NEGROS ISLAND SOLAR POWER INC. PROJECT

Document Prepared By Negros Island Solar Power Inc.

Project Title	Negros Island Solar Power Inc. Project
Version	01
Date of Issue	05-01-2018
Monitoring Period	02-03-2016 to 25-11-2017 (both days included)
Prepared By	Negros Island Solar Power Inc.
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1 PROJECT DETAILS

1.1 Summary Description of the Project and its Implementation Status

The Negros Island Solar Power Inc. Project (hereafter referred as "project activity" involves the installation of 32MW La Carlota Solar Power PV Plant and 48MW Manapla Solar Power Plant. The total installed capacity of the project is 80MW. The Plants are greenfield, stand-alone power plants with a gross peak generation capacity of 32MWp and 48 MWp DC intended to provide daytime power to the grid throughout the entire year. The design concept is for approximately 124,000 modules and 179,000 modules respectively. They have been designed to ensure optimum energy efficiency.

The purpose of the project activity is to generate power using renewable energy source (solar energy) and sell the power generated to the state grid. The project activity is located on Negros Island, within the Cebu-Negros-Panay sub-grid of the Visayas electricity grid.

The relevant implementation dates are in the table below

Table 1.1.1- Implementation timeline of the project

Event	32MW La Carlota	48MW Manapla
Date of Construction	03/11/2014	28/05/2015
Commissioning Date	02/03/2016	08/03/2016

Since, the solar power is Green House Gas (GHG) emissions free, the power generated is replacing anthropogenic emissions of greenhouse gases estimated to be approximately 66,039 tCO2e per year (annual average), thereon displacing 119,312 MWh/year amount of electricity from the generation-mix of power plants connected to the Philippine electricity grid, which is mainly dominated by thermal/ fossil fuel based power plant. The total estimated emission reductions during the entire crediting period of 10 years will be approximately 660,390 tCO2e.

The purpose of the project activity is to generate electricity by the utilization of renewable solar PV technology and further selling the generated energy to the Visayas Grid. In this process there is no consumption of any fossil fuel and hence the project does not lead to any greenhouse gas emissions. Thus, electricity would be generated through sustainable means without causing any negative impact on the environment. In the Pre- project scenario the entire 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 (primarily based upon fossil fuels).

The emission reductions of the project during the first monitoring period (02/03/2016- 25/11/2017) is 104,351 tCO_2

1.2 Sectoral Scope and Project Type

The project activity falls under the following Sectoral scope and Project Type:

Sectoral Scope: 01 - Energy industries (renewable / non-renewable sources)

Project Type I - Renewable Energy Projects

Methodology: Grid-connected electricity generation from renewable sources --- Version 17.0

1.3 Project Proponent

Organization name	Negros Island Solar Power Inc.
Contact person	Lord Lee Van Burgos
Title	Assistant Vice President – Solar Operations
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1.4 Other Entities Involved in the Project

Not applicable. This section left blank intentionally.

1.5 Project Start Date

The project start date is 02/03/2016 on which the first solar PV plant, i.e. 32MW La Carlota Solar Power Plant was commissioned.

1.6 Project Crediting Period

Crediting period start date: 02/03/2016

Crediting period end date: 01/03/2026

The project activity adopts renewable crediting period of 10 years period which can be renewed for maximum 02 times.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

The proposed project activity involves setting up of 80MW of solar power project including 32MW La Carlota and 48MW Manapla solar power plants. As per section 3.9.1 of VCS standard Version 3.7, the projects are classified as follows:

1) Projects: Less than or equal to 300,000 tonnes of CO_2e per year

2) Large projects: Greater than 300,000 tonnes of CO2e per year

As the Estimated GHG emission reductions or removals per year considering total project activity capacity is 66,039 (tCO_2e) which is less than 300,000 tonnes of CO2e per year, thus the project falls in the category of Project

Project Scale	
Project	x
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 1	66,039
Year 2	66,039
Year 3	66,039
Year 4	66,039
Year 5	66,039
Year 6	66,039
Year 7	66,039
Year 8	66,039
Year 9	66,039
Year 10	66,039
Total estimated ERs	660,390
Total number of crediting years	10
Average annual ERs	66,039

1.8 Description of the Project Activity

The proposed project activity involves the installation of Solar Power Plants in different cities of Negros Occidental, Philippines i.e. La Carlota and Manapla. The total installed capacity of the project is 80 MW.

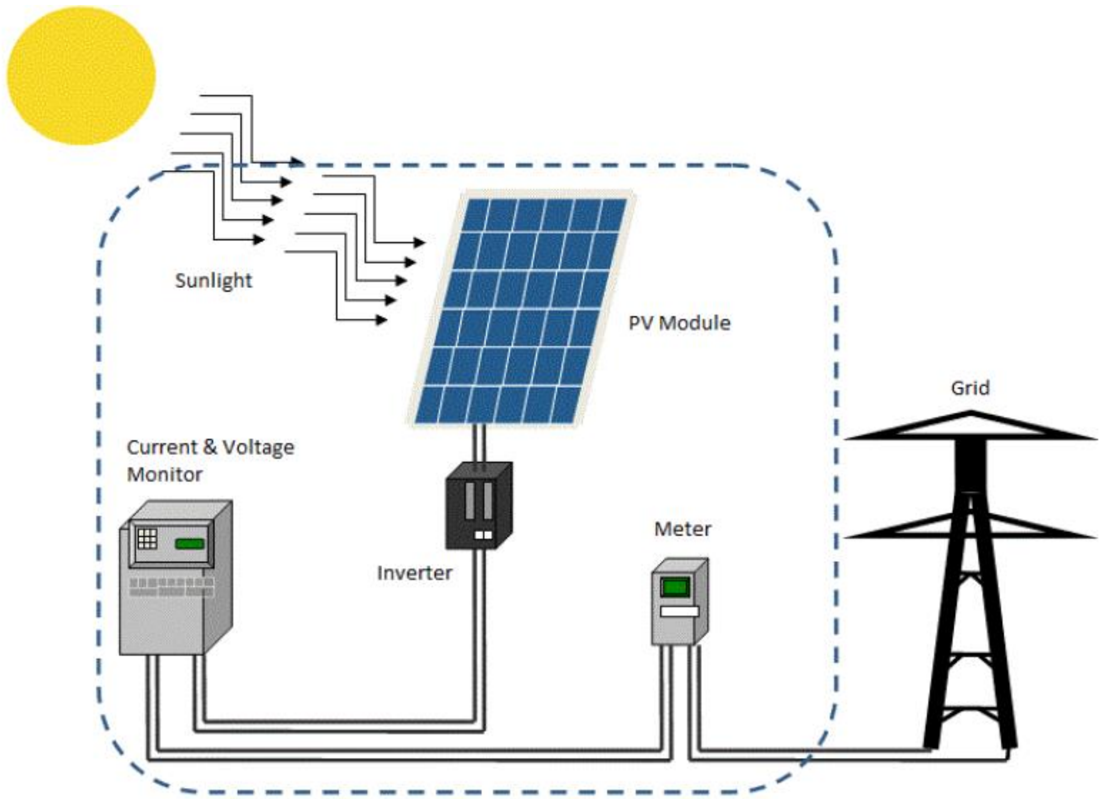
The project activity is a new facility (Greenfield) and the electricity generated by the Project will be exported to the Visayas electricity grid. The Project therefore displaces an equivalent amount of electricity which would have otherwise been generated by fossil fuel dominant electricity grid. The Project Proponents plan to avail the VCS benefits for the Project.

In the Pre- project scenario the entire electricity, delivered to the grid by the project activity, would have otherwise been generated by the operation of grid-connected power plants which is mainly dominated by fossil fuels or by the addition of new generation sources.

The project shall result in replacing anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 66,039 tCO2e per year, thereon displacing 119,312 MWh/year amount of electricity from the gird.

Solar power technology

The main components of the solar farm include the photovoltaic (PV) modules, solar cable connectors, current and voltage controller, and inverter. The modules are equipped with efficient, polycrystalline cells and have a high nominal output of 240 W-260 W at the nominal operating temperature of 43°C +/- 2°. At the rear of each module is a connection box with the connection cables, plug, and socket. The solar modules will be mounted securely using a mounting system that does not require cutting to size or drilling and has a high corrosion resistance. The inverter converts the direct current (DC) to the utilizable alternative current (AC). It is accompanied by a spacious ventilation system with temperature-controlled fans. The operation conditions of the inverter are -25°C … +62°C. Cables also connect the inverter directly to the grid.



The project activity is harnessing solar energy through installation of PV with total installed capacity of 80 MW. Solar energy is a pollution-free, infinitely sustainable form of energy. It does not use fossil fuel. It does not produce greenhouse gases, and it does not produce toxic or radioactive waste. Therefore the technology used for the project activity is environmentally safe and sound.

The project activity is generating power using solar energy, which is a renewable source of energy. The solar PV system mainly consists of PV modules, module mounting structures, junction boxes, Inverters, regulators, monitoring devices etc. The solar PV cells convert solar radiation into DC current. The solar panels are installed in arrays. The modules in the each array are connected in parallel and/or series in order to get the preferred current & voltage which match with the rated input parameters of the inverter. The Inverter connected in each array converts the DC current to AC current. The electricity collected from all the inverters in La Carlota is stepped up to 13.2 kV and in Manapla is stepped up to 13.8 kV through 13.8kV/405V/405V transformers. The 13.2 kV and 13.8 kV electricity is further stepped up to 69 kV and up to 138 kV at 138/69kV substation and then supplied to Visayas grid. The operational life time of the project activity is 25 years. The commissioning of the project activity has been completed and details are mentioned in section 1.5.

