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

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SECTION A. General description of the project

A.1. Title of the project:

Photovoltaic Solar Power Plant "Omao Solar"

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

Document Version: 1.1
Date: 30 of November 2011

A.2. Description of the project:

"Omao Solar" Photovoltaic Solar Power Plant (hereinafter referred to as "Omao Solar PSPP") developed by the Austrian-based Activ Solar GmbH (hereinafter referred to as "Activ Solar") is the Joint Implementation (JI) project in the Autonomous Republic of Crimea, Ukraine. Omao Solar PSPP with its installed capacity of 20 MW is expected to be connected to the Ukrainian energy grid. This project includes a full cycle of construction of the new Omao Solar PSPP, including the project development, construction, installation, start-up, connection of all necessary components, and the PSPP commissioning.
The project development started in January 2011. Omao Solar LLC is the project owner.

Omao Solar PSPP covers the area of 40 hectares. This land plot serving as Omao Solar PSPP location is leased for 49 years. The plant is equipped with 87,282 photovoltaic modules which are capable to ensure the annual electricity generation of 25 thousand MWh. Power produced by the plant will help to cover electricity needs of about 5,000 households. The project cost exceeds 73.2 EUR million.

The proposed JI project completely complies with the Ukrainian energy priorities set out in the Energy Strategy of Ukraine until 2030[1]. The Strategy foresee increasing electricity consumption with simultaneous economy growth within the next years. Key priorities of the Strategy include increasing energy efficiency on the demand side, decreasing dependency on imported energy, as well as increased share of alternative and renewable sources in power generation. The proposed JI project will result in reduced consumption of fossil fuels required for electricity generation and supplies in the Ukrainian energy grid by means of delivering solar-powered electricity. Therefore, the proposed JI project meets priorities of the state energy strategy, while it ensures reduction of the fossil fuel consumption for electricity supply to the Ukrainian energy grid. Another important component of the proposed JI project's positive impact is increased reliability of electricity supply as a result of reduced load on the Ukrainian energy grid.
Moreover, the proposed JI project has other positive social and economic impacts:
- a positive environmental impact as a result of use of clean technology of electric power production under the project;
- the local community and Omao Solar PSPP will be provided with long-term jobs due to the power plant operation in the future;
- additional local budget revenues from taxes and rental of the land where Omao Solar PSPP is located.

Thus, the JI project implementation will result in reduction of greenhouse gas (GHG) emissions, in particular, carbon dioxide, due to replacement of the electricity generation by power plants of Ukraine with solar-powered electricity generation.

[1] http://zakon.rada.gov.ua/signal/kr06145a.doc

A.3. Project participants:

Table 1. Project participants

Party involved	Legal entity project participants (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ukraine (host Party)	Omao Solar LLC	No
Finland	GreenStream Network Plc	No

Omao Solar LLC

Omao Solar LLC is the owner of Omao Solar PSPP. On 28 July 2011, the National Electricity Regulatory Commission (NERC) of Ukraine approved the green electricity tariff[2] for Omao Solar LLC.

The project developer Activ Solar is the international group of companies based in Vienna, Austria. It focuses on development and implementation of solar technologies. The company's key activities are planning, financing, and implementation of the solar energy projects, in particular, development and construction of solar photovoltaic parks, as well as manufacturing of silicon products for solar panels. At the end of 2008 Activ Solar was joined by the OJSC Semiconductor Plant located in the city of Zaporizhzhya. One of the Semiconductor Plant's key activities is production of trichlorosilane (TCS) and polycrystalline silicon which are main components for manufacturing of photovoltaic modules meant to be used in solar power industry. Today, the plant can annually produce up to 3,000 t of polycrystalline silicon. Moreover, Activ Solar is a member of the European Photovoltaic Industry Association (EPIA) being a part of the European Renewable Energy Council (EREC).

GreenStream Network

GreenStream Network (GSN) is a group of companies with approximately 60 employees; offices are located in Germany, Finland, Latvia, Norway, Sweden, Estonia and China. The headquarters is located in Finland (Helsinki). GSN is offering advisory services, brokerage, financial, and other services related to renewable energy, emissions trading, such as the EU ETS, and greenhouse gas offset projects, such as JI, CDM and voluntary standards. GSN is a member of the IETA (International Emissions Trading Association), the RECS (Renewable Energy Certificate System), and a registered participant in the Paris-based exchange Bluenext Carbon Exchange for EU allowances. GSN key personnel has a long experience in energy markets, emissions trading, green certificates, CDM/JI project development and advisory activities. GSN has participated, among others, in one of the first transatlantic CO_2 trades, in the first EU emission allowance trade between Nordic companies, in the first JI and CDM projects developed by Nordic governments, in the establishment of some of the first energy companies in the Baltic States' liberalized energy markets, and in numerous advisory assignments for energy and industrial enterprises, as well as public organizations. GSN has closely followed the key JI and CDM countries' climate policies and the developments of the carbon markets, e.g. through the IETA (activities in several working groups) and BALTREL cooperation (e.g. chairmanship of the Task Force on JI), the World Bank (cooperation on marketing the CDM-fund Community Development Carbon Fund to

[2] http://www.nerc.gov.ua/control/uk/publish/article/main?art_id=115665&cat_id=34446

companies in Northern Europe), and NEFCO (cooperation on preparing documentation for and launching the JI-fund Testing Ground Facility to companies).

A.4. Technical description of the project:

A.4.1. Location of the project:

Omao Solar PSPP, where the proposed JI project implementation is planned, is located in Karyerne village, Okhotnykove Village Council, in the centre of Saksky District, western part of the Autonomous Republic (AR) of Crimea, close to the northern bank of the arm of Sasyk lake.

A.4.1.1. Host Party(ies):

Ukraine.

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

Autonomous Republic of Crimea, Saksky District, Okhotnykove Village Council.

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

Karyerne village.

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

Physical location of the project is the territory of Omao Solar PSPP, Karyerne village, Okhotnykove Village Council, Saksky District, the AR of Crimea, Ukraine.

Please see Figures 1 and 2 for location of Crimea, project location and Karyerne village.
Omao Solar PSPP coordinates are as follows: 45° 16'56.98" north latitude, 33°35'58.19" east longitude.

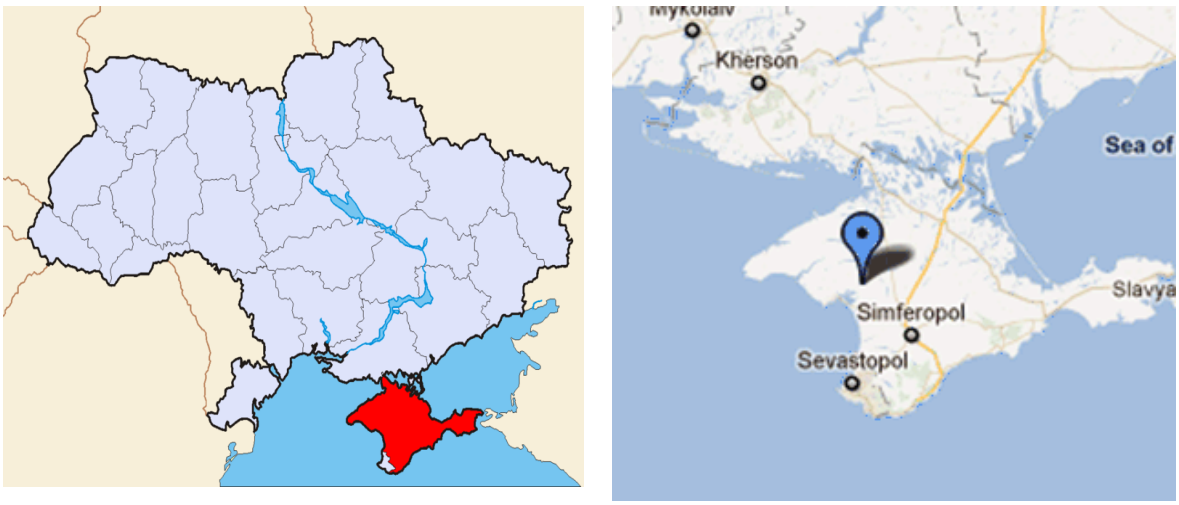

Figure 1. Map of Ukraine, location of the Autonomous Republic of Crimea and the project location

