CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Project Title: GHG abatement through Solar Power Generation at Jaisalmer, Rajasthan, India

Version: 03

Date: 18/07/2012

A.2. Description of the small-scale project activity:

M/s Precision Technik Private Limited (PTPL) incorporated on 19th December 1995 under the Companies Act, 1956 is a part of the Sonthalia Group. The Sonthalia Group is a Kolkata based business house with diversified business interests in Polymers, Textiles & Readymade Garments, Jewellery, Steel, Solar Module manufacturing and Infrastructure Development.

PTPL has developed a 5 MW grid connected solar Photo voltaic power project in Nokh Village, Pokhran Tehsil in Jaisalmer District in the State of Rajasthan in Western India. The project activity is expected to supply 8,322 MWh of net electricity annually to the NEWNE[1] grid. The entire power generated from this project is being sold to NTPC Vidyut Vyapar Nigam (NVVN) by connecting it to state grid through a power purchase agreement with NVVN. The project activity was commissioned on 8th February, 2012 and is continuing operation since then.

Baseline scenario:

The baseline for the project activity under consideration is generation of equivalent amount of electricity at the NEWNE grid which would have resulted in the emission of 7,889 tCO_2/annum considering the GHG intensity associated with the fossil fuel dominated power generation at the NEWNE grid of India. For the project activity under consideration the baseline scenario and the pre-project scenario are similar. In absence of the project activity equivalent amount of electricity would have been generated in the NEWNE grid which is predominantly a fossil fuel dominated grid.

Whereas the operation of solar PV power plant is emission free and no emissions occur during the lifetime of the project activity. As per the applicable methodology the baseline scenario for the project activity is the generation of equivalent electricity from NEWNE connected power plants, which is also

[1] NEWNE: Northern Eastern Western North Eastern

the pre-project scenario. Hence the project activity will result in the emission reduction to the tune of 7,889 tCO_2/annum.

Project's contribution to sustainable development

Ministry of Environment and Forests (MoEF), Government of India, has stipulated the following indicators for sustainable development in the interim approval guidelines for CDM projects.

Environmental Well-Being:

Indian economy is highly dependent on "Coal" as fuel, to generate energy. Thermal power plants are one of the major consumers of coal in India, and yet the there is a consistent power deficit in the national Grid. The project substitutes the use of the coal and other fossil fuel(s) for power generation and there by reduces carbon dioxide (CO2) emissions from the generation of power. Also the associated SPM, SOx, NOx emissions and emission of transportation and excavation of associated fossil fuel are avoided. Further generation of power through renewable sources like solar energy, reduces the intensity of Global Warming by reducing the GHG Emissions. Therefore power generation from renewable energy sources creates global as well as local air pollutant benefits.

Social Well-Being:

The proposed project activity is benefiting the local rural community by employment generation and strengthening social infrastructure in the region. Thus, it will improve the quality of life for the community living nearby.

Economic Well-Being:

The project activity has created business opportunities for local stakeholders such as bankers, consultants, equipment suppliers, manufacturers and contractors during the implementation phase. The contribution of the project activity towards the infrastructural development of the region will result in an economic well-being for the local populace throughout the project lifetime.

Technological well-being:

The amount of solar energy produced in India is less than 1%[2] of the total energy demand. The grid-interactive solar power as of December 2010 was merely 10 MW.[3]

Solar power is currently prohibitive due to high initial costs of deployment. The solar power generation technology has not achieved complete maturity till now. The capital cost for implementation of solar projects is also high because of the same reason. The project activity will lead to the promotion of such projects in this region and has got a replicating potential.