Technical specification of solar PV module installed in the project

Module type	Framed
Nominal output	240W-260W
No. of cells	60
Cell type	polycrystalline
Module weight	19.5kg
Maximum permissible load	5,400Pa
Maximum permissible system voltage	1,000V

1.9 Project Location

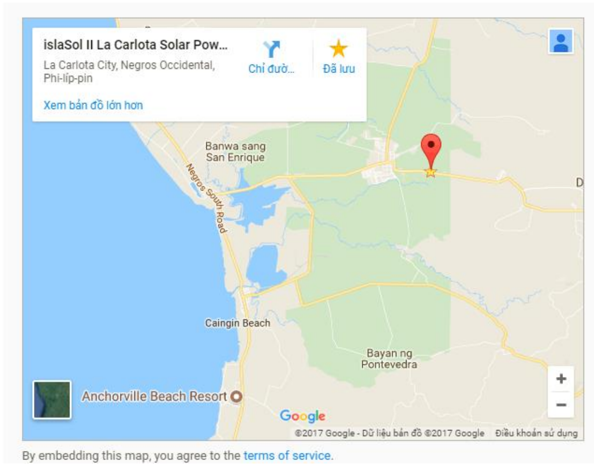
La Carlota 32MW Solar Power Plant

The City of La Carlota is located at the Southwest part of Central Negros Occidental, bounded on the north by the City of Bago, on the east by the mountain ranges of Kanlaon Volcano, on the southwest by the town of La Castellana, on the south by the town of Pontevedra and on the west by the town of San Enrique. The study area is focused on the eight major catchment of La Carlota City. It lies on geographical coordinates between 122° 56' 5" and 122° 56' 25" East Longitude and 10° 25' 10" and 10° 25' 40" North Latitude.

Manapla 48MW Solar Power Plant

The Municipality of Manapla is situated at 10º57'00" latitude and 123º07'30" longitude. It is approximately 44.7 kilometers away from the city of Bacolod and it is located at the northern part of the province. It is bounded by Cadiz City on the east, by Victorias on the south and Guimaras Strait on the Western and northern portion. The plant is located on Latitude: 10.9° North Latitude and 123.2° East Longitude.

The project location has been highlighted in the map shown below.



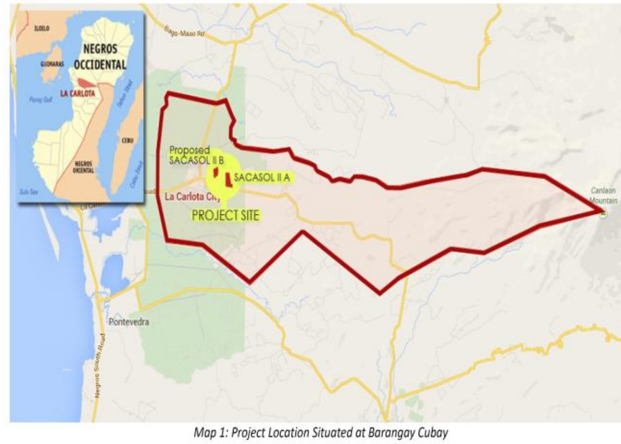
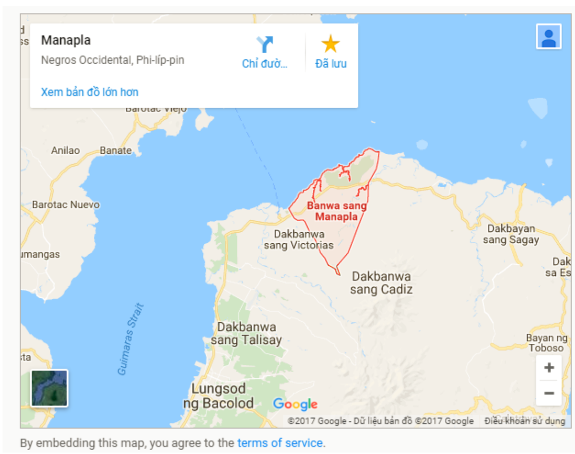


Figure 1.9.1. Location of La Carlota 32MW Solar Power Plant.



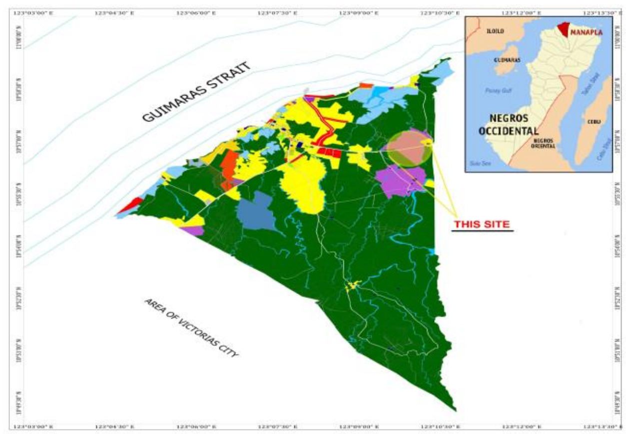


Figure 1.9.2. Location of Manapla 48MW Solar Power Plant.

1.10 Conditions Prior to Project Initiation

In the absence of the project activity, the equivalent amount of electricity would have been generated from the existing/new power plants connected to the grid. Therein, the main emission source in the existing scenario is the grid connected power plants and the primary GHG involved is CO_2. For this project activity, the baseline scenario is the same as conditions existing prior to project initiation. Please refer section 2.4 of joint VCS PD and MR for baseline scenario for the project activity.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Project has received necessary approvals for development and commissioning for each plants from the local authorities (e.g. Department of Energy, Department of Environment and Natural Resources, etc.) and is in compliance to the local laws and regulations.

The WESM (Wholesale Electric Spot Market) registration, Commissioning Certificates (released by Department of Energy) are the project ownership documents which are executed only when the project activity compliance laws and regulatory requirements. Land procurement was initiated only after obtaining the required approvals for the project activity.

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The Project is owned by Individual investors hence it possess right of use of ER credits. The Ownership is demonstrated through the following documents.

1) Commissioning certificates for solar plant in the name of Project Owner issued by Department of Energy.

2) The project also has been approved for Wholesale Electricity Spot Market (WESM) for sale of electricity by the PP.

1.12.2 Emissions Trading Programs and Other Binding Limits

Net GHG emission reductions or removals generated by the project activity under consideration will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions in any Emission Trading program or other binding limits.

1.12.3 Other Forms of Environmental Credit

The Project has no intend to generate any other form of GHG-related environmental credit for GHG emission reductions or removals other than VCS. It is going to be registered under VCS program and there will not be any double accounting throughout the project lifetime.

1.12.4 Participation under Other GHG Programs

The proposed project activity has not been registered and is not seeking registration at moment under any other GHG programs.

1.12.5 Projects Rejected by Other GHG Programs

The proposed project activity is not rejected by other GHG Programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

This is not a grouped project activity. Thus, this section is not applicable for this project.

Leakage Management

Not applicable to the project activity.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Sustainable Development

As a renewable energy project, it will actively bring about both environmental and economic benefits to the local society and contribute to the local sustainable development. The proposed project activity's contributions to sustainable development are:

- Reducing the dependence on exhaustible fossil fuels for power generation;
- Providing clean electricity to a nation in need of power;
- Reducing air pollution by replacing coal and other fossil fuel fired power plants with clean, renewable power;
- Paving the way for further usage of the country's renewable natural resources by importing technology and creating local capacity;
- Contributing to local economic development through employment creation directly or indirectly.
- Providing additional local income through the taxes that the project proponent will pay to the Local Government Units (LGU). This additional income can be used by the LGU to fund more locally beneficial projects.
- The installation of the renewable energy projects also led to development of basic infrastructure like roads, communication with the nearby cities etc. which also improved in living standards of the local population.

The project has definitely had positive influences on sustainable development in the region and in Philippines. The Negros Island Solar Power Inc. Project has enabled the use of local resources for energy production and thus decrease dependency on imported fossil fuels as an energy source. In addition, the project has a significant effect on air quality in the region; directly and indirectly, create new jobs for local inhabitants during the construction and operation phases.

Further Information

Not applicable for the project.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Baseline and monitoring methodology:

Approved consolidated baseline methodology ACM0002 (Version 17.0.0): "Grid-connected electricity generation from renewable sources".

The methodology draws upon:

- Tool for the Demonstration and Assessment of Additionality (Version 07.0.0)
- Tool to calculate the emission factor for an electricity system (version 04.0)

For more information on the baseline and monitoring methodology we refer to the UNFCCC website:

http://cdm.unfccc.int/methodologies/PAmethodologies/approved

2.2 Applicability of Methodology

The baseline and monitoring methodology ACM0002 is applicable to the proposed project activity, because it meets all the applicability criteria stated in the methodology:

Table B.2.1: Applicability conditions of methodology ACM0002 version 17.0.0

Applicability Conditions	Justification
3) This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) install a greenfield plant; (b) involve a capacity addition to (an) existing plant(s); (c) involve a retrofit of (an) existing operating plants/units; or (d) involve a rehabilitation of (an) existing plant(s)unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s).	Applicable. The project activity involves installing a new 32MW La Carlota and a new 48MW Manapla solar power plants at the site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plants)
4) The methodology is applicable under the following conditions:	

(a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	Applicable The Project consists of the installation of a new 32MW La Carlota and 48MW Manapla solar power plants.
(b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant/unit 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, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	Not relevant as the project activity does not involve capacity addition, retrofit or replacement of any existing solar power plant.
5) In case of hydro power plants, one of the following conditions shall apply[1]:	Not relevant as the project activity consists of a new 32MW La Carlota and 48MW Manapla solar power plants
a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or	
b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 W/m^2; or	
c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m^2; or	
d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m^2, all of the following conditions shall apply:	Not relevant as the project activity consists of a new 32MW La Carlota and 48MW Manapla solar power plants

[1] Project participants wishing to undertake a hydroelectric project activity that result in a new reservoir or an increase in the volume of an existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology.

i. The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m^2; ii. Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; iii. Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 shall be: a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project.	
6) In the case of integrated hydro power projects, project proponent shall: 7) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or 8) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	Not relevant as the project activity consists of a new 32MW La Carlota and 48MW Manapla solar power plants.
9) The methodology is not applicable to: a) 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; b) Biomass fired power plants/units;	Not relevant for project activity since: The project activity is a Greenfield solar energy project, so there will be no fuel switching.