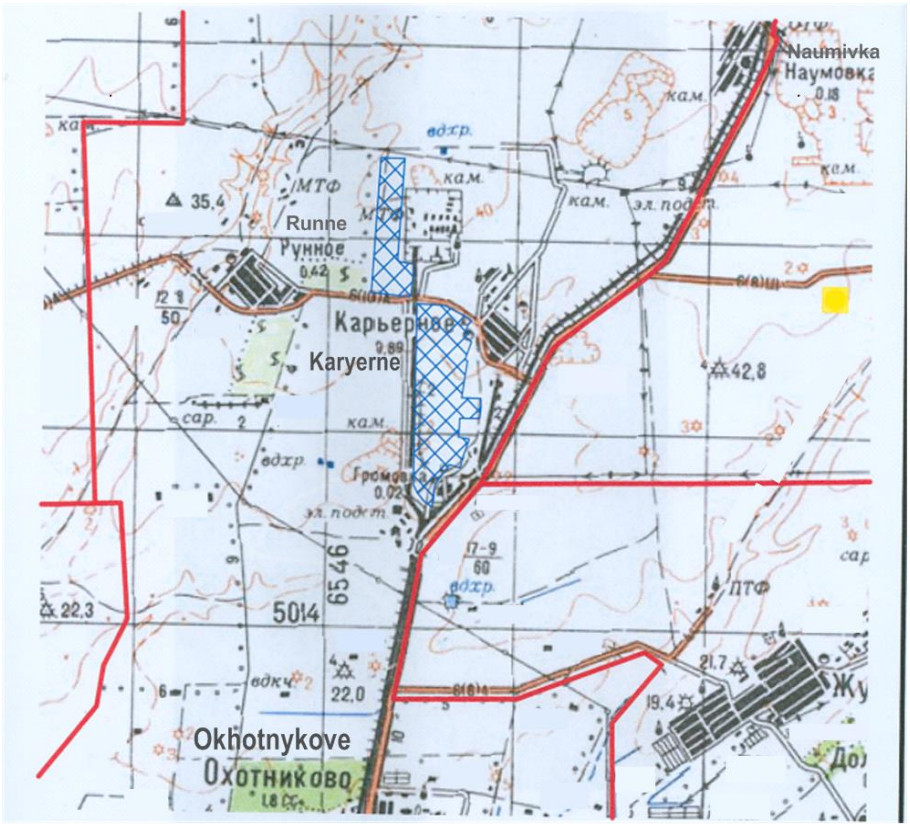

Figure 2. Karyerne village and surrounding settlements.

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

The proposed JI project envisages the full cycle of construction of the new Omao Solar PSPP, including the project development, construction, installation, start-up, connection of all necessary components and PSPP commissioning.

The new Omao Solar PSPP belongs to the solar photovoltaic system where solar radiation is directly transformed into electric power by solar cells (photovoltaic panels). Please see Figure 3 for a simplified functional chart of the solar photovoltaic power plant.

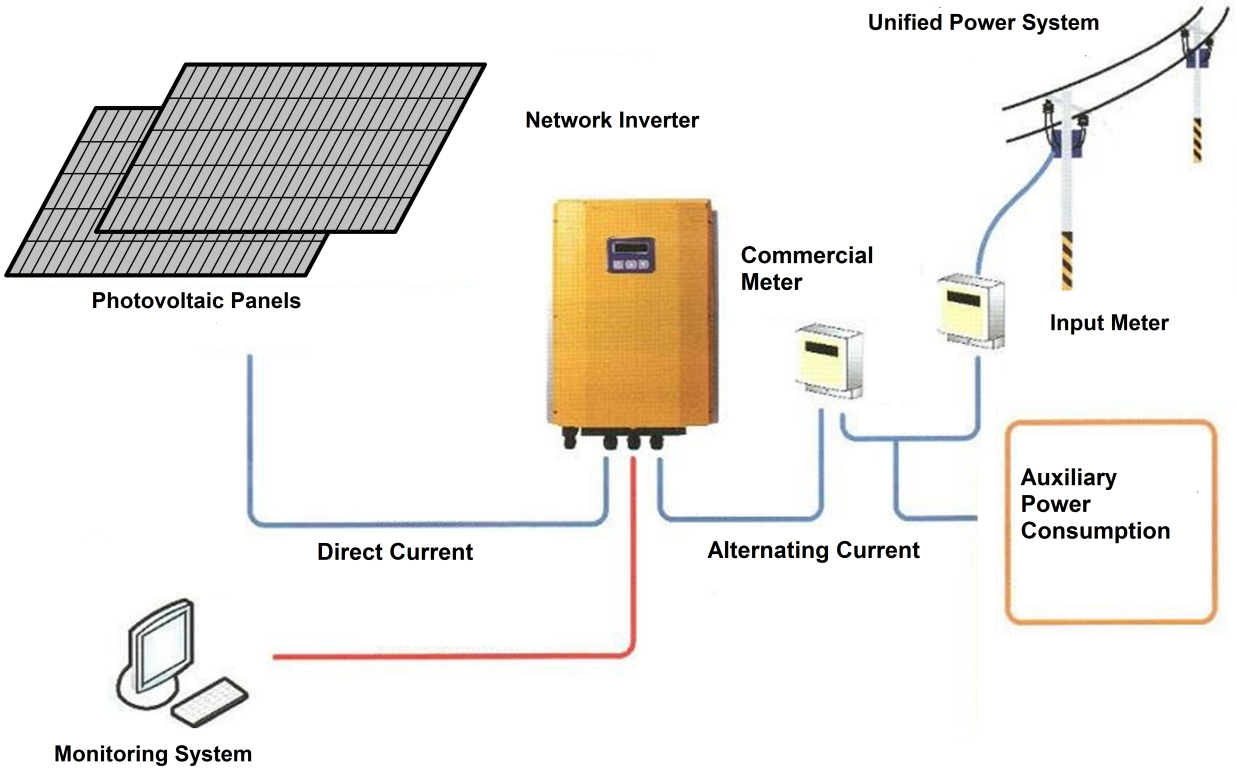

Figure 3. Simplified functional chart of the solar photovoltaic power plant.

The process of electricity production by the solar photovoltaic power plant is as follows. Photovoltaic panels capturing sunrays transform solar energy into direct current electrical voltage. Then, the direct current electrical voltage is supplied from photovoltaic panels to network inverters in order to convert the direct current into alternating current and ensure parameter matching for connection to the unified energy grid. Power supplied to the grid and consumed to cover the power plant needs is measured by commercial and input electric meters. The monitoring system ensures proper monitoring of all necessary electrical parameters.

More detailed measures of Omao Solar PSPP construction, as well as relevant technologies and components of the solar photovoltaic power plant are provided below.

Construction of necessary facilities

Omao Solar PSPP facilities include support structures, piles, mountings for installation of photovoltaic panels, as well as rooms for location of necessary electrical equipment of the photovoltaic power plant. Design of the photovoltaic panel mounting system makes it possible to form 25° tilt angle. Moreover, the design of mountings allows placing solar modules in rows to ensure direct sunlight access and humidity supply to the soil below. The facility height facilitates protection from heavy snow showers.

Construction of all necessary facilities of the power plant started in April 2011.

Installation of photovoltaic panels

Photovoltaic panels are the key components of Omao Solar PSPP. They are assembled from separate solar cells. The whole photovoltaic unit of the power plant is made of a set of photovoltaic panels set on the support structure. Figure 4 shows the assembled and installed photovoltaic panels.

Figure 4. Photovoltaic panels installed.

Solar cell (photoelectric converter) operation principle is based on the inner photoeffect of semi-conductors.
The technology based on the semi-conductor material properties is used for solar cell production. Solar cell operation principle and the technology used are described below.
As it was mentioned before, polycrystalline silicon is the key component of solar cells.
Polysilicon chucks are melted down and crystallized to form blocks (ingots). Received ingots are then sliced into ultra-thin wafers. In order to enhance their conductivity, impurities are introduced into silicon wafers, a process known as “impurity doping” or "doping". The top layer is doped with phosphorous ("n-type" layer), and the bottom one is doped with boron ("p-type" layer).
Due to boron properties, the “p-type” layer has relatively fewer electrons, which are equivalent to positive charges (also known as "holes”).On the other hand, phosphorus has relatively more electrons compared to silicon. Thus, the “n-type” layer has extra free electrons that are not as tightly bound to the atom as the others.
When two layers come in contact, free electrons from the n-side travel to the p-side; and electrons and holes combine at the junction between the layers. As soon as the balance is reached, a diffuse electrical field is established at the p-n junction, making it easy for electrons to move from the p-side to the n-side, but not the opposite direction. When the sunlight photons hit a solar cell, it releases free electrons. Electrons that are close to the field get under its influence and are carried across the p-n junction from the p-side to the n-side, disrupting the electrical neutrality.
When an external circuit is available, these electrons return to the p-layer to remove the imbalance, which results in the electric current.[3]

The principle of photoeffect in a solar cell is depicted on the diagram in Figure 5.