A.3. Project participants:

Name of party involved (*) (host) indicates a host party	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicates if the party involved wishes to be considered as project participants (Yes/No)
India (Host)	M/s. Precision Technik Private Limited (PTPL) (Private entity)	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

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A.4.1.1. Host Party(ies):

India

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

Rajasthan

A.4.1.3. City/Town/Community etc:

Village: Nokh

[2] http://cercind.gov.in/2009/July09/Draft-Explanatory-Memorandum_Solar-Power-Projects.pdf

[3] http://en.wikipedia.org/wiki/Solar_power_in_India

CDM – Executive Board

Tehsil: Pokhran

District: Jaisalmer

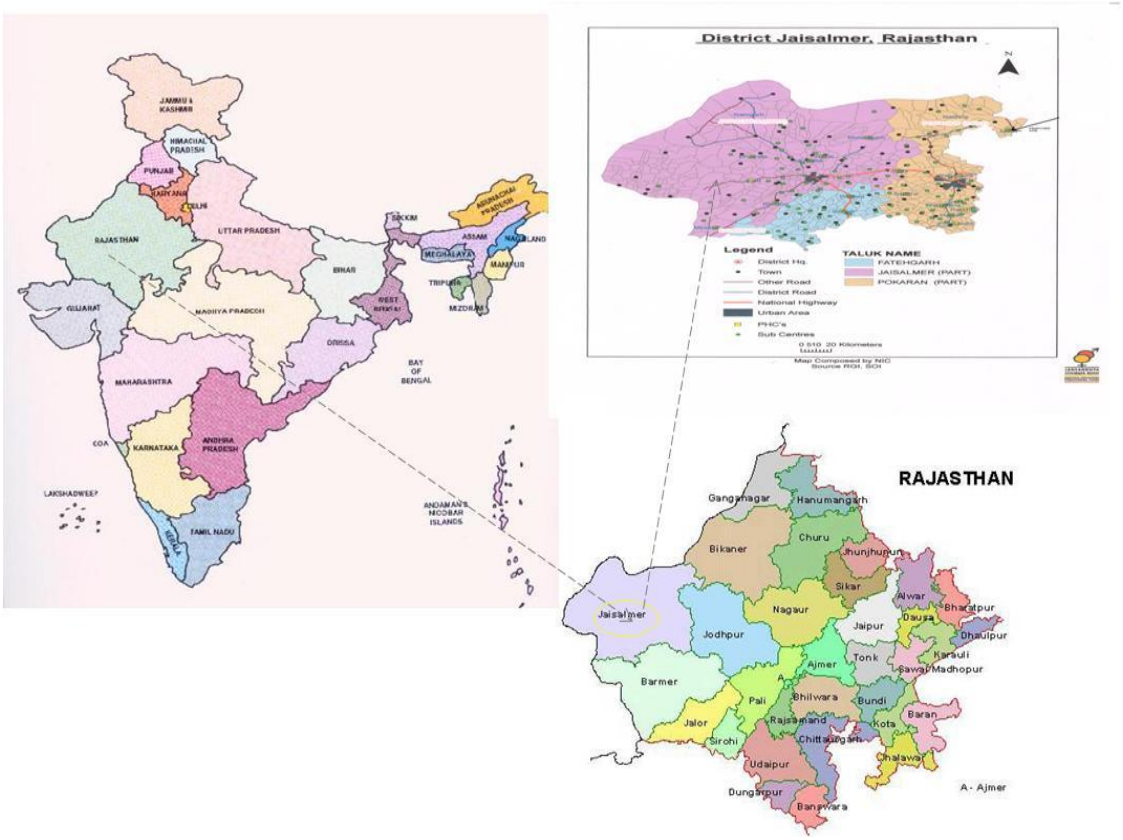
A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The site is located at Village Nokh in Pokhran Tehsil of Jaisalmer District, Rajasthan. The site is well connected with NH 15 running close to proposed location. The site is 110km from Jaisalmer city in Jaisalmer-Jodhpur railway line. Nearest airport Jodhpur is 190 km from the site. The precise geographic location of the project activity is given below:

Latitude: 26^0 54'56.69''

Longitude: 70^0 54' 30.03''

Project activity site Map



A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

Type and Category of the project:

Referring to the UNFCCC CDM website, as per Appendix B to the simplified modalities and procedures (M&P) for small-scale CDM project activities, type and category applicable to the project activity are:

Type: Type I: Renewable Energy Projects
Category: I.D.: "***Grid connected renewable electricity generation***" Version 17 EB 61.