10) In the case of retrofits, rehabilitations, 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, that is 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".	Not relevant The project activity is not a case of retrofit, replacement or capacity addition. The project activity is a Greenfield project.

The baseline and monitoring methodologyACM0002 (version 17.0.0) has been applied.

In addition, the applicability conditions included in the tools applied and referred to above apply as follows:

Applicability Conditions	Justification
"Tool for the demonstration and assessment of additionality", version 07.0.0: Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory.	The chosen methodology prescribes the use of this tool. Please refer to section 2.5 below for more details.
"Tool to calculate the emission factor for an electricity system", version 04.0: 1. This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity, i.e. where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects). 2. Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, the conditions specified in "Appendix 2: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in	1. The Project Activity is the installation of 32MW La Carlota and a new 48MW Manapla solar power plants supplying electricity to the national Grid. 2. The project electricity system is located in a non-Annex I country. 3. The project is not relevant to biofuels use. Details have been presented in 3.1 section below.

generation and not to other aspects such as transmission capacity. 3. In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex-I country. 4. Under this tool, the value applied to the CO_2 emission factor of biofuels is zero.	

Any conditions for the application of the tools are addressed in the sections below where the tools are used, sections B.5 and B.6, showing that the tools are applicable to the proposed project activity. In addition, it is noted that:

- The proposed project activity is a Greenfield project, therefore the tool "Combined tool to identify the baseline scenario and demonstrate additionality", version 06.0, is not required to identify the baseline scenario of the Proposed Project Activity; and
- The proposed project activity is a solar power project, therefore there are no fossil fuels used for electricity generation, so there are no CO_2 emissions and leakage from combustion of fossil fuels, and thus the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", version 02, is not applicable to the proposed project activity.

We conclude that these tools are applicable to the project activity for further demonstration and assessment the project's addition and for calculation of the CO_2 emission factor.

2.3 Project Boundary

The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

According to the ACM0002 methodology and "Tool to calculate the emission factor for an electricity system" for definition of an electricity system, the relevant grid definition should be based on the following considerations:

1. Use the delineation of grid boundaries as provided by the DNA of the host country if available; or

2. Use, where DNA guidance is not available, the following definition of boundary: In large countries with layered dispatch system (e.g. state/provincial/regional/national) the regional grid definition should be used.

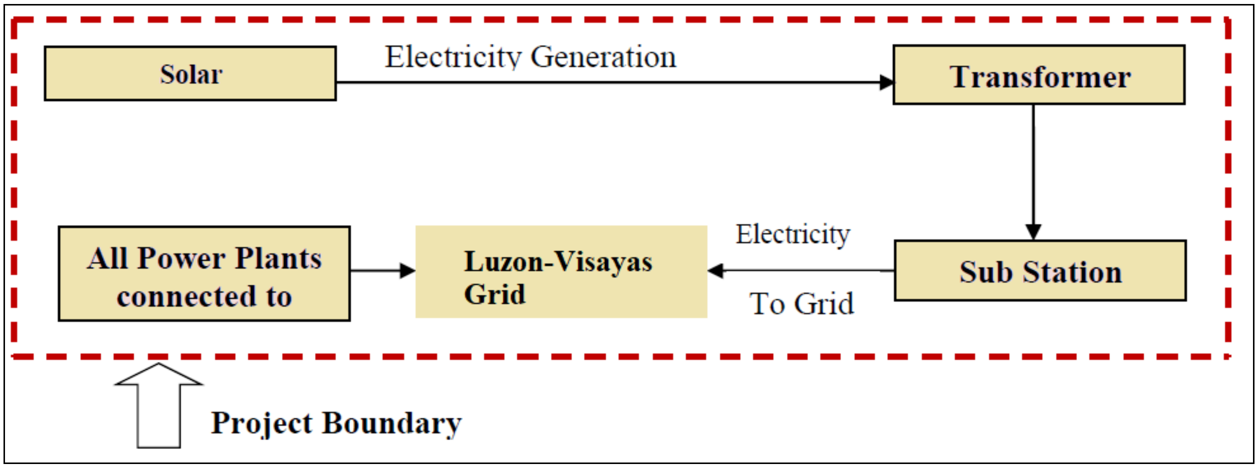
In the Philippines there are 3 separate notable grids as defined by the Philippine Department of Energy (PDOE)[2]. The project activity is situated in the Negros Island of the country, which is

[2] http://www.doe.gov.ph/power-and-electrification/national-grid-emission-factor-ngef

connected to Visayas grid. However, the below neighboring Visayas grid can be included, as there is a 440 MW high-voltage direct current (HVDC) interconnection between Leyte and Luzon, which was commissioned in 1998 aiming to transmit electricity from the large 610 MW geothermal plant in Leyte-Visayas to power hungry Luzon. Hence, there is a clear physical connection between the two grids making the proposed project activity able to displace grid electricity stemming from both. The Luzon-Visayas grids can therefore be considered as one grid.

Figure 2.3.1 The three different power grids in the Philippines

Source		Gas	Included?	Justification/Explanation
Baseline	Fossil fuel-fired Power plants connected to the Luzon-Visayas Power Grid	CO_2	Yes	Main emission resource.
		CH_4	No	Minor emission resource.
		N_2O	No	Minor emission resource.
Project	Negros Island Solar Power Inc. Project	CO_2	No	Minor emission resource.
		CH_4	No	Minor emission resource.
		N_2O	No	Minor emission resource.



The schematic representation of project boundary for grid connected project activity instances is represented as above.

2.4 Baseline Scenario

As per para 23 of ACM0002 version 17.0, if the project activity is the installation of a Greenfield power plant:

"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".

Hence, the baseline for the project activity is the equivalent amount of power from the Luzon-Visayas grid.

The combined margin ($EF_{grid,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) (having weightage 25%) and build margin (BM) (having weightage 75%). Calculations for this combined margin must be based on data from an official source of CEA database (where available) and made publically available.

The combined margin of the Luzon-Visayas Grid used for the project activity is as follows[3]:

Parameter	Value	Nomenclature	Source
$EF_{grid,y}$	0.5535 tCO_2/MWh	Combined margin CO_2 emission factor for the project electricity system in year y	Calculated as the weighted average of the operating margin (0.75) & build margin (0.25) values, sourced from Department of Energy[4]
$EF_{grid,OM,y}$	0.6032 tCO_2/MWh	Operating margin CO_2 emission factor	Calculated as per "Tool to calculate the emission factor for

[3] https://www.doe.gov.ph/national-grid-emission-factor-ngef
[4] https://www.doe.gov.ph/national-grid-emission-factor-ngef

		for the project electricity system in year y	an electricity system, version 04.0.0" as 3-year generation weighted average using data for the years 2009-2011. The data are obtained from Department of Energy.
$EF_{grid,BM,y}$	0.4044 tCO2/MWh	Build margin CO_2 emission factor for the project electricity system in year y	Calculated as per "Tool to calculate the emission factor for an electricity system, version 04.0.0" as 3-year generation weighted average using data for the years 2009-2011. The data are obtained from Department of Energy.

2.5 Additionality

The additionality of the proposed project activity is demonstrated using an investment analysis as according to the steps described in the 'Tool for the demonstration and assessment of additionality' (version 07.0.0).

Step 0. Demonstration whether the proposed project activity is the first-of-its-kind

This step is not applied to the project activity since it is not first-of-its-kind, hence the additionality of the project will be demonstrated in next steps below.

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

According to the CDM Validation and Verification Standard for project activities (V.V.S, version 01.0) paragraph 94: "Where the baseline scenario is prescribed in the approved methodology, no further analysis is required."

The project activity is the installation of new grid connected renewable power plant. The methodology ACM0002 describes the baseline scenario of projects of installation of new grid-connected renewable power plant as "Electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of the grid connected power plants and by the additional 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, no need to further analyse alternatives to the project activity to assess and demonstrate the additionality.

Accordingly, the realistic and credible alternatives to the proposed project are:

(a) The proposed project is undertaken without registering it as a emission reduction project activity.

(b) The baseline scenario: Electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of the grid connected power plants and by the additional of new generation sources

Step 2. Investment analysis

Sub-step 2a: Determine appropriate analysis method

The analysis will be analyzed through Option III of the additionality tool, i.e. benchmark analysis. This method is applicable because:

- Option I: simple cost analysis, does not apply as the project generates economic returns through the sales of electric power to the grid.
- Option II: Investment comparison analysis is not used, as the baseline or BAU scenario, in accordance with ACM002, is continuation of the national grid. On the project site there are no alternatives for a similar provision of power to the grid, suggesting an investment comparison.
- Option III, benchmark analysis can be transparently demonstrated using financial/economic information for the proposed project activity and compare financial indicators against a relevant industry benchmark hurdle rate.

Conclusion: We conclude that option III is applicable to the project activity as transparent data on the project activity and relevant industry benchmark is available.