[3] http://activsolarat.colocall.com/technology/-how-it-works

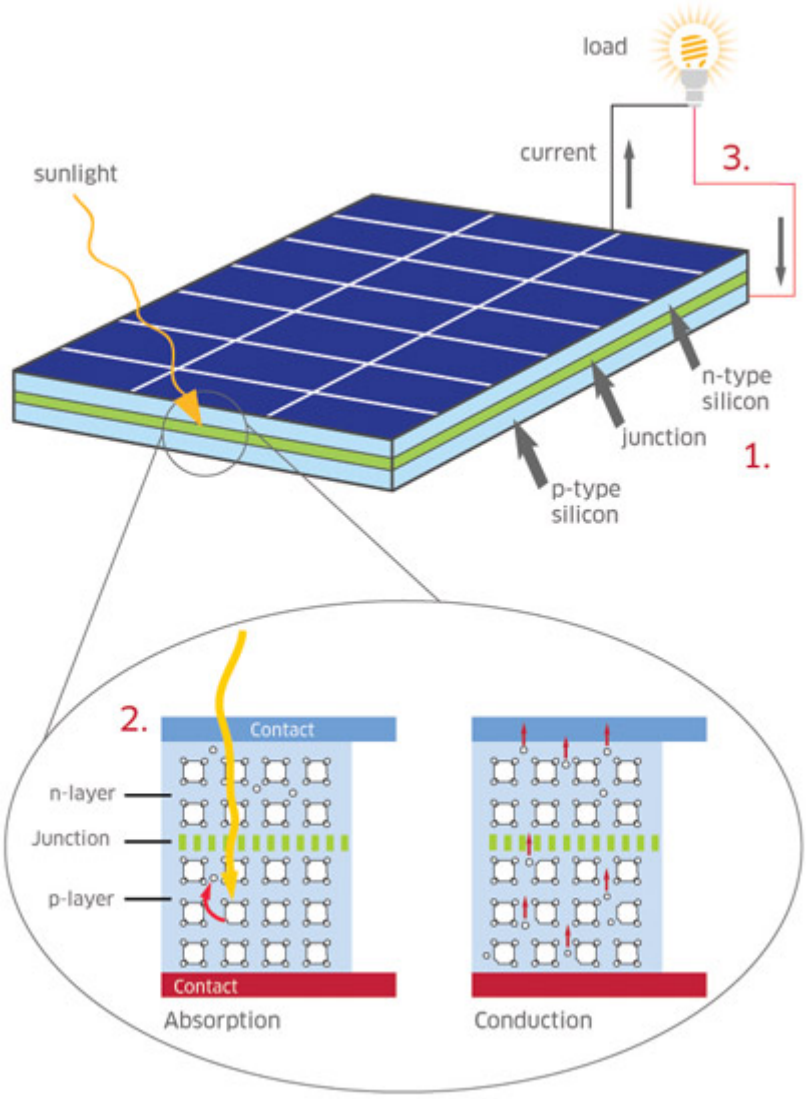

Figure 5. Photoeffect principle in the solar cell.

1. – A solar cell consists of: "n-type" layer and "p-type" layers forming a p-n junction.

2. – Electric current generation as a result of solar radiance upon availability of the external electric circuit.

3. – External electric loading and electric current direction.

Five types of photovoltaic panels (modules) are installed in Omao Solar PSPP. Photovoltaic module types, their number, and key technical characteristics are provided in the Table 2 below:

Table 2. Photovoltaic modules types, numbers and technical characteristics

Module type	220P-60	225P-60	230P-60	230W	235W
Number, pcs.	6,315	23,184	18,032	18,925	20,826
Initial capacity, W	220	225	230	230	235
Efficiency factor, %	13.44	13.74	14.05	13.9	14.2

Installation of all 87,282 photovoltaic panels in Omao Solar PSPP was completed in early May 2011.

Electric equipment installation and connection

Inverter stations

Inverter station is a complex of technical equipment for transformation of parameters of electric power from solar modules and its further power transmission to the Ukrainian energy grid, as well as for monitoring and logging of electric parameters. Inverter station components are located in the concrete frame of (5.38 x 2.98 x 3.56) m.

On the whole, 40 inverter stations operate in Omao Solar PSPP.

The inverter station's key component is a network inverter. Each inverter station is equipped with 2 network inverters.
Network inverters are important parts of the solar photovoltaic power plant to be connected to the Ukrainian energy grid. While photovoltaic panels are capable to ensure the direct current, network inverters convert the direct current from photovoltaic panels into the alternating current with electric parameters necessary for matching and further transmission to the energy grid.

Moreover, inverter stations include a distributor, distribution transformer and a local electrical data logger (PV.LoG).

Parameter monitoring system

The monitoring system ensures proper supervision and control of all necessary electrical parameters of the power plant, such as electric current, electric power, voltage and frequency of the alternating electric current. Monitoring these parameters is an integral part of the process of electricity generation and transmission to the Ukrainian energy grid.

In addition, the monitoring system provides collection and processing of additional data , such as solar radiation, ambient air temperature, barometric pressure, relative humidity, wind speed, and other parameters to ensure reliable operation of the solar power plant.

A simplified diagram of the parameter monitoring system is provided in Figure 6.

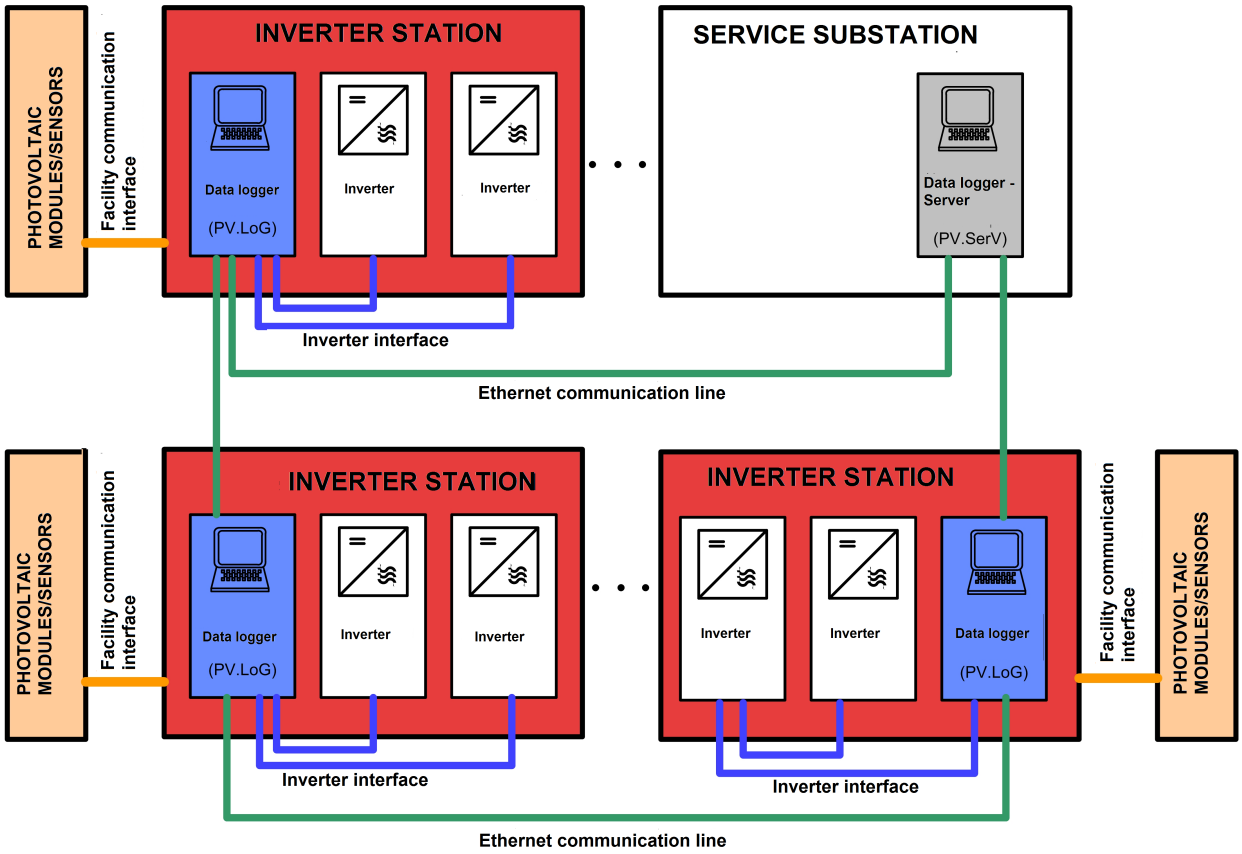

Figure 6. Simplified parameter monitoring system

Basic electrical parameters, current solar radiation data, and other climatic variables are transmitted from relevant devices and sensors nearby photovoltaic panels to the inverter stations. This data is recorded and processed by local data loggers (PV.LoG) placed in specific sections of inverter stations. All local data loggers of inverter stations are connected to the central data logger (PV.SerV) which calculates data and server functions as well. Remote control of components of the parameter monitoring system is performed by special software

Commissioning and start-up operations started in May 2011, and the electric equipment connection to the energy grid started in July 2011.