Technology to be employed by the project activity

The project activity is harnessing renewable solar energy through installation of solar PV farm with total capacity of 5 MW. The solar PV power plant has got solar PV modules, inverters, transformers and other protection system and supporting components as well. The various components of the plant include:

- Solar Photovoltaic modules
- Inverters
- Transformers
- Circuit breakers
- Lightening arrester
- Isolator
- Current transformer
- Switchyard
- LT panel
- Earthing system

The Direct Current (DC) from modules is converted into Alternating Current (AC) by inverters. The inverter outputs are fed into a junction box which in turn is connected to the LV Panel in the control room. The output from LV Panel is stepped up by outdoor type transformers located near the control room. The HV side of transformer is connected to HT Panel in the control room. The LV and HT Panels have all necessary metering and protection as per Power evacuation schematic.

- 5 MW divided into 5 nos of 1 MW
- 1 MW divided in to 2 nos of 500 KW inverter

- 500 kw system is connected by 113 strings of solar panel
- Each string consists of 22 solar modules connected in series

Basic System Design:

Parameter	**Specifications**
Power Generation Units	5 no's each with a proposed capacity of 1MW.
Inverter	Each of the 1 MW units are divided into 2 nos of 500 kW each. Inverter input voltage range 500-820 volt
Modules	230 Wp 30 volts modules have been used. Approximately 4348 modules (1 MW) have been used.
Strings	String voltage is 660 volt, 226 strings per MW have been used
Wires	Each inverter has got 5 wires

The project activity under consideration involves generation of electricity using solar PV technology and does not involve any combustion of fossil fuel. Therefore the technology involved for this project activity is environmentally safe and sound.

There is no technology transfer involved in this project activity.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

Years	**Estimation of annual emission reductions in tonnes of CO_2**
2012-13	7,889
2013-14	7,889
2014-15	7,889
2015-16	7,889
2016-17	7,889
2017-18	7,889
2018-19	7,889
2019-20	7,889
2020-21	7,889
2021-22	7,889
Total estimated reductions (tonnes of CO_2)	78,890
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tones of CO_2)	7,889

A.4.4. Public funding of the small-scale project activity:

There is no public funding from Annex-I countries and also there is no diversion of Official Development Assistance (ODA) for the project activity.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

Paragraph 2 of Appendix C of the Simplified Modalities and Procedures for Small Scale CDM project activities states that:

"***A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:***

- ***With the same project participants;***
- ***In the same project category and technology/measure; and***
- ***Registered within the previous 2 years; and***
- ***Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point****"*

There is no registered project of Precision Technik Private Limited registered with the UNFCCC, and no other project of M/s Precision Technik Private Limited is within 1 km of the project activity of the proposed small-scale activity at the closest point. So this project activity is not a debundled project activity of a large scale project activity in line with EB54 Annex 13 Version 3.1.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

Methodology Title: AMS I.D.: "Grid connected renewable electricity generation" – Version 17.0
Reference: I.D./Version 17, Sectoral Scope: 01, EB 61
http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X

Methodological Tool: "Tool to calculate the emission factor for an electricity system" – Version, 2.2.1
Reference: EB 63, Annex 19
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

B.2 Justification of the choice of the project category:

The position of the CDM project activity vis-à-vis applicability conditions in the AMS-I.D, Version-17 is described in the following table.

SL No	Category (Applicability)	Justification
1	*This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass[4]:* *(a) Supplying electricity to a national or a regional grid; or* *(b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling..*	The project activity under consideration involves generation of electricity utilizing the solar energy potential in the State of Rajasthan. The project activity is supplying electricity to NEWNE grid and thus it meets this applicability condition.
2	*Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A[5]) applies*	The project activity under consideration is a 5 MW grid connected solar power project that is supplying electricity to the NEWNE grid. The project does not supply electricity to house hold users (included in the project boundary) located in off grid areas, hence the methodology AMS-I.A is not applicable

[4] Refer to EB 23, annex 18 or the definition of renewable biomass.