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

The benchmark analysis as described in the additionality tool prescribes that the project returns should be compared to a benchmark value that is based on “standard returns in the market, considering the specific risk of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer”. As previously described, in the immature solar power market in the Philippines, a crucial factor is the willingness from investors to supply equity to the project. Hence, the relevant benchmark would be based on the typical minimum required return for an equity providing investor in a project of this type in the Philippines.

According to Paragraph 12 of the “Guidelines on the Assessment of Investment Analysis” EB62, Version 05, in cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. The following benchmark analysis applies the equity IRR as financial indicator via calculation based on investment cost financed by equity. The Equity IRR is considered to be a suitable and widely used financial indicator to determine the attractiveness of equity investments.When analysing a potential project, investors compare the equity IRR of the project against their required rate of return as an appropriate benchmark in line with the Paragraph 15 of the said Guidelines.

Benchmark calculation:

The equity IRR needs to be compared with an appropriate benchmark. Following the "Guidelines on the Assessment of Investment Analysis", version 05 (Annex 5 of EB 62), paragraph 15 states, "If the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors".Thus the project participant applies the following benchmark calculation to determine the appropriate benchmark for this project.

Determine the cost of equity using default value (appendix A) of the "Guidelines on the Assessment of Investment Analysis", version 05 (Annex 5 of EB 62):

Applying the default values approach, the expected return on equity for the Philippines is 12.75% (energy industries, Ba3 rating) in accordance with guidance from EB62, convert into nominal values by adding the inflation rate by applying the average forecasted inflation rate by the IMF.

The benchmark is calculated by the following equation by Irving Fisher[5]:

$$(1 + r_n) = (1 + r_r) \times (1 + i)$$

where:

r_n is the nominal interest rate (or nominal return on equity in this case)

r_r is the real interest rate (or real return on equity in this case)

i is the rate of inflation

Since the inflation rate or the target inflation rate of the central bank of the host country for the duration of the crediting period is not available, then the average forecasted inflation rate for the host country published by the IMF or the World Bank for the next five years after the start of the project activity shall be used based on the World Economic Outlook database, i.e. the average inflation rate of the Philippines economy for the period from 2017-2021[6]. Hence here we calculate a benchmark nominal equity IRR as **16.15%** indicated in the table below.

	Real Return on Equity (ROE) (r_r)	**Inflation (i)**	**Nominal ROE (r_n)**
Benchmark	12.75% (The Philippines, Group 1)[7]	3.02%[8]	16.15%

[5] http://everything.explained.at/Fisher_equation/

[6] World Economic Outlook Database, October 2017

[7] Appendix A, "Guidelines on the Assessment of Investment Analysis", version 05 (Annex 5 of EB 62)

In conclusion, the return of equity of **16.15%** applied as the cost of equity for power generation projects in the Philippines at the date of decision making of the proposed project fulfils the requirements of the Guidelines on Assessment of Investment Analysis (EB 62, Annex 5).

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

For the calculation of the equity IRR for the proposed project, we use the parameters listed in Table 2.5.1 which refer to the main input values of the project activity.

Table 2.5.1 Parameters used in the calculation of the Equity Internal Rate of Return

Negros Island Solar Power Inc. Project		
Variable	**Value employed**	**Source**
Macroeconomics		
Inflation rate, Philippines	3.01%	The average inflation rate of the Philippines economy for period from 2017-2022[9]
Inflation rate, Singapore	1.58%	The average inflation rate of the Singapore economy for period from 2017-2022[10]
Investment		
Total investment cost before VAT, PHP'000	(6,020,291)	
Investment including premium	(5,576,606)	consolidating payment instructions to investors
Investment into company	(5,196,559)	Audited Balance Sheet
Premium paid to TL	(318,605)	consolidating payment instructions to investors
Transaction costs	(61,441)	consolidating payment instructions to investors
Release of holdback amounts	(382,244)	Internal calculation - Holdback reconciliation
Operations		
Total Installed capacity (MW) including:	80	Technical Specifications - GHD Study
La Carlota	32	
Manapla	48	
Annual generation (MWh, 2015)	119,312	Technical Specifications - GHD Study
La Carlota	47,273	

[8] Source: World Economic Outlook Database, October 2017.

[9] Source: World Economic Outlook Database, October 2017

[10] Source: World Economic Outlook Database, October 2017

Manapla	72,040	
Investment horizon (years)	25 years	Site Lease term
Power tariff (PHP/kWh)		historical until Sep 2017; forecast: maximum historical WESM price inflated by Philipppine CPI (see financial statements)
La Carlota	3.53	
Manapla	3.56	
Annual O&M cost (PHP'000, Oct 2016 - Sep 2017)	(513,415)	- Audited and unaudited financial statements 2016 - Unaudtied financial statements as of Sep 2017 - Major contracts (Conergy, PRSS, land lease, management contracts)
Annual depreciation	Plant: 25 years useful life Non-plant: 5 years useful life	2016 audited financial statements
Taxes		
Government share	1.0%	Renewable Energy Act of 2008 (http://www.lawphil.net/statutes/repacts/ra2008/ra_9513_2008.html)
Income Tax rate	10.0%	Renewable Energy Act of 2008 (http://www.lawphil.net/statutes/repacts/ra2008/ra_9513_2008.html)
Income Tax Holiday (years)	7	Renewable Energy Act of 2008 (http://www.lawphil.net/statutes/repacts/ra2008/ra_9513_2008.html)

Analysis results

We calculate the Internal Rate of Return based on investments being made in the first year and power sales in each subsequent year. A spreadsheet with the detailed calculation is available to the validator. Table 2.5.2 summarizes the main results of the calculations.

Table 2.5.2 Equity Rate of Return (IRR)

	Internal Rate of Return (IRR)
Project without VER revenues	-1.28%
Benchmark	16.15%

Sub-step 2d: Sensitivity analysis

The tool for the demonstration and assessment of additionality requires that a sensitivity analysis is conducted to check whether, under reasonable variations in the critical assumptions, the results of the analysis remain unaltered. We have used as critical assumptions:

- Total investment cost
- O&M costs
- Tariff
- Power Production

In the sensitivity analysis, variations of ±10% have been considered in the critical assumptions. Table 2.5.3 summarizes the results of the sensitivity analysis.

Table 2.5.3 Results of the sensitivity analysis – impact of variations in critical assumptions on IRR

Critical assumption \ Percentage Variation	-10%	0%	+10%
Total investment cost	-0.62%	-1.28%	-1.86%
O&M cost	-1.18%	-1.28%	-1.38%
Tariff	-3.11%	-1.28%	0.21%
Power Production	-3.11%	-1.28%	0.21%

The IRR remains below the benchmark with 10% variations of the key parameters, which can already be considered conservative variations for sensitivity analysis. This substantiates that the investment is not financially attractive (Equity IRR for the project activity is less than the Benchmark).Thus it can be easily concluded that project activity is additional & is not business as usual scenario.

Step 3. Barrier analysis

Additionality is demonstrated using an investment analysis (see Step 3), therefore no barrier analysis is required as according to the 'Tool for the demonstration and assessment of additionality' (version 07.0.0).

Step 4. Common practice analysis

<u>Sub-step 4a. The proposed CDM project activity (ies) applies measure(s) that are listed in the definition section above.</u>

As the project activity involves in generating electricity by utilizing solar power resource which is one of renewable energies, then the project is considered to apply the measure (ii) indicated in para. 13b of Tool for the demonstration and assessment of additionality (version 07.0.0) as below:

(ii) Switch of technology with or without change of energy source including energy efficiency improvement as well as **use of renewable energies** (example: energy efficiency improvements, power generation based on renewable energy);

The latest version of the Tool "Common practice" version 03.1 shall be applied to demonstrate the common practice analysis following the steps below:

(i) Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

The proposed project has a capacity of 80 MW. The output range as +/-50% of the design capacity of the proposed project activity is 40MW – 120 MW.

(ii) Step 2: Identify similar projects (both carbon and non-carbon) which fulfill all of the following conditions:

(a) The projects are located in the applicable geographical area;

The applicable geographical area for the proposed project is the whole host country (the Philippines).

(b) The projects apply the same measure as the proposed project activity;

The proposed project activity is a power generation based on renewable solar energy. As per the definition of "Measure" prescribed in the "Guidelines on common practice" (version 02.0), all projects of power generation based on renewable energy are considered.

(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;

The proposed project activity uses solar power resource and hence only solar power generation projects indicated in step (b) above are considered.

(d) The plant in which the project are implemented produce goods or services with comparable quality, properties and application areas (e.g. clinker) as the proposed project plant;

The proposed project activity only generates electricity. All solar projects indicated in step (c) with electricity generation are considered.

(e) The capacity or output if the project is within the applicable capacity or output range calculated in Step 1;

Installed capacity from 40MW to 120MW as assessed in step 1 are considered.

(f) The project started commercial operation before the project design document (joint PD and MR) is published for public comment on VCS website or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

Since the Joint PD and MR of the proposed project published for public comment on VCS website would be on 31 December 2017 which is later than the start date of the project on 02 March 2016. Hence the common practice analysis will include all solar power projects (Carbon revenue and non carbon revenue) as the same measure, same energy source as the proposed project activity within the applicable output range determined in Step 1 and that have started commercial operation before the start date of the project activity on 02 March 2016.

Given the specific conditions in the Philippines; remote location and geographical position, very tight weather window for construction, typhoons, lack of local expertise and capacity, immature financial markets and lack of finance and liquidity, the boundary suitable for comparison is the country barrier. This means that similar projects can in this case be considered as grid connected large scale solar power development in the Philippines.