Please see Table 3 for the schedule of Omao Solar PSPP construction stages.

Table 3. Schedule of the JI project measures

#	Construction stage	Start date
1	Feasibility Study/project documentation preparation	January 2011
2	Construction of the necessary facilities	April 2011
3	Installation of photovoltaic panels	May 2011
4	Pre-commissioning and start-up	May 2011
5	Connection to the Ukrainian energy grid	July 2011
6	Commissioning	July 2011

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:

Project implementation will ensure the reduction of greenhouse gas emissions due to reduced consumption of fossil fuel, which is required for electricity production and supply to the Ukrainian energy grid, by extended solar-powered electricity generation.

There is no national legislation committing the owners of Omao Solar LLC to invest in the project.

Implementation of the proposed PSPP construction project requires significant funding. Today, only a short-term project financing at high rates is available in the domestic market. Project finance from foreign crediting markets is complicated for Ukrainian companies due to the low international rating of Ukraine, and, therefore, country-related risks perceived as high. Additional income from ERUs was taken into account when the investment decision was made.

Additional income from the Joint Implementation (JI) mechanism has a positive impact on the project economic indicators. The JI project implementation will increase the internal rate of return and reduce the payback period, and will ensure lower sensitivity of the project economic indicators to electricity price changes.

In the absence of the project, the electricity supplied to the Ukrainian energy grid in amount of electricity transmitted from Omao Solar PSPP will be compensated by existing power plants of Ukraine, at least through 2020.

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

Estimation of emission reductions over the commitment period is provided in Table 4.

Table 4. Estimation of emission reductions over the commitment period

	Years
Length of the crediting period	2
Year	Estimate of annual emission reductions in tonnes CO_2 equivalent
2011*	17,295
2012	21,158
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	38,453
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	25,635

* - from 07/07/2011 to 31/12/2011

Estimation of emission reductions after 2012 is provided in Table 5.

Table 5. Estimation of emission reductions after the commitment period

	Years
Length of the crediting period	8
Year	Estimate of annual emission reductions in tonnes CO_2 equivalent
2013	20,914
2014	20,671
2015	20,428
2016	20,184
2017	19,940
2018	19,697
2019	19,453
2020	19,210
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	160,497
Annul average emission reductions over the crediting period (tonnes of CO_2 equivalent)	20,062

A.5. Project approval by the Parties involved:

The Project Idea Note (PIN) and an application for the Letter of Endorsement were submitted to the State Environmental Investment Agency (SEIA) of Ukraine for review on 29 August 2011. The Letter of Endorsement is expected before completion of the Determination Report.

The PDD and Determination Report will be submitted to the SEIA for review in order to obtain the Letter of Approval from the host Party. The Letter of Approval will be obtained from the investor party before the first periodic verification.

SECTION B. Baseline

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

Step 1. Identification and description of the baseline scenario setting approach.

Any JI project baseline should be set pursuant to the Marrakesh Accords Addendum B[4].
According to the decision 10/CMP.1, approved CDM methodologies can be used for PDD development for the JI projects.
To set baseline for the proposed project activity, the approved CDM methodology ACM0002 "Consolidated Baseline Methodology for Grid-Connected Electricity Generation from Renewable Sources", version 12.1.0[5] was chosen.

The chosen CDM methodology applies to projects of grid-connected electricity generation from renewable sources where the project activity involves:

- construction of the new power plant on land where there was no electricity generation from renewable sources before ("greenfield plant");
- construction of the solar power plant;
- no switch from one fuel type to another.

Whereas the proposed project activity includes: (1) construction of the new solar power plant in location where there was no electricity generation from renewable sources before, (2) electricity generation to be supplied to the Ukrainian energy grid only, (3) no switching from one fuel type to another, the chosen CDM methodology ACM0002, "Consolidated Baseline Methodology for Grid-Connected Electricity Generation from Renewable Sources", version 12.1.0 is completely suitable for baseline setting for the proposed project.

Under the proposed project activity, for baseline setting, the chosen CDM methodology implies the following approach:

"If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:
Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

Therefore, following this approach to baseline setting described in the chosen CDM methodology, baseline GHG emissions are formed from electricity production and transmission to the Ukrainian energy grid from the existing power plants of Ukraine. Estimation of baseline emissions is based on calculated combined CO_2 emission factors for the Ukrainian power grid[6,7].

Step 2. Application of the chosen approach

[4] http://unfccc.int/resource/docs/cop7/13a02.pdf

[5] http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L

[6] http://www.neia.gov.ua/nature/doccatalog/document?id=127498

[7] http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514

Baseline scenario emissions

According to the chosen CDM methodology, baseline emissions include only CO_2 emissions from electricity generation by fossil fuel-fired power plants that is displaced due to the project activity.

The baseline emissions are to be calculated as follows:

$$BE_y = EL_{net,y} * EF_{el,y} \qquad (B.1)$$

Where:

BE_y - Baseline emissions in year y, tCO_2;

$EL_{net,y}$ – electricity balance in year y is a difference between the amount of power generated by the plant and supplied to the grid and the amount of power consumed from the grid as a result of the project activity, MWh.

According to the chosen CDM methodology, for newly constructed plants ("greenfield plants"), such as the proposed project envisages, the value $EL_{net,y}$ is determined only by the balance of the power plant electricity supplied to the grid.

Under the proposed project the electricity balance $EL_{net,y}$ in Omao Solar PSPP in year y is the difference between the amount of electricity transmitted to the Ukrainian energy grid and the amount consumed from the Ukrainian energy grid.

$EF_{el,y}$ – combined CO_2 emission factor for electricity generation in the grid in year y, tCO_2/MWh. For the proposed project, the combined CO_2 emission factor for electricity generation in the $EF_{el,y}$ is the CO_2 emission factor for the Ukrainian energy grid (for electricity generation).

The 2011 emission level was estimated based on the CO_2 emission factor for the Ukrainian energy grid for 2011 approved by the NEIA's Order # 75 "On Approval of Carbon Dioxide Specific Emission Factors in 2011" [8] dated 12/05/2011.

While at the time of preparing this document, no emission factor for 2012 and later for the Ukrainian energy grid was approved by the State Environmental Investment Agency of Ukraine, the estimation of the emission level for 2012 and beyond was based on the baseline proposed for the Ukrainian energy grid in the document "Ukraine - Assessment of new calculation of CEF" published on the UNFCCC official site[9].

Project scenario

The proposed project implies implementation of the technology based on transformation of the solar energy into electric power (by photovoltaic panels), the use of which does not result in greenhouse gas emissions. Moreover, the project activity does not imply any permanent or temporary use of fossil fuels or other fuel types which are leading to greenhouse gas emissions upon combustion.

[8] The value pointed the NEIA's Order # 75 "On Approval of Carbon Dioxide Specific Emission Factors in 2011" dated 12/05/2011 is used for the year 2011, http://www.neia.gov.ua/nature/doccatalog/document?id=127498

[9] Justification of the CO_2 carbon dioxide factor is provided in "Ukraine - Assessment of new calculation of CEF", http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514

Therefore, the project does not result in greenhouse gas emissions, in particular, carbon dioxide emissions.

Leakage

Project leakages relate to solar power plant construction (leakages from equipment and material transportation and energy consumption during construction). For simplification, the above-mentioned emissions were not included in calculations. No other emission sources or increase of emissions from the existing emission sources were detected outside the project.

Emission reductions

Whereas the project activity implies no GHG emissions and the project emissions are zero emissions, emission reductions are calculated as follows:

$$ER_y = EL_{net,y} * EF_{el,y} \qquad (B.2)$$

Where:

ER_y - emission reduction in year y, tCO_2;
$EL_{net,y}$ – electricity balance in Omao Solar PSPP in year y (difference between the amount of electricity transmitted to the Ukrainian energy grid and the amount of electricity consumed from the Ukrainian energy grid), MWh;
$EF_{el,y}$ - CO_2 emission factor for the Ukrainian energy grid (for electricity generation) in year y, kg CO_2/kWh (or tCO_2/MWh).