[5] AMS-I.D "Grid connected renewable electricity generation", AMS-I.F "Renewable electricity generation for captive use and mini-grid" and AMS-I.A "Electricity generation by the user"

SL No	Category (Applicability)	Justification
		for this project activity. The power generated from the project activity is not used for captive use and it also is not supplied to a mini grid system. Hence the methodology AMS-I.F is not applicable for this project activity.
3	*This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition[6]; (c) involve a retrofit of (an) existing plant(s)[7]; or (d) involve a replacement of (an) existing plant(s[8]).*	This project activity under consideration involves installation of a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant). Hence this eligibility condition is satisfied by the project activity.
4	*Hydro power plants with reservoirs[9] that satisfy at least one of the following conditions are eligible to apply this methodology:* • *The project activity is implemented in an existing reservoir[10] with no change in the volume of reservoir;* • *The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2;* • *The project activity results in new reservoirs and the power density of the*	The project activity is a solar power generation project in the state of Rajasthan. Since this is not a hydropower project so this condition is not applicable in this case.

[6] A capacity addition is an increase in the installed power generation capacity of an existing power plant through: (i) The installation of a new power plant besides the existing power plant/units; or (ii) The installation of new power units, additional to the existing power plant/units. The existing power plant/units continue to operate after the implementation of the project activity.

[7] Retrofit (or rehabilitation or refurbishment). It involves an investment to repair or modify an existing power plant/unit, with the purpose to increase the efficiency, performance or power generation capacity of the plant, without adding new power plants or units, or to resume the operation of closed (mothballed) power plants. A retrofit restores the installed power generation capacity to or above its original level. Retrofits shall only include measures that involve capital investments and not regular maintenance or housekeeping measures

[8] Replacement. It involves investment in a new power plant or unit that replaces one or several existing unit(s) at the existing power plant. The installed capacity of the new plant or unit is equal to or higher than the plant or unit that was replaced.

[9] A reservoir is a water body created in valleys to store water generally made by the construction of a dam.

[10] A reservoir is to be considered as an .existing reservoir. if it has been in operation for at least three years before the implementation of the project activity.

SL No	Category (Applicability)	Justification
	power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2;	
5	*If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fue[11]l, the capacity of the entire unit shall not exceed the limit of 15 MW*	This project activity is 5 MW (< 15 MW) solar power (renewable energy) project and does not have any nonrenewable component. So this condition is not applicable for this project activity.
6	*Combined heat and power (co-generation) systems are not eligible under this category*	The project activity is a solar power generating project in Rajasthan. Since it is not a co-generation plant so this condition is not applicable here.
7	*In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct[12] from the existing units.*	The project activity under consideration is a green field project activity. Hence this condition is not applicable in this case.
8	*In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW*	This is a green field project activity with total installed capacity of 5 MW. So this condition is not applicable here.

The project activity is installation of 5 MW of solar PV modules and there would not be any change in the capacity of the project during its crediting period and the EPC contract for the project activity has also been placed and the project has also been commissioned. Since the project generates and exports

[11] A co-fired system uses both fossil and renewable fuels, for example the simultaneous combustion of both biomass residues and fossil fuels in a single boiler. Fossil fuel may be used during a period of time when the biomass is not available and due justifications are provided.

[12] Physically distinct units are those that are capable of generating electricity without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered .physically distinct.

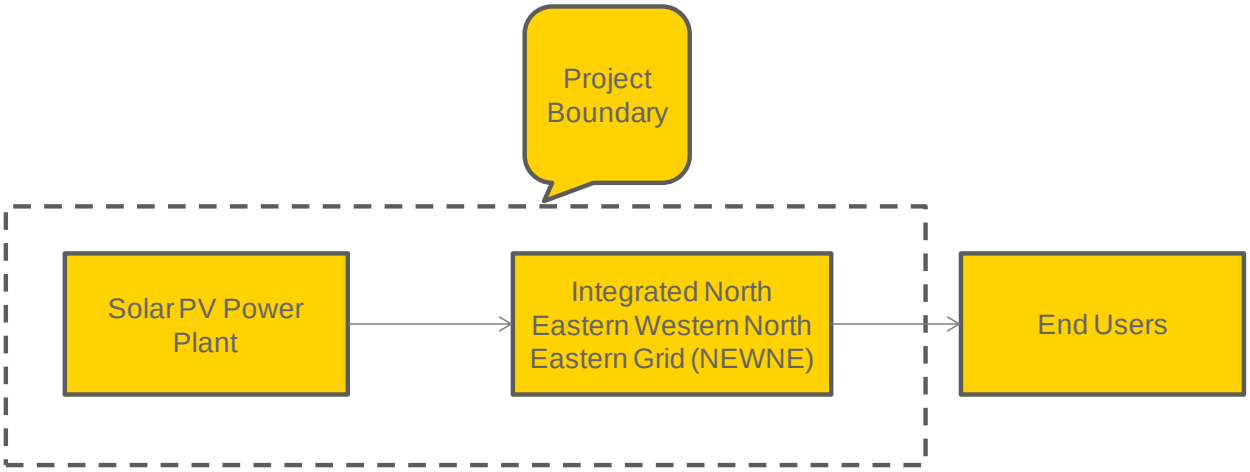
renewable electricity to the grid system and the capacity of the project activity is well below the qualifying limit of 15 MW. Hence the choice of project type and category is justified.