Following the information published by the Department of Energy of the Philippines up to 2017 (release date October 2017)[11] which is the latest information at time of PDD uploading in VCS website as of December 2017, there are several operational solar projects that are falling into range of 40MW-120MW, as presented in table below:

No.	Name of the project	Date of commissioning	Installed capacity (MW)
1	MAJESTIC	Mar 2015	41.3
2	PETROSOLAR	Feb 2016	50.1
	The proposed Project activity	*02 Mar 2016*	*80*

(iii) Step 3: Within the projects identified in step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

As resulted in step 2, N_{all} =2.

[11] https://www.doe.gov.ph/sites/default/files/pdf/electric_power/existing_power_plants/existing_power_plants_luzon_june_2017.pdf (release date, 10 August 2017)

https://www.doe.gov.ph/sites/default/files/pdf/electric_power/existing_power_plants/existing_power_plants_visayas_june_2017.pdf (release date, 10 August 2017)

https://www.doe.gov.ph/sites/default/files/pdf/electric_power/existing_power_plants/existing_power_plants_mindanao_june_2017.pdf (release date, 10 August 2017)

(iv) Step (4): within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.

From the information published on DOE website, the two solar power projects listed in step 3 above were qualified for FIT which is an incentive policy for renewable energy projects in Philippines.

No.	Name of the project	Date of commissioning	Installed capacity (MW)	Feed-In Tariff (Approved for Renewable Energy)
1	MAJESTIC	Mar 2015	41.3	YES
2	PETROSOLAR	Feb 2016	50.1	YES
	The Project activity	*02 Mar 2016*	*80*	*NO*

Feed-In Tariff

In order to utilize the large potential of renewable resources for energy production in the Philippines, a progressive set of policy measures intended to reduce the use of fossil fuels and increase development of domestic renewable energy sources, was signed into law by the Philippine President on December 16, 2008. Republic Act 9513 is known as the Renewable Energy (RE) Act and comprises of a set of incentives such as fixed feed-in tariffs, a 7 year tax holiday, duty-free importation of RE machinery, equipment and materials, no VAT on electricity sales, no VER tax charged and prioritized electricity dispatch. The corresponding rises in electricity off take prices for renewable energy projects, tax holidays and other incentives have drawn attention from the global renewable energy industry and initiated development and feasibility studies of various renewable energy projects.

The RE Act seeks to increase the utilization of renewable energy by providing fiscal and non-fiscal incentives towards institutionalizing the development of capabilities to use renewable energy systems and promoting efficient and cost-effective commercial application. Towards that end, the law mandates the formulation of a Feed-in Tariff (“FIT”) system for electricity produced from biomass, ocean, run-of-river hydropower, solar and wind energy resources.

The RPS and FIT policies mandate the National Grid Corporation of the Philippines (“NGCP”) to collect from local distribution companies a levy on all customers, which the NGCP is then required to distribute to qualifying renewable energy generators so as to augment the revenues of generators from the market price to the level of the FIT. The guaranteed payments assure developers future cash flow and are designed to stabilize pricing in the medium to long-term.

The Energy Regulatory Commission (“ERC”) is tasked with developing the rules and regulations (collectively the “Rules”) governing the FIT with the assistance of the National Renewable Energy

Board ("NREB"). The Rules have been released by the ERC and establish the FIT system and regulate the method of establishing and approving the FIT and the FIT allowance.

According to the NREB in their petition to the ERC, the FIT system will provide for:

- *Priority connection to the grid for electricity generated from emerging renewable energy sources;*
- *Priority purchase, transmission of, and payment for such electricity by grid system operators; and*
- *A fixed tariff to be paid for electricity produced from each type of renewable energy resource over a fixed period of time.*

Under the FIT system, the ERC will fix the price for electricity generated from renewable sources for 20 years. The FIT will be a fixed tariff adjusted annually by a formula to allow pass-through of local inflation and foreign exchange rate variations and will apply to eligible renewable energy projects. Each renewable energy resource will be subject to an initial three-year installation target, which is set at 500 MW for solar.

Following submission by the NREB to the ERC and two years of hearings and deliberations, the specific FIT rates were approved by the ERC in late July 2012 and are listed as follows:

- PhP 5.90 per kWh for hydroelectric;
- PhP 6.63 per kWh for biomass;
- PhP 8.53 per kWh for wind; and
- PhP 9.68 per kWh for solar.

The NGCP will give priority to the dispatch of electricity from renewable energy resources. Facilities will then be paid the corresponding FIT rate based on actual metered export. The amount paid to the generator will account for the difference between the price of electricity as determined by the Wholesale Electricity Spot Market ("WESM") and the FIT rate established by the ERC.

The Majestic and Petrosolar projects listed in table above are applicable for FIT while the project activity is qualified for Wholesale Electricity Spot Market (WESM) in which the tariff is much lower than FIT. Hence following para 12 of Tool "Common Practice" version 03.1, these project are applied "different technologies" with promotional policy under FIT system.

Then **N_{diff} = 2**

(v) Step (5): calculate factor $F=1-N_{diff}/N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

F = 1 -2/2 = 0, less than 0.2, and

N_{all}-N_{diff} = 2-2 =0, less than 3.

As per methodological tool "common practise" version 03.1, the proposed project activity is a "common practice" within a sector in the applicable geographical area if the factor F is greater than 0.2 and N_{all}-N_{diff} is greater than 3.

Both conditions are not fulfilled with the results mentioned above. Hence, the project activity is entirely not a common practice in the Philippines.

2.6 Methodology Deviations

Not applicable.

3 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

The proposed project activity is to be established a solar energy project. According to the methodology ACM0002 (version 17.0.0), the baseline scenario of the proposed project activity is electricity delivered to the Grid by the proposed project activity, which 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".

In accordance with the 'ACM0002 methodology' (version 17.0.0), baseline emissions for the year *y* are calculated as:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

(**1**)

Where:

- BE_y = Baseline emissions in year *y* (tCO_2)
- $EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the GS VER project activity in year y (MWh/yr)
- $EF_{grid,CM,y}$ = Combined Margin CO_2 emission factor for grid connected power generation in year *y*, calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh).

As the project involves the construction of a new solar power project, therefore:

$$EG_{PJ,y} = EG_{facility,y} \quad (2)$$

Where:

- $EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the GS-VER project activity in year y (MWh)
- $EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)

For the calculation of Combined Margin CO_2 emission factor, $EF_{grid,CM,y}$, the methodology refers to the 'Tool to calculate the emission factor for an electricity system' ("EF tool"). The National Grid Emission Factor (NGEF) has been calculated based on the EF tool version 02.2.1 and published officially on website of Department of Energy, Republic of the Philippines[12]. However, the PP used the input data provided by Department of Energy, Philippines and recalculated the emission factor following the update version of the Tool. The below is summary step wise approach to calculate the baseline emission factor following the EF tool, version 04.0.0.

In accordance with this tool, the baseline emission factor is calculated as a "combined margin" emission factor (CM) of the electricity system: a weighted average of two emission factors pertaining to the electricity system: the operating margin (OM) and the build margin (BM). Both the OM and BM emission factors are calculated *ex ante*.

Description of the calculation process

The key methodological steps according to the 'Tool to calculate the emission factor for an electricity system' are:

1. Identify the relevant electricity systems;
2. Choose whether to include off-grid power plants in the project electricity system (optional).
3. Select a method to determine the operating margin (OM);
4. Calculate the operating margin emission factor according to the selected method;
5. Calculate the build margin (BM) emission factor;
6. Calculate the combined margin (CM) emission factor.

Step 1. Identify the relevant electricity systems

Step 1 involves the identification of the relevant electric power system which is described in section 2.3 of this PD. As such, considering the inter-connection and power exchange between

[12] https://www.doe.gov.ph/national-grid-emission-factor-ngef

Luzon and Visayas grids, the project participants conducted the emission factor calculation combining two grids as one.

According to paragraph 21 of the Tool (version 04), for the purpose of determining the operating margin emission factor, use one of the following options to determine the CO2 emission factor(s) for net electricity imports from a connected electricity system:

(a) 0 t CO_2/MWh; or

(b) The simple operating margin emission rate of the exporting grid, determined as described in Step 4 section 6.4.1, if the conditions for this method, as described in Step 3 below, apply to the exporting grid; or

(c) The simple adjusted operating margin emission rate of the exporting grid, determined as described in Step 4 section 3.1 below; or

(d) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in Step 4 section 3.1 below.

Based on the most recent data available at the moment, i.e. data from year 2009 to 2011 published by the Department of Energy (or DNA Philippines)[13], there was no electricity import during this period. Hence, the CO_2 emission factor for electricity import would be 0 (zero) tCO_2/MWh (option a).

Step 2. Choose whether to include off-grid power plants in the project electricity system (optional)

Off – grid plants are not relevant to the project's grid displacement so therefore they are not included for operating margin and build margin emission factor calculation.

Step 3. Select a method to determine the operating margin (OM) method

The Tool offers several options for the calculation of the OM emission factor:

(a) Simple OM; or

(b) Simple adjusted OM; or

(c) Dispatch data analysis OM; or

(d) Average OM

Of these, the Simple OM method is the most appropriate method as data for the other methods is not publicly available. The use of the Simple OM method is allowed as low-cost/must-run

[13] https://www.doe.gov.ph/national-grid-emission-factor-ngef

resources constitute less than 50% of total grid generation in: 1) the average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

The grid OM emission factor will be calculated *ex ante* and is based on a 3-year generation-weighted average, based on the most recent data available at the time of submission of the PDD as once at the validation stage. In this case, no monitoring and recalculation of the emission factor during the crediting period is required.

See for details spreadsheet calculation.

Step 4. Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the three year generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh), not including low-cost/must-run power plants/units.