Key parameters for baseline setting

Parameters not to be monitored: not applicable.
Parameters to be monitored:

Data/Parameter	$EF_{el,y2011}$
Data unit	kg CO_2/kWh
Description	CO_2 emission factor for the Ukrainian energy grid for electricity generation projects (for 2011)
Time of determination/monitoring	
Source of data (to be) used	NEIA's Order # 75 "On Approval of Carbon Dioxide Specific Emission Factors in 2011" dated 12/05/2011 http://www.neia.gov.ua/nature/doccatalog/document?id=127498
Value of data applied (for ex ante calculations/determinations)	1.063
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Carbon dioxide emission factor approved for the energy grid in Ukraine
QA/QC procedures (to be) applied	CO_2 emission factor for the Ukrainian energy grid (for electricity generation) is checked on the annual basis.
Any comment	

Data/Parameter	$EF_{el,y}$
Data unit	tCO_2/MWh
Description	CO_2 emission factor for the Ukrainian energy grid for electricity generation projects (beyond 2011)
Time of determination/monitoring	
Source of data (to be) used	"Ukraine - Assessment of new calculation of CEF" http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514
Value of data applied (for ex ante calculations/determinations)	0.807
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Justification of the carbon dioxide emission factor is provided in "Ukraine - Assessment of new calculation of CEF"
QA/QC procedures (to be) applied	CO_2 emission factor for the Ukrainian energy grid (for electricity generation) is checked on the annual basis.
Any comment	

Data/Parameter	$EL_{net,y}$
Data unit	MWh
Description	Electricity balance in Omao Solar PSPP in year *y*
Time of determination/monitoring	
Source of data (to be) used	Omao Solar LLC
Value of data applied (for ex ante calculations/determinations)	Electricity balance value for each year is monitored in accordance with the monitoring plan (see Section D)
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the CDM methodology ACM0002 "Consolidated Baseline Methodology for Grid-Connected Electricity Generation from Renewable Sources", version 12.1.0.
QA/QC procedures (to be) applied	See Section D for relevant QA/QC procedures.
Any comment	

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:

According to the chosen CDM methodology, additionality is proven by applying "Tool for the demonstration and assessment of additionality" (version 5.2.1).

Step 1: Identification of the alternative project activity in compliance with effective laws and regulations

This step is taken to identify all alternative scenarios of the proposed JI project activity which can serve as a baseline scenario with implementation of the following sub-steps:

Sub-step 1a: Identification of the project activity alternatives

Choosing baseline scenario

Alternative baseline scenario options can be all possible realistic alternatives similar to the proposed project activity under the Joint Implementation (including the planned project activity without JI mechanism implementation). There are four alternatives to the baseline scenario, in particular:

Scenario 1:
In the absence of the project activity, the current situation remains unchanged: at least by 2020 the existing power plants of Ukraine generate electricity, which is envisaged by the project, to be supplied to the Ukrainian energy grid.

Scenario 2:
The solar photovoltaic power plant, which is planned under this project, will be constructed without the JI mechanism implementation (no ERUs sale).

Scenario 3:
Construction of the new hydropower plant of 20 MW installed capacity.

Scenario 4:
Construction of the new power plant of 20 MW installed capacity with steam turbines and boilers to use biomass as fuel.

Analysis of alternative options and identification of the best baseline scenario

Scenario 1:
At least by 2020 existing power plants will be generating and supplying electricity to the Ukrainian energy grid. This scenario is realistic since it does not require any investment for construction of new energy facilities. Existing power plants of Ukraine are capable to supply electricity to the Ukrainian energy grid at least by 2020.

Scenario 2:
The proposed project will not be implemented under the JI mechanism. CO_2 emission reductions will not be converted into Emission Reduction Units (ERUs). The project implementation without the JI mechanism will mean an income reduction by EUR 461,440 during 2011-2012 or income reduction by EUR 2,387,400 in 2011-2020 (ERUs price of EUR 12). In this case, the project is not attractive for investments.

Scenario 3:
Construction of the new hydropower plant of 20 MW installed capacity.
Use of the hydro resource potential in the Crimean Republic mainly implies construction of the small hydropower plants on small rivers in the AR of Crimea[10]. In addition, the estimated total installed capacity of small hydropower plants in the AR of Crimea approximates 6,900 kW, which is much lower that the installed capacity under the proposed project. Thus, the restriction imposed by the energy potential of the Crimean water resources on implementation of the hydropower facilities is higher than the expected 6,900 kW.

Scenario 4:

[10] Article # UDK 614.78 "Use of alternative energy sources and their future in the power industry", see Section "Alternative Hydropower Industry", p. 70
http://www.nbuv.gov.ua/portal/natural/Ste/2011_2/67-71.pdf

Construction of the new power plant with biomass-fired steam turbines and boilers.
The main barrier to this alternative is absence of the biomass supply infrastructure in the Crimean Republic. Forest coverage in the Crimea is as small as 11.4 % provided that the optimal environmental standard for forests is 19 % for the whole region.[11] Mentioned environmental conditions set significant barriers to reliable industrial use of the forest resources in the Crimea. In Ukraine, wood production is mainly developed in the western regions (Zakarpattya region, Lviv region, etc.), therefore, transportation of wood/sawdust from the western regions to the Crimean Republic results in significant additional expenses. In addition, the Ukrainian market is missing biomass-fired equipment of required capacity to generate electricity (20 MW), and the imported equipment is rather expensive. Therefore, biomass-fired boilers are not often installed in Ukraine.

After all, out of all proposed scenarios, the Scenario 1 and Scenario 2 are defined as the most plausible ones. In view of all mentioned baseline scenarios, ***Scenario 1*** is the most plausible in case of the project absence, and it is regarded as the ***baseline scenario***.

Sub-step 1b: Compliance with compulsory laws and regulations

All abovementioned alternatives comply with the current legislation. Laws do not require using either of the proposed alternatives.

Step 2:Investment analysis

Sub-step 2a: Identification of the relevant analysis method

The proposed JI project should generate income from electricity sales to the Ukrainian energy grid. Thus, simple cost analysis (Option I) does not apply to this project.

It's hard to obtain financial indices for similar projects in Ukraine since this project is the first one of a kind. Therefore, the investment comparative analysis (Option II) cannot be provided.

To prove the proposed JI project additionality, the threshold sensitivity analysis will be (Option III) applied.

Sub-step 2b: Option III. Application of the threshold sensitivity analysis

According to the CDM Supervisory Board EB 22 report, Annex 3, "Clarifications on the Consideration of National and/or Sectoral Policies and Circumstances in Baseline Scenarios", version 2[12], clause 7 (b), national policies focusing on GHG emission abatement technologies, including renewable energy use, should not be included in the additionality analysis. In this case, hypothetical situations with no regard to advantages of the relevant national policies should be take into account. This requirement concerns only the policies that were implemented after approval of the Modalities and Procedures for a Clean Development Mechanism by the Conference of Parties (decision 17/CP.7 dated 11 November 2001).
Since the Law of Ukraine # 601-VI "On Amendments to Some Laws of Ukraine on the Green Tariff Setting" of 25/09/2008[13] which established the green electricity tariff for Omao Solar LLC was approved

[11] http://rescomzem.gov.ua/zemelnoe-zakonodatelstvo/normativnyie-dokumentyi-reskomzema-kryima/novyij-resurs12.html

[12] http://cdm.unfccc.int/EB/022/eb22_repan3.pdf

[13] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=601-17

in 2008 (i. e. after 11/11/2001), the abovementioned requirement stipulated in CDM EB 22 Annex 3 directly applies to the proposed project.

Since the green tariff setting for Omao Solar LLC is an advantage given by the Ukrainian national renewable energy policy and, therefore, it should not be taken into account for establishing of the project's internal rate of return (IRR), a general wholesale price approved by the NERC for electricity sales to the Ukrainian energy grid was used. In early January 2011 it made up 527.12 UAH/MWh.[14]

Key assumptions of the investment analysis are as follows:

1. Analysis was based on stable prices in foreign currency (EUR). For estimation of income from ERUs sale and conversion of UAH as the national currency of Ukraine, the 2010 official average exchange rate was used: EUR 1 = UAH 10.53.[15]

2. Ukraine's average inflation rate of 10.82 %[16] for 2001-2010 was used for estimation of the expected price for electricity sales to the Ukrainian energy grid in the estimation period.

3. The residual value of the project equipment is calculated based on general primary costs from capital investments and expected operating life, and added to the capital cash flow in the last year of the estimation period.

