last reference – 05/08/2012) Appendix Default values for the expected return on equity Para 3
Country risk premium for Ukraine	8.25%	URL:http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem09.xls (last reference – 05/08/2012) Value as of January 2010
Expected return risk (introduction of the new technology for Ukraine)	6.50%	URL: http://www.libinfo.org/nsi/index.php?file=z0711009&down=z0711009.rar Page 56 (Low to Average risk, middle value from the range of 6-7%(last reference – 17/08/2012)
Real ROE rate	21.93%	
Real lending rate	9.32%	URL:http://www.bank.gov.ua/files/4-Financial_markets(4.1).xls (last reference – 17/08/2012)
WACC at 50/50 capital structure can be derived as follows:	0.5×21.93%+0.5×9.32% = 15.63%	
Where:		
Inflation in Euro Area (Average 1997 - 2010)	1.90%	URL: http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=en&pcode=tec00118&tableSelection=1&footnotes=yes&labeling=labels&plugin=1 (last reference – 05/08/2012)

The figure of WACC 15.63% serves as the discount rate for NPV calculation of the project.