There are 2 options proposed, including:

Option A: Based on data on the net electricity generation and a CO_2 emission factor of each power unit[14]; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Based on the data available, option A has been selected to calculate the simple OM emission factor. Under this option, the simple OM emission factor is calculated based on the net electricity generation of each power unit and an emission factor for each power unit, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_{m} (EG_{m,y} \times EF_{EL,m,y})}{\sum_{m} EG_{m,y}} \quad (1)$$

Where:

$EG_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

[14] Power units should be considered if some of the power units at the site of the power plant are low-cost/must-run units and some are not. Power plants can be considered if all power units at the site of the power plant belong to the group of low-cost/must-run units or if all power plants at the site of the power plant do not belong to the group of low-cost/must-run units.

m = All power units serving the grid in year y except low-cost/must-run power units.

y = The relevant year as per the data vintage chosen in step 3

Determination of $EF_{EL,m,y}$

Since the only data on electricity generation and the fuel types used is available, hence the option A2 has been chosen to calculate the emission factor of each power unit m- $EF_{EL,m,y}$

Option A2: The emission factor $EF_{EL,m,y}$ should be determined based on CO_2 emission fator of the fuel type used and the efficiency of the power unit, as follows:

$$EF_{EL,m,y} = \frac{EF_{CO_2,m,i,y} \times 3.6}{\eta_{m,y}} \quad (2)$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

$EF_{CO2,m,i,y}$ = Average CO_2 emission factor of fuel type I used in power unit m in year y (tCO_2/GJ)

$\eta_{m,y}$ = Average net energy conversion efficiency of power unit m in year y (ratio)

m = All power units serving the grid in year y except low-cost/must-run power units.

y = The relevant year as per the data vintage chosen in step 3

The result shows that the three year generation weighted Operating Margin Emission factor for the Luzon-Visayas Grid over the years 2009-2011 is 0.6032 tCO_2/MWh.

Details in the spreadsheet calculation.

Step 5. Calculate the build margin emission factor

In terms of vintage of data, project participants can choose between one of the following two options:

(a) **Option 1**: For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of

CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

(b) **Option 2:** For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emission factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 1 was selected.

According to the 'Tool to calculate the emission factor for an electricity system' version 04.0.0, the sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

(c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin.

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activities, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20 per cent of the annual electricity generation of the project electricity system (if 20 per cent falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample-CDM}$) the annual electricity generation ($AEG_{SET-sample-CDM}$, in MWh);

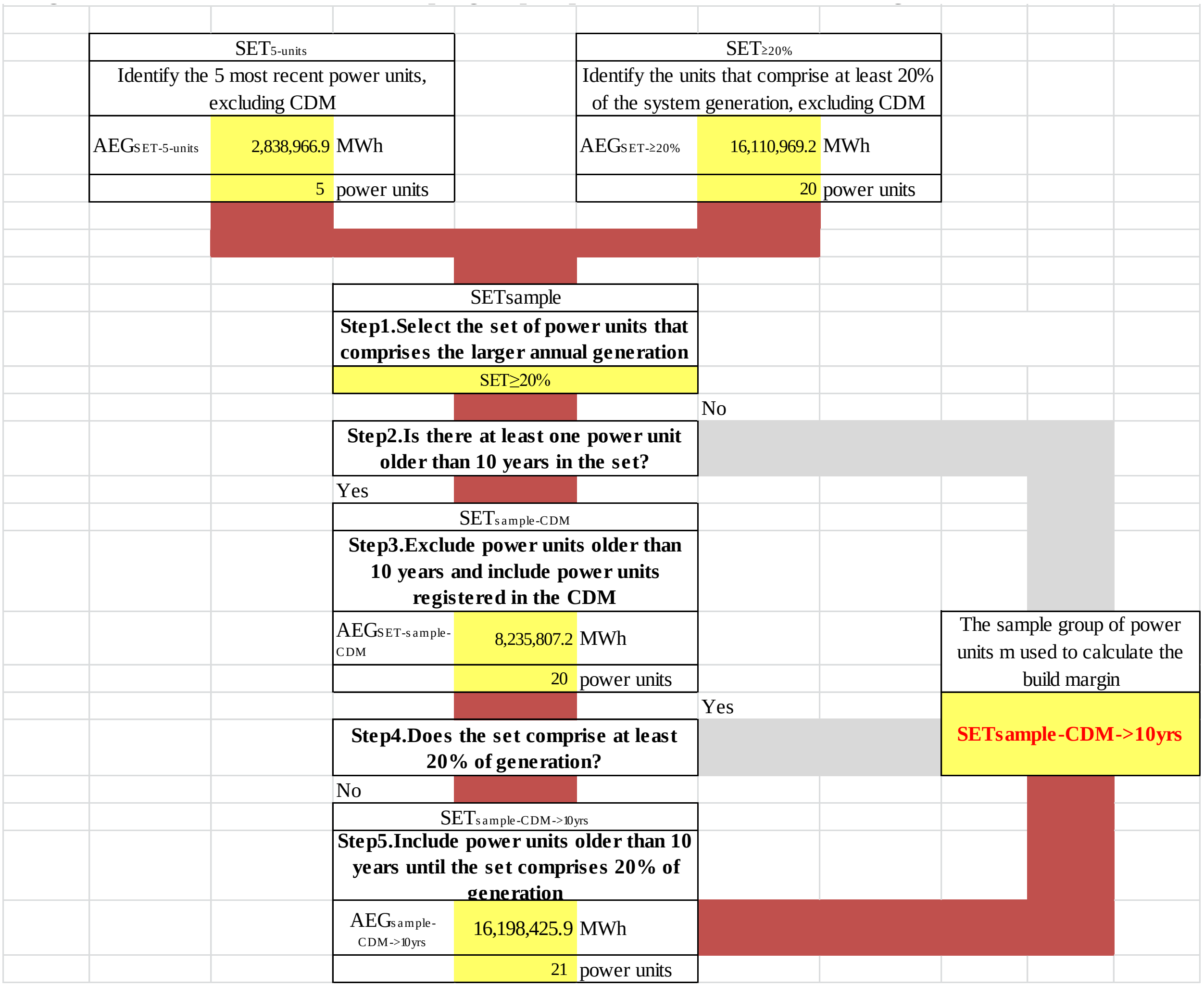
If the annual electricity generation of that set is comprises at least 20 per cent of the annual electricity generation of the project electricity system (i.e. $AEG_{SET-sample-CDM} \geq 0.2 \geq AEG_{total}$), then use the sample group $SET_{sample-CDM}$ to calculate the build margin. Ignore Steps (e) and (f).

Otherwise:

Include in the sample group $SET_{sample-CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20 per cent of the annual electricity generation of the project electricity system (if 20 per cent falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample-CDM->10yrs}$).

Consequently, based on the data available, the sample group of power units *m* used to calculate the build margin has been determined as per the following diagram:



Details in the spreadsheet calculation.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units during the most recent y, i.e. 2011, the most recent year for which power generation data is available.

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \qquad (3)$$

Where:

$EF_{grid,BM,y}$ = Build Margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$	= Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	= CO_2 emission factor of power unit m in year y (tCO_2/MWh)
M	= Power units included in the build margin
Y	= Most recent historical year for which electricity generation data is available

Result shows a Build Margin for the grid of 0.4044 tCO_2/MWh.

Details in the spreadsheet calculation.

Step 6. Calculate the combined margin (CM) emission factor

The Baseline Emission Factor is calculated as a Combined Margin, using a weighted average of the Operating Margin and Build Margin.

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$
(4)

The "Tool to calculate the emission factor for an electricity system" provides the following default weights for solar power projects: Operating Margin, w_{OM} = 0.75; Build Margin, w_{BM} = 0.25

Applying these default weights and the calculated emission factors, we calculate a combined margin Baseline Emission Factor of 0.5535 tCO_2e/MWh.

Please go to official website of Department of Energy (DOE) for more information of computed National Grid Emission Factor derived using the 2009-2011 power statistics[15].

Calculation of Baseline Emissions

Baseline Emissions are calculated by multiplying the Baseline Emission factor by the net quantity of electricity supplied to the grid electricity system by the project according to the formula 1 repeated below for convenience:

$$BE_y = EG_{facility,y} \times EF_{grid,CM,y}$$

The estimated baseline emissions are based on expected net power supply to the grid and an *ex ante* calculation of the emission factor in the first crediting period, and will hence be revised during the implementation of the project activity on the basis of actual net power supply to the

15 https://www.doe.gov.ph/national-grid-emission-factor-ngef

grid. However, the combined margin baseline emission factor will not be updated during the first crediting period.

Calculation of Emission Reductions

As mentioned in the ACM0002, version 17.0.0, 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.

Emission reductions are calculated in accordance with methodology ACM0002 as follows:

$$ER_y = BE_y - PE_y \quad \textbf{(5)}$$

Where:

- ER_y = Emission reductions in year *y* (tCO_2)
- BE_y = Baseline emissions in year *y* (tCO_2)
- PE_y = Project emissions in year *y* (tCO_2)

3.2 Project Emissions

Project emissions

According to the methodology ACM002, for most renewable power generation project activities, PEy = 0. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad (6)$$

Where:

PE_y	=	Project emissions in year y (tCO_2e/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year y (tCO_2/yr)
$PE_{GP,y}$	=	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO_2e/yr)
$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants in year y (tCO_2e/yr)

The methodology provides procedures to calculate the project emissions from the following sources:

- fossil fuel combustion in geothermal and solar thermal projects;
- emissions of non-condensable gases from the operation of geothermal power plants, and;
- emissions from water reservoirs of hydropower plants.

As the proposed project which is a solar energy project, does not involve either geothermal or solar thermal or hydropower aspects, hence the three sources mentioned above do not apply for the project.

Hence PE_y = 0..

3.3 Leakage

Leakage

As per 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.