4. Project financing expenses (for example, payment of loan interest) are not included in the IRR estimation.

5. Inflation adjustment of the IRR is based on the generally accepted approach .[17]. It's assumed that the inflation rate applied to the IRR estimation is 1.60 %, i. e. the inflation level in the EU for 2010[18].

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

The acceptable IRR value of the project can be calculated based on the low risk investment ratio and risk factor. In September 2010, the government of Ukraine placed USD 1.5 billion Eurobonds for 10 years at 7.75 % annual interest rate[19]. Thus, the required profitability level, with not regard to specific project risks, can be estimated at the level of 7.75 %. Because of the data on similar projects missing in Ukraine, the risk factor adjustment can be estimated only on the basis of expert review. The risk factor is 8 % in view of the conservative approach to risk assessment proposed by the official methodological

[14] Decree # 1954 of the National Electricity Regulatory Commission "On Approval of the Expected Wholesale Market Price in January 2011" dated 23/12/2010
http://www.nerc.gov.ua/

[15] Web-site of the National Bank of Ukraine:
http://bank.gov.ua/files/5-Exchange_rates.xls

[16] http://ukrstat.gov.ua/

[17] "Discounted Cash Flow Analysis Methodology and Discount Rates" by Lawrence Devon Smith – online resource: http://www.cim.org/mes/pdf/VALDAYLarrySmith.pdf

[18] http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=en&pcode=tsieb060&tableSelection=1&footnotes=yes&labeling=labels&plugin=1

[19] Decree of the Cabinet of Ministers of Ukraine # 856 "On Taking Foreign Loans BY the State in 2010" of 17 September 2010:
http://www.minfin.gov.ua/control/uk/publish/article/main?art_id=303961&cat_id=42981

recommendations on evaluation of the investment project effectiveness as of 21 June 1999 N BK approved in Russia; Ukraine has no officially adapted methodology alike. Therefore, according to conservative risk estimates, and with no regard to risk factors, the internal rate of return reaches 16.37 % (1.0775 * 1.08 - 1.0).

The estimated nominal IRR of the project (adjusted for inflation) without ERUs sale is negative and makes -0.08 %, much below the target index. ERUs sale makes the project more financially viable when the internal profitability factor goes up to 0.36 %. But even in this case, the nominal IRR is significantly lower than the target index.

Sensitivity analysis was conducted for a case when the electricity price increases by 10 %. Meanwhile, IRR indices are as follows: 0.29 % (without ERUs sale) and 0.74 % (with ERUs sale).
Thus, upon the electricity price increase by 10 %, the estimated IRR remains below the target index of 16.37 %.

The investment analysis shows that the project has an unacceptable payback period which is not attractive without the ERUs sale, so it's additional.
According to the "Tool for the demonstration and assessment of additionality", version 5.2.1, for further additionality check, we apply Step 4 (Common practice analysis).

Step 4: Common practice analysis
Unlike in the EU, USA, South Korea, and other countries where the practice of implementation of solar photovoltaic power plants is quite enhanced and utilized for the recent decades[20], in Ukraine the solar power engineering, in particular, construction of photovoltaic power plants is still at the pioneering stage of development. There is a number of reasons for that. First, photovoltaic technology implementation requires higher capital expenses (photovoltaic panels and frameworks) compared to electricity generation technologies which are conventional for Ukraine, e.g. heat power plant. Second, the common practice of the photovoltaic technology implementation in the energy sector implies availability of the developed infrastructure of photovoltaic panel production and a relevant market. Despite Ukraine has the required industrial potential of implementation of the photovoltaic panel production technology, today it's missing a reliable national infrastructure for photovoltaic panel production and the market for such equipment. In view of the abovementioned factors, we may conclude that today Ukraine is missing the common practice of construction of photovoltaic power plants.

Omao Solar PSPP is one of the first solar power plants in Ukraine. The proposed project is therefore not a common practice for Ukraine.

[20] http://ec.europa.eu/energy/publications/doc/2009_report-solar-energy.pdf

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

The project boundaries include all Omao Solar PSPP facilities ensuring the power plant operation. According to the chosen CDM methodology, extended project boundaries also include all power plants connected to the Ukrainian power grid. These extended project boundaries make allowance for the fact that the electricity generated by Omao Solar PSPP and transmitted to the Ukrainian power grid will replace the electric power produced in other places of the grid. Please see Figure 7 for the project boundaries.

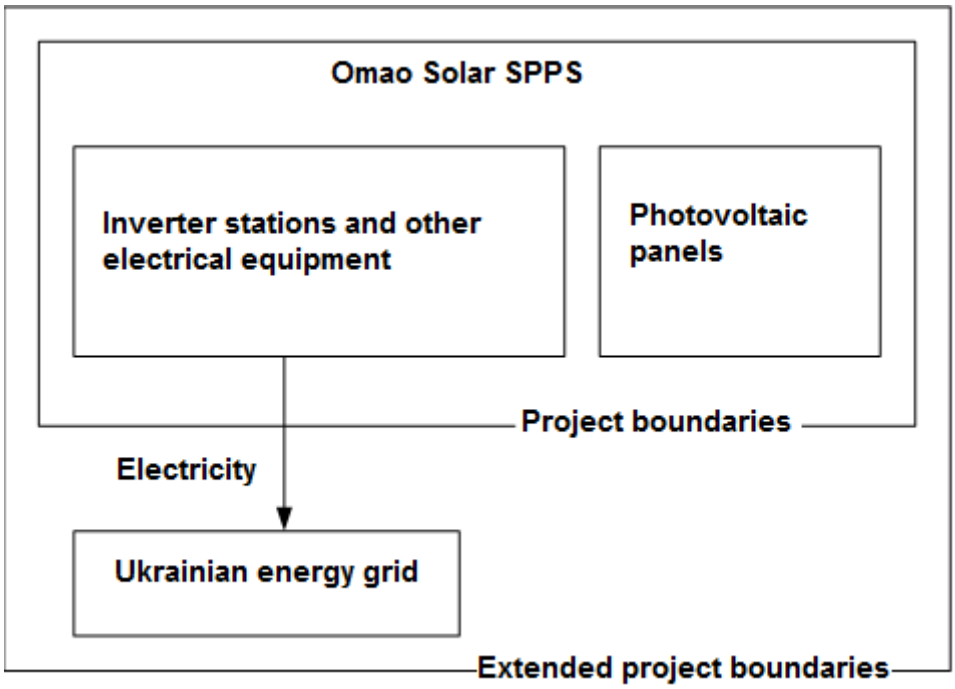

Figure 7. Project boundaries

Table 6 lists greenhouse gases and their sources included in the project boundaries.

Table 6. Sources of emissions and GHG emissions included in the project boundaries

	Source	GHG	Included	Comments
Baseline scenario	Emissions from fossil fuel combustion by power plants for electricity generation to be replaced as a result of the project activity	CO_2	Yes	CO_2 is the key greenhouse gas emission source
		CH_4	No	Insignificant source, it is a conservative simplification
		N_2O	No	Insignificant source, it is a conservative simplification

Project scenario	Emissions from operation of the solar photovoltaic power plant	CO_2	No	The project activity does not imply formation of any emission sources
		CH_4	No	The project activity does not imply formation of any emission sources
		N_2O	No	The project activity does not imply formation of any emission sources

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

The baseline was set by the PDD developer, GreenStream Network, on behalf of Omao Solar LLC on 04/10/2011.

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SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Starting date of the project is 07 December 2010, the day of obtaining the solar power plant construction permit by Omao Solar LLC.

C.2. Expected operational lifetime of the project:

For all proposed investments, the project operational lifetime will make up 10 years (102 months): 2 years (18 months), 2011 – 2012 in the Kyoto crediting period and 8 years (84 months), 2013 – 2020 in the post-Kyoto period.

Operational lifetime of photovoltaic panels installed in Omao Solar PSPP totals 25 years.

C.3. Length of the crediting period:

07/07/2011 – 31/12/2012 (2 years or 18 months) and 01/01/2013 – 31/12/2020 (8 years or 84 months).

SECTION D. Monitoring Plan

D.1. Description of monitoring plan chosen:

The monitoring plan was developed in accordance with the CDM methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", version 12.1.0[21].
The chosen methodology defines its applicability to projects complying with the following requirements:

- project activity covers grid-connected electricity generation from renewable sources;
- project activity covers construction of the new power plant on land where there was no electricity generation from renewable sources before ("greenfield plant");
- project activity covers construction of the solar power plant;

Since this JI project complies with the above-mentioned requirements, the methodology is applicable to this project.

This JI project generates zero emissions since it uses a technology resulting in no GHG emissions. Therefore, emission reductions are determined only by baseline emissions.
In accordance with the methodology ACM0002, version 12.1.0, for this project type, monitoring of baseline emissions is performed per the formula below:

$$BE_y = EL_{net,y} * EF_{el,y} \qquad (D.1)$$

Where:

BE_y - baseline emissions in year y, tCO_2;
$EL_{net,y}$ – Omao Solar PSPP electricity balance in year y (difference between the electricity supplied to the Ukrainian energy grid and the electricity consumed from the Ukrainian energy grid), MWh;
$EF_{el,y}$ - CO_2 emission factor for the Ukrainian energy grid (for electricity production) in year y, kg CO_2/kWh (or tCO_2/MWh).

In accordance with the monitoring requirements of ACM0002, version 12.1.0, all data collected for monitoring are kept in the electronic format for 2 years at least after the crediting period. All measurements are taken by calibrated equipment according to the relevant industrial standards.

[21] http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L

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

While the technology of electricity production by the solar photovoltaic plant does not imply any emissions of GHGs or pollutants into the air, no project GHG emissions occur.

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

Not applicable.

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
B1	$EL_{net,y}$	Commercial electricity meter on the site	MWh	*M*	Monthly	100 %	*Electronic and paper*	

B2	$EF_{el,y}$	NEIA's Order # 75 "On Approval of Carbon Dioxide Specific Emission Factors in 2011"[22] dated 12/05/2011 "Ukraine - Assessment of new calculation of CEF" published on the official UNFCCC web-site[23];	kg CO_2/kWh; tCO_2/MWh	*C*	Monthly	100 %	*Electronic*	*CO_2 emission factor for the Ukrainian power grid for electricity generation projects (for 2011): 1.063 kg CO_2/kWh* *CO_2 emission factor for the Ukrainian energy grid for electricity generation projects (after 2011): 0.807 t CO_2/MWh*

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

Baseline emissions are monitored per the formulae below:

$$BE_y = EL_{net,y} * EF_{el,y} \qquad (D.2)$$

[22] http://www.neia.gov.ua/nature/doccatalog/document?id=127498

[23] http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514

Where:

BE_y - baseline emissions in year *y,* tCO_2;
$EL_{net,y}$ – balance of electricity in Omao Solar PSPP in year *y* (difference between the electricity transmitted to the Ukrainian energy grid and the amount consumed from the Ukrainian energy grid), MWh;
$EF_{el,y}$ - CO2 emission factor for the Ukrainian energy grid (for electricity generation) in year *y*, kg CO_2/kWh (or 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 has been left blank intentionally. Please see Section D.1.1 Option 1 for information on parameters and used formulas.

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

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):

Not applicable.

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

No additional GHG emission sources or changed emissions from existing sources were identified. As a result, there are no leakages.

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	Data variable	Source of data	Data unit	Measured (m),	Recording	Proportion of	How will the data	Comment

(Please use numbers to ease cross-referencing to D.2.)				calculated (c), estimated (e)	frequency	data to be monitored	be archived? (electronic/paper)	

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):

While the project activity generates no GHG emissions and project emissions equal zero, emission reductions are estimated as follows::

$$ER_y = EL_{net,y} * EF_{el,y} \qquad (D.3)$$

Where:

ER_y - emission reductions in year y, tCO_2;
$EL_{net,y}$ – balance of electricity in Omao Solar PSPP in year y (difference between the electricity supplied to the Ukrainian power grid and the electricity consumed from the Ukrainian power grid), MWh;
$EF_{el,y}$ - emission factor for the Ukrainian power grid (for electricity generation) in year y, kg CO_2/kWh (or tCO_2/MWh).

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:

Please see Section F “Environmental impacts”.

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.
B1 $EL_{net,y}$	0.5 % (low)	Electricity balance measured by commercial electricity meters, type SL761B071, serial # 53100847, serial # 53100839, serial #53100838 and serial #53100844. Meters are calibrated by the Crimean State Centre of Standardization, Metrology and Certification at least once in 6 years.

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

Monitored data collection and logging (electricity balance) are completely automatic processes entirely controlled by the Automatic System for Commercial Accounting of Power Consumption (ASCAPC). Electricity balance data recorded by commercial meters is directly obtained by the director of Omao Solar LLC and State Enterprise "Energorynok" (SE "Energorynok") through the ASCAPC. On the daily basis, Omao Solar LLC and SE "Energorynok" jointly collate data on electricity transfer to the grid.
Please see Figure 8 for the organizational chart of monitoring.

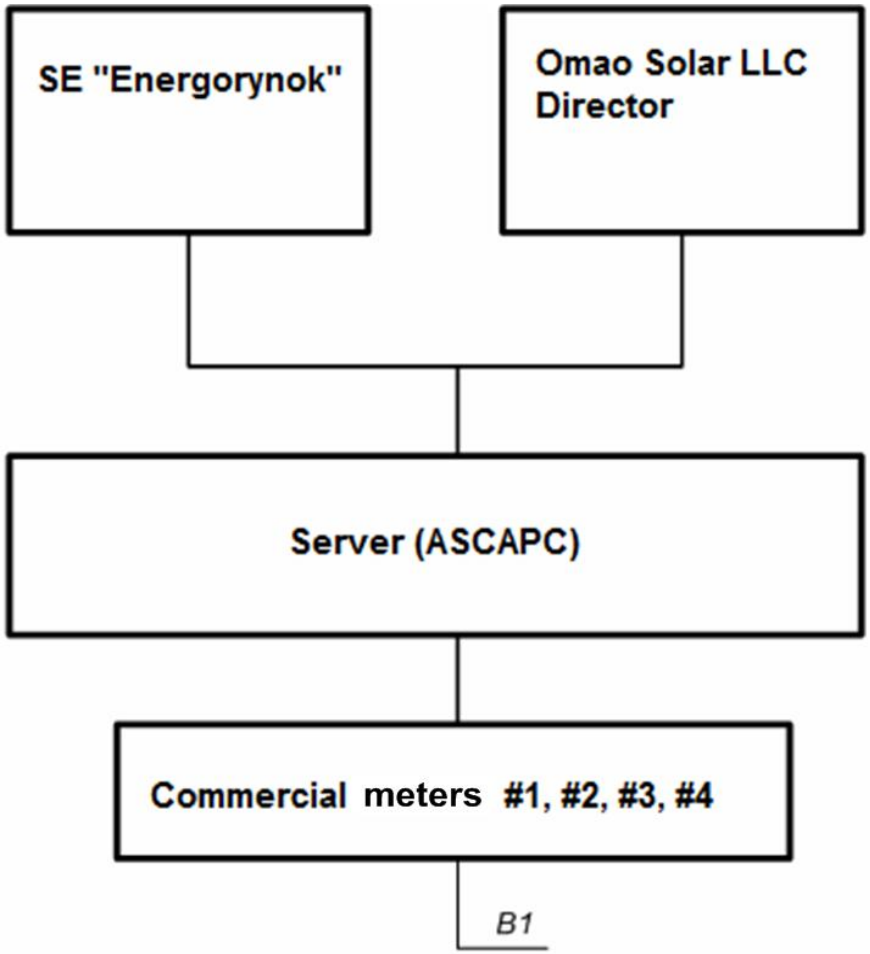

Figure 8. Monitoring organizational chart

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

This monitoring plan was established by the PDD developer, GreenStream Network, on behalf of Omao Solar LLC on 04/10/2011.

GreenStream Network is a project participant. Please see Section A.3 (or Annex 1) for the list of project participants.

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SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Table 7. Project emissions

Year	Estimated annual emissions (tCO_2)
2011	0
2012	0
2013	0
2014	0
2015	0
2016	0
2017	0
2018	0
2018	0
2019	0
2020	0

E.2. Estimated leakages:

Not applicable in accordance with the Subsection D.1.3.

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

Since no leakages are detected, project emissions remain as follows:

Table 8. Project emissions

Year	Estimated annual project emissions (tCO_2)
2011	0
2012	0
2013	0
2014	0
2015	0
2016	0
2017	0
2018	0
2018	0
2019	0
2020	0

E.4. Estimated baseline emissions:

Results of estimation of CO_2 emissions are provided in table below.

Table 9. Baseline emissions

Year	Estimated annual emissions (tCO_2)
2011*	17,295
2012	21,158
2013	20,914
2014	20,671
2015	20,428
2016	20,184
2017	19,940
2018	19,697
2019	19,453
2020	19,210

* - from 07/07/2011 to 31/12/2011

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

Emission reductions generated by the proposed JI project are estimated as the difference between the baseline and project emissions. Outside the project boundaries no leakages are detected. Emission reductions are provided in the table below.