3.4 Estimated Net GHG Emission Reductions and Removals

As per methodology ACM0002 (version 17.0) net GHG emission reductions are calculated as follows:

ERy = BEy – PEy

ERy = Emission reductions in year y (tCO2e/yr)

BEy = Baseline emissions in year y (tCO2e/yr)

PEy = Project emissions in year y (tCO2e/yr)

Ex-ante calculation (estimate) of net GHG emission reductions:

Ex-ante emission reduction calculations are calculated based on current project activity instances to be included in the grouped project activity under consideration. Summary of ex-ante emission reduction calculations is as follows:

Year	Estimated baseline emissions or	Estimated project emissions or	Estimated leakage emissions	Estimated net GHG emission reductions or

	removals (tCO_2e)	removals (tCO_2e)	(tCO_2e)	removals (tCO_2e)
Year 1	66,039	0	0	66,039
Year 2	66,039	0	0	66,039
Year 3	66,039	0	0	66,039
Year 3	66,039	0	0	66,039
Year 3	66,039	0	0	66,039
Year 3	66,039	0	0	66,039
Year 3	66,039	0	0	66,039
Year 3	66,039	0	0	66,039
Year 3	66,039	0	0	66,039
Year 10	66,039	0	0	66,039
Total	660,390	0	0	660,390

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	$\mathbf{EF_{grid,OM,y}}$
Data unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of “Tool to calculate the emission factor for an electricity system”.
Source of data	Data provided by DOE Philippines
Value applied:	0.6032
Justification of choice of data or description of measurement methods and procedures applied	As per the “Tool to calculate the emission factor for an electricity system”, version 04.0.0
Purpose of Data	Calculation of baseline emissions
Comments	Value is fixed and ex-ante for the entire crediting period

Data / Parameter	$\mathbf{EF_{grid,BM,y}}$
Data unit	tCO_2/MWh

Description	Build margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of "Tool to calculate the emission factor for an electricity system"
Source of data	Data provided by DOE Philippines
Value applied:	0.4044
Justification of choice of data or description of measurement methods and procedures applied	As per the "Tool to calculate the emission factor for an electricity system", version 04.0.0
Purpose of Data	Calculation of baseline emissions
Comments	Value is fixed and ex-ante for the entire crediting period

Data / Parameter	$\mathbf{EF_{grid,CM,y}}$
Data unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of "Tool to calculate the emission factor for an electricity system".
Source of data	Data provided by DOE Philippines
Value applied:	0.5535
Justification of choice of data or description of measurement methods and procedures applied	As per the "Tool to calculate the emission factor for an electricity system", version 04.0.0.
Purpose of Data	Calculation of baseline emissions
Comments	Value is fixed and ex-ante for the entire crediting period

Data / Parameter	$\mathbf{EG_{m,y}}$
Data unit	MWh
Description	Net electricity generated by power plant/unit *m,* in year *y*
Source of data	Data provided by DOE Philippines
Value applied:	For detailed values; *see the GEF spreadsheet calculation*

Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions
Comments	Value is fixed and ex-ante for the entire crediting period

Data / Parameter	$EF_{CO2,m,i,y}$
Data unit	tCO_2/GJ
Description	CO_2 emission factor of fuel type I used in power unit m in year y
Source of data	Data provided by DOE Philippines
Value applied:	For detailed values; *see the GEF spreadsheet calculation*
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions
Comments	Value is fixed and ex-ante for the entire crediting period

Data / Parameter	$\eta_{m,y}$
Data unit	-
Description	Average net energy conversion efficiency of power unit m in year y.
Source of data	Data provided by DOE Philippines
Value applied:	For detailed values; *see the GEF spreadsheet calculation*
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions
Comments	Value is fixed and ex-ante for the entire crediting period

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4.2 Data and Parameters Monitored

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of "Tool to calculate the emission factor for an electricity system".
Source of data	Data published by DOE Philippines
Description of measurement methods and procedures applied	As per the "Tool to calculate the emission factor for an electricity system".
Frequency of monitoring/recording	Value is fixed and ex-ante for the entire crediting period
Value applied:	0.5535
Monitoring equipment	NA
QA/QC procedures applied	NA
Purpose of data	Calculation of baseline emissions
Calculation method	As per the "Tool to calculate the emission factor for an electricity system".
Comments	Value is fixed and ex-ante for the entire crediting period

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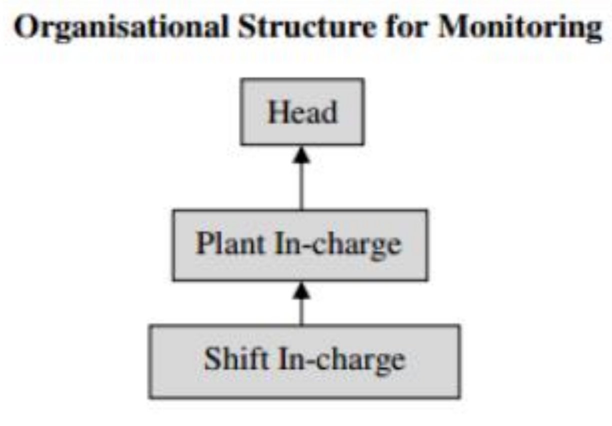
Data / Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Electricity meter(s)
Description of measurement methods and procedures applied	This parameter should be either monitored using bi-directional energy meter or calculated as difference between: (i) the quantity of electricity supplied by the project/unit to the grid ($EG_{export,y}$); and (ii) The quantity of electricity delivered to the project plant/unit from the grid ($EG_{import,y}$). The net supply of power to the grid by the proposed project is calculated based on measured parameters $EG_{export,y}$ and $EG_{import,y}$. These two parameters, import and export to the grid, are measured at the same location near the connection to the grid, through standard electricity metering instrument(s) M_x. The metering instruments will be installed at the grid-connected point to measure the amount of electricity going from and to the grid. The readings of electricity will be continuously measured by metering instrument itself and monthly recorded. The accuracy of

	the meter(s) will meet the requirements of national standards and regulations, shall be of IEC 687 class 0.2. *Please refer to Appendix I for more details.* Person/entity responsible for the measurements: the project participant (i.e. NISP)
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value applied:	119,312
Monitoring equipment	The two parameters, import and export to the grid, are measured at the same location near the connection to the grid, through standard electricity metering instrument(s) M_x. The metering instruments will be installed at the grid-connected point to measure the amount of electricity going from and to the grid. The readings of electricity will be continuously measured by metering instrument itself and monthly recorded. The accuracy of the meter(s) will meet the requirements of national standards and regulations shall be of IEC 687 class 0.2. *Please refer to Appendix I for more details.* Person/entity responsible for the measurements: the project participant (i.e. NISP)
QA/QC procedures applied	This data will be directly used for calculation of emission reductions. Measurement results of electricity supplied to the grid and that delivered from the grid to the project will be cross-checked with records for sold electricity. The meter(s) will be calibrated annually in accordance with national standards and procedures.
Purpose of data	Calculation of baseline emissions
Calculation method	$EG_{facility,y} = EG_{export,y} - EG_{import,y}$
Comments	

4.3 Monitoring Plan

The monitoring plan, which is implemented by the PP describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data results with the PP. PP proposed the following structure for data monitoring, collection, data archiving and calibration of equipment for this project activity instances. The team comprises of the following members:



PP has assigned the responsibility of operation and maintenance of project activity instances with relevant and authorised O&M contractors. The Plant In-charge and Shift In-Charge would be deployed by O&M contractors.

Responsibilities of Head: Overall functioning and maintenance of the data.

Responsibilities of Plant In-charge: Responsibility for Maintains the data records, ensures completeness of data, and reliability of data (calibration of equipments).

Responsibilities of Shift In-charge: Responsibility for day to day data collection and maintains day to day log book for monitored data.

In the event when the individual verification period dates and billing cycle dates of the project activity does not coincide, then the electricity export will be apportioned based on number of days. The ratio of number of days under monitoring period and total number of days under billing cycle will multiplied to total electricity export to billing cycle.

For project activity which involves solar projects with common metering, apportioning will be followed to determine net electricity export to grid. The apportioning procedure is not under control of PP, thus value of net electricity supplied to grid is available to PP and same is mentioned as monitoring parameter. The value of net electricity supplied to grid is used for ER calculations.

It is to be noted that the metering arrangement, accuracy class of meters, feeder arrangements, calibration frequency of meters are under control of state electricity board and PP do not have any control on it. Thus any deviation at actual site or during verification is accepted.

QA & QC Procedures to be followed

Necessary check meters as required would be installed, to operate in standby mode or when the main meters are not working. All meters will be calibrated annually. Records of calibration certificates will be maintained for verification. Hence, high quality is ensured with the above parameters. The calibration of meters is under purview of state electricity board and CME/ project activity instances owner do not have any control on it.

Data Recording and Storage

For measuring the net energy supplied to grid by the project activity at the interconnection point, one set of Main meter and Check Meter shall be provided. Representatives of both project activity Owner and Philippine Electricity Market Corporation (PEMC) will be present to record the monthly meter readings. The PEMC will prepare the monthly record for the net energy supplied to the grid and same will be used as a basic document for monitoring and verification of the net energy supplied to the grid. Based on the monthly record, the project activity Owner shall raise an invoice to the PEMC for payment.

The above documents will be kept at safe storage for verification of emission reductions generated from the project activity. The period of data storage will be 2 years beyond crediting period.

Emergency preparedness

The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. However, in case monitoring equipment get failed or found faulty, they shall be replaced with calibrated meters as quickly as possible. In case main meter get failed or found faulty, the reading of check meter will be considered.