Table 10. Emission reductions of the project

Year	Estimated annual emissions (tCO_2)
2011*	17,295
2012	21,158
2013	20,914
2014	20,671
2015	20,428
2016	20,184
2017	19,940
2018	19,697
2019	19,453
2020	19,210
Total emission reductions during the crediting period,(tCO_2e)	198,950
Annual average emission reductions during the crediting period,(tCO_2e)	19,895

* - from 07/07/2011 to 31/12/2011

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

Table 11. Balance of emission reductions over the commitment period

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 emission reductions (tonnes of CO_2 equivalent)
2011*	0	Not applicable	17,295	17,295
2012	0	Not applicable	21,158	21,158
Total (tonnes of CO_2 equivalent)	0	Not applicable	38,453	38,453

* - from 07/07/2011 to 31/12/2011

Table 12. Balance of emission reductions after the commitment period

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 emission reductions (tonnes of CO_2 equivalent)
2013	0	Not applicable	20,914	20,914
2014	0	Not applicable	20,671	20,671
2015	0	Not applicable	20,428	20,428
2016	0	Not applicable	20,184	20,184
2017	0	Not applicable	19,940	19,940
2018	0	Not applicable	19,697	19,697
2019	0	Not applicable	19,453	19,453
2020	0	Not applicable	19,210	19,210
Total (tonnes of CO_2 equivalent)	0	Not applicable	160,497	160,497

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:

Photovoltaic Solar Power Plant "Omao Solar" Project includes measures requiring conduction of the Environmental Impact Assessment (EIA). The following EIA was performed and approved as a part of the project documentation:

- "Solar Power Plant of 20 MW (peak-load) installed capacity in Okhotnykove village of Saksky District, the AR of Crimea. The Environmental Impact Assessment. 1557/6-2-0 – OBOC.1, Volume 4, Book 1".

The Environmental Impact Assessment was performed by Dniprovsky Design Institute.
Environmental impact of measures under the proposed JI project was assessed in accordance with the documents below:

- DBN A.2.2-1-2003 "Composition and Content of Materials Under the Environmental Impact Assessment (EIA) Used for Designing and Construction of Enterprises, Buildings, and Facilities";
- DBN A.2.2-3-2004 "Content, Procedure of Development, Coordination and Approval of Project Documentation for Construction";
- National Standard GOST 17.2.3.02-78. "Nature Protection. Atmosphere. Regulations for Establishing Permissible Emissions of Harmful Pollutants from Industrial Enterprises";
- Law of Ukraine "On Ecological Expertise";
- Law of Ukraine "On Environmental Protection";
- Law of Ukraine "On Nature Reserve Fund of Ukraine";
- Land Code of Ukraine;
- Water Code of Ukraine;
- Forest Code of Ukraine;
- DK 005-96. Waste Classifier. State Standard of Ukraine, K.1996
- SNiP II-12-77 "Design Standards. Noise Protection";
- DBN 390-92 "Urban Development. Planning and Construction of Urban and Rural Settlements".

Key conclusions

Planned construction and operation of Omao Solar PSPP does not imply any pollutant formation and emissions into the air because photovoltaic cells do not depend on fuel. The only likely source of air pollution is motor-car parking (6 parking stalls) nearby the Entry Check Point (ECP) in the area of Omao Solar PSPP. Motor vehicles entering (leaving) and moving around the parking area is a fugitive emission source of nitrogen oxide, carbon monoxide, and hydrocarbons as a part of exhaust gases of motor vehicles. Nitrogen oxide emissions make up 0.0001 t/year (threshold value is 1t/year), carbon monoxide emissions total 0.0026 t/year (threshold value is 1.5 t/year), hydrocarbon emissions total 0.0001 t/year (threshold value is 1.5 t/year).

Thus, fugitive emissions of pollutants (motor-car parking) into the air are negligibly small against relevant threshold values and, therefore, have no impact on the current state of the atmospheric air.

Solar power plant operation will not result in any changes of the acoustic mode in the power plant area and surrounding residential buildings. Operating power transformers are the noise source in the power plant. According to SNiP II-12-77 "Designing Standards. Acoustic Protection" "and DBN 390-92

"Urban Development. Planning and Construction of Urban and Rural Settlements", the level of noise from power transformer stations does not exceed 50 dBA. Reduction of noise impact on the environment and creating acoustic comfort conditions are provided through design and location decisions for the power plant, namely, by setting a sufficient distance between the noise source and residential area (over 1 km). This measure ensures sound pressure reduction in the residential area by 66 dBA.

Therefore, Omao Solar PSPP operation will not have any impact on the current acoustic state. An acoustic discomfort caused by the power plant operation is not expected.

The planned project activity does not imply any use of water for technological or household needs, which eliminates formation of both industrial and domestic wastewater. Drinking needs of the staff will be covered by supplies of the bottled drinking water. UB-4 type composting toilet will be used for sanitary and domestic needs. All domestic waste will be promptly transported for further processing. Thus, the project activity does not have any negative impact on subsurface and surface water due to the absence of polluting industrial and domestic wastewater.

The project activity results in no soil contamination because the solar photovoltaic power plant operation does not technologically imply any formation of pollutants and their further subsiding in the soil. To prevent emergencies caused by accidental release of transformer fluid, the project envisages the network of emergency oil drains used to transmit the transformer fluid to air-tight oil tanks. Planned project activity does not imply any formation of industrial waste since photovoltaic panels of the power plant are utilized by the manufacturer. Operational waste such as used fluorescent lamps will be collected and transported for further demercurization as stipulated in the relevant agreement.
Therefore, the project activity has no negative impact on the soil.

All electrical equipment of Omao Solar PSPP (transformers, inverters, power transmission line, etc.), which is a source of electromagnetic radiation, is placed in special facilities and protective structures to eliminate the environmental impact of electromagnetic radiation. As cable power lines, but not overhead transmission lines, are used for power transmission in Omao Solar PSPP, no measures are required to prevent from electromagnetic radiation coming from overhead transmission lines.
Therefore, the project activity has no negative impact of electromagnetic radiation on the environment.

Omao Solar PSPP has all necessary permits and licenses for the project activity, in particular:

- NERC's Electricity Generation License # 578472 dated 07/07/2011;
- Permit of the Inspection of State Architectural and Construction Control in the AR of Crimea for Construction Works # 852 dated 07/12/201;
- Okhotnykivs'ka Village Council Decision # 644 on Location of the Solar Power Plant in the Territory of Okhotnykivs'ka Village Council of Saksky District, Crimea, dated 17/06/2010;
- Declaration on the Facility Readiness for Operation dated 30/05/2011;
- Positive Conclusion # 01-01621-04-10 of the Comprehensive State Expertise dated 01/11/2010;
- Real Estate Title Certificate # 43, dated 30/05/2011, issued to Omao Solar LLC by the Executive Committee of Okhotnykove Village Council.

Transboundary impacts

As a result of the proposed JI project implementation no pollutant are emitted into the air, therefore, no transboundary impacts are identified.

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 proposed project will have a general positive environmental impact compared to the current situation, since the project implementation and functioning implies the use of solar-powered electricity generation technology being environmentally friendly. Moreover, implementation of the proposed project will ensure reduction of pollutant emissions in the environment from fossil fuel combustion by the existing power plants of Ukraine. Thus, in general, the impact of implementation of the proposed project measures is positive.

SECTION G. Stakeholders' comments

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

Stakeholders potentially impacted by the project are the population of Karyerne village and surrounding settlements. The local population was properly informed of the implemented project through mass media, namely, "Uryadoviy Kuryer" # 119 (4517).

Since the project has a positive impact and improves the environment and social situation, only positive comments on the project were received.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

Unmonitored parameters:			
Not applicable			
Monitored parameters:			
Variable value	Data source	Information unit	Value
Electricity balance in Omao Solar PSPP in year *y*, $EL_{net,y}$	Omao Solar LLC	MWh	Electricity balance is monitored for every year in accordance with the monitoring plan (see Section D)
CO_2 emission factor for the Ukrainian energy grid for electricity generation projects, $EF_{el,y}$	The value set in the NEIA's Order # 75 "On Approval of Carbon Dioxide Specific Emission Factors in 2011" dated 12/05/2011 is applied to the year 2011, http://www.neia.gov.ua/nature/doccatalog/document?id=127498 Justification of the carbon dioxide emission factor is provided in "Ukraine - Assessment of new calculation of CEF", http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514	$kgCO_2$/ kWh tCO_2/ MWh	1.063 (in 2011) 0.807 (after 2011)

Annex 3

MONITORING PLAN

See Section D.