5 SAFEGUARDS

5.1 No Net Harm

The IEE studies for the wind turbines and transmission line did not identify any significant environmental impacts from the proposed project activity. The wind power plant site is uninhabited while the transmission line will be installed over forest land, rice paddies and along roads.

The identified impacts are the following[16]:

Issues	Assessment of Impact	Mitigation Measures
Construction Phase		
Land	Vegetation disturbance /Secondary growth sugarcane plant & grasses	*1.* Design and implement an appropriate landscape for greening area 2. Designate location for equipment, and areas of the site which should be kept free of traffic, equipment, and storage.
	Increased storm water, runoff and soil erosion	1. Improve existing side drainage channel to absorb surface runoff. 2. Storm water management that minimizes impervious area

[16] IEE Report

		infiltration by use of recharge areas and use of detention and/or retention basin with outlet control structure. 3. Ensure that construction vehicles are restricted to use existing graded roads. *4.* Site excavation works to be planned such that a section is completed and rehabilitated *before another section begins.* 5. Interconnected open drains will be provided on site.
	Soil and Water pollution	*Use of an integrated solid waste management system i.e. through a* hierarchy of options: • Waste reduction • Reuse and Recycle • Waste processing • Waste disposal (Disposal to LGU landfill)
		• Provide facilities for proper handling and storage of construction materials to reduce the amount of wastes. • Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction wastes generated over time. • Provide proper storage for scrap materials. • Use building materials that have minimal or no packaging to avoid the generation of excessive packaging wastes. • Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce wastes at site. • Dispose waste more responsibly by contracting a registered waste handler who will dispose the wastes at designated sites or landfills only. • Placement of collection bins for segregated wastes to be provided at designated points on site.
Air	Degradation of ambient air quality	▪ Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles; ▪ Wash truck tires to remove dirt and mud before leaving the site; ▪ Ensure strict enforcement of onsite speed limit regulations; ▪ Provision of traffic signages at the ingress and outgress of the project site; ▪ Personal Protective equipment to be provided to employees and worn. ▪ Vehicle idling time shall be minimized; ▪ Monitor and brief truck drivers to avoid unnecessary revving engines of stationary vehicles and to switch off engines whenever possible; ▪ Vehicles delivering construction materials to site should be adequately maintained to reduce exhaust emissions. ▪ Only trucks with engines maintained will be permitted to deliver fuel supplies to reduce emissions
	Disturbance to residents	▪ Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used. ▪ Sensitize construction drivers to avoid revving of vehicle

		engines or hooting ▪ Ensure that construction machinery are kept in good condition to reduce noise; ▪ Ensure that all generators and heavy duty equipment are insulated or placed in enclosures (containers) to minimize ambient noise levels. ▪ The noisy construction works will entirely be planned to be during daytime when most of the neighbors are awake.
Water	Increase water demand	▪ Promptly detect and repair of water pipe and tank leaks ▪ Briefing to construction workers to conserve water by avoiding unnecessary use of water; ▪ Ensure taps are not running when not in use
	Generation of sewage	▪ Provision of septic tank ▪ Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards *are not violated*
	Oil spills	▪ Install oil trapping equipment in areas when there a likelihood of oil spillage such during the maintenance of construction equipment. Soil in such an area will be well protected from contamination
People	Accidents and fatalities	▪ Ensure compliance with the Occupational Safety and Health Act (OSHA) provisions e.g. employees to be provided with *appropriate PPE*
Operation Phase		
Land	Soil and water pollution	▪ Prepare solid waste management plan ▪ Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Composting and reuse 4. Resource recovery 5. Disposal to LGU land fill. ▪ Ensure that wastes generated at the plant are efficiently managed through recycling, reusing and proper disposal procedures.
	Surface and ground water contamination from sewage	▪ Provide adequate and safe means of handling sewage generated at the plant (provision of 3- chamber septic tank) ▪ Ensure regular monitoring of the sewage discharged from the project to ensure that the stipulated sewage/effluent discharge rules and standards are not violated
	Power resource competition	▪ Switch off electrical equipment, appliances and lights when not being used ▪ Install occupation sensing lighting at various consultant locations such as storage areas which are not in use all the time ▪ Install energy saving fixtures within the plant. ▪ Monitor energy use during the operation of the project and set targets for efficient energy use ▪ Brief and train workers to use energy efficiently. ▪ Utilization of solar power for project operation
	Water resource competition	▪ Enforcement of water conservation policy within the plant ▪ Regular check up for water leakage ▪ Install water conserving taps that turn-off automatically when water is not being used
Air	Dust emissions	▪ Suitable wet suppression techniques need to be utilized in all exposed areas ▪ Enforce low speed limits for vehicles moving within the site

People	Increased health and safety impacts (accidents and fatalities)	▪ Implement all necessary measures to ensure health and safety of the plant workers and the general public during operation of the power plant as stipulated in the Occupational Safety and Health Act (DOLE) ▪ Ensure compliance with the Occupational Safety and Health Act (OSHA) provisions e.g. employees to be provided with appropriate PPE

The above assessments indicate that the project is not expected to cause any significant long-term adverse effects to the environment.

5.2 Environmental Impact

Mandated by Presidential Decree No. 1586, as drafted by the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR), an environmental impact assessment is required for a project such as the proposed project, and was undertaken by conducting an Initial Environmental Examination (IEE) Report.

The Initial Environmental Examination Report for the La Carlota and Manapla Solar Power Plants was conducted in May 2014 to secure the Environmental Compliance Certificate (ECC) which has been released by the DENR on 02/06/2014 and 21/07/2014 respectively and amended on 02/08/2016 for La Carlota and 25/05/2015 for Manapla solar power plant.

The IEE involves next to a significant amount of environmental analysis, inclusion of various local stakeholders optimizing access to indigenous knowledge of the environment, interviews on the socio-economic impact, and social development plans. It also involves consultation of all government agencies relevant as well as public stakeholder meetings.

The purpose of the assessment is to ensure that the investment decision made for the project activity had been considered the ensuring environmental impacts. The checklist included the process of identifying, predicting, evaluating the effects on environment, biological resource, ecosystem, economy and society under the implementation of project activity. Furthermore, based on the impact assessments of the project activity, the IEE checklist proposes that the mitigation measures should be conducted during the construction and operation phases in order to minimize the negative impacts and ensure the long-term benefits from this project.

5.3 Local Stakeholder Consultation

In line with the VCS requirements, a local stakeholder consultation meeting has been organized on 21 December 2017 for both La Carlota and Manapla Solar Power Plants.

In this meeting, the opinion of the stakeholders with regard to the project, the non-technical summary and the sustainable development matrix have been gathered. Also the best way to assure continuous input throughout the remaining crediting period has been discussed. Stakeholders have been invited via various media and the following stakeholders will be invited to the meeting and comment on the project:

- Local residents

- Local officials (including the ones who were consulted earlier in the course of the project).

Figure 5.3.1. Some pictures of local stakeholder meeting in 21 December 2017

At the stakeholder meetings on 21 December 2017, there were 21 participants in total joined the meetings in La Carlota and Manapla solar power plants including representatives of the Project Owner (Negros Island Solar Power Inc.), local authorities and local stakeholders.

The attendance list has been attached with Minutes of meetings provided to DOE for review.

Content of the meeting:

- Explanation of the project and how a solar plant operates and generate electricity
- Environmental and social impacts assessment;
- Corporate Social Responsibility
- A brief introduction on VCS system.
- Q&A Session.

The Minutes of meeting on 21 December 2017 summarize the comments received from the stakeholders about the impacts of the project on the local community and project owner. Details of the comments are as below:

- All the participants supported the development of La Carlota and Manapla solar power plants invested by Negros Island Solar Power Inc. All of them noted that the best thing they like about the project is the utilization of clean energy, which is seen as a key opportunity to save from imported fuel and help to reduce the polluted gases emissions which normally caused by fired fuel plants instead.

- The project has many positive socio-economic and environmental impacts on the region. The environmental impact of a RE project is directly or indirectly relevant to a number of national environmental objectives. Renewable energy would partly reduce climate impact that is geared in establishing ecologically sustainable energy utilization.

Overall, the comments were positive.

5.4 Public Comments

This section will be completed once the public comment period is finished.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Value applied:	125,303.750
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.

6.2 Baseline Emissions

$$BE_y = EG_{facility,y} \times EF_{grid,CM,y}$$

Where:

BE_y: Baseline emissions in year y (tCO2e/yr)

$EG_{facility,y}$: Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS project activity in year y (MWh/yr)

$EF_{grid,CM,y}$: Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system" version 04 (tCO_2e/MWh).

Then BE_y = **125,303.750 x 0.5535 = 104,351 tCO_2** (rounded down)

6.3 Project Emissions

As per methodology, for renewable energy projects, there is no any project emissions occurred.

Hence, PE_y= 0.

6.4 Leakage

As per methodology, for renewable energy projects, there is no any leakage emissions occurred. Hence, LE_y= 0

6.5 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
Year 2016	49,437	0	0	49,437
Year 2017	54,914	0	0	54,914
Total	104,351	0	0	104,351

APPENDIX 1: METER DETAILS

Meter and Calibration details for current monitoring period:

1. La Carlota 32MW Solar Power Plant

Meter Type	Meter Serial Number	Make	Accuracy Class	Calibration Date
Main Meter	153631320	AMETEK	0.2	28/01/2016 & Jan 2017
Check Meter	15882036	ELSTER	0.2	28/01/2016 & Jan 2017

2. Manapla 48MW Solar Power Plant

Meter Type	Meter Serial Number	Make	Accuracy Class	Calibration Date
Main Meter	153631349	AMETEK	0.2	28/01/2016 & Jan 2017
Check Meter	15882039	ELSTER	0.2	28/01/2016 & Jan 2017