So, in the light of the above points, it is justified that the project activity under consideration meets the applicability criterion of the methodology AMS-I.D, Version 17.

B.3. Description of the project boundary:

As per paragraph 9 of the methodology AMS – I D/version 17, "***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***."

In line with the above definition the project boundary is depicted in the figure below:



B.4. Description of baseline and its development:

According to the paragraph 10 of the methodology AMS-I D/version 17, *"**The baseline scenario is that the 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 into the grid**."*

In absence of the project activity the 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 into the grid. There is no Government Policy that gives comparative advantages to

solar power generation projects compared to the base case scenario. Hence the project activity complies with Annex 3 of EB 22.

Since the project activity is the installation of a new grid-connected renewable plant/unit, the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the existing grid connected power plants and by the addition of new generation sources to the NEWNE grid.

According to the paragraph 11 of the methodology AMS-I D/version 17, *"**The baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor**."*

$$BE_y = EG_{BL,y} \times EF_{CO2,grid,y}$$

Where,

BEy is the baseline emissions in year y, tCO_2

$EG_{BL,y}$ is the quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{CO2,grid,y}$ is the CO2 emission factor of the grid in year y, tCO2e/MWh

The emission factor can be calculated in a transparent and conservative manner as follows:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the '***Tool to calculate the Emission factor for an electricity system***' Version 02.2.1.

OR

(b) The weighted average emissions (in tCO2e/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Calculations must be based on data from an official source (where available) and made publicly available.

Option (a) has been considered to calculate the grid emission factor as per the ***'Tool to calculate the emission factor for an electricity system"*** as data is available from an official source.

The detail methodology for the calculation of combined margin emission factor is given below:

Step 1: Identify the relevant system:

The Central Electricity Authority, Ministry of Power, Government of India (Host Country) has given the delineations of the project electricity system and the connected electricity system in India. As per CEA, the Indian power system is divided into two regional grids, viz. NEWNE Grid & Southern Grid. Since Rajasthan comes under NEWNE grid, therefore NEWNE grid has been considered to be the relevant electricity grid for the computation of the combined margin emission factor.

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

The calculation of operating margin and build margin emission factor is based on one of the two options:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation

Option I (Only grid power plants are included in the calculation) is applicable since as per the CEA database user guide version 6[13], the grid system in India is stable enough and off grid generation is not significant.

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

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM

Out of the above options simple OM method (option a) is used in India. The dispatch data analysis OM is not used as off grid generation is not significant in India as per Step 2 above and other methods can not be applied in India due to lack of necessary data.

As per emission factor tool, the simple OM method (option a) can only be used if low- cost/must-run resources constitute less than 50% of total grid generation in:

1) average of the five most recent years, or

2) based on long-term averages for hydroelectricity production.

In India as per available data (most recent five years) with CEA, the low-cost/must-run resources constitute on an average of 17.80% of the NEWNE Grid which is less than 50% of total grid generation.

[13] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Share of low cost /must run (% of net generation)[14]					
Year	2005-06	2006-07	2007-08	2008-09	2009-10
NEWNE grid	18%	18.5%	19.0%	17.3%	15.9%
Average of last five years (NEWNE grid)			17.80%		

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

In the project activity Simple Operating Margin (OM) has been calculated *ex-ante*

As per the "Tool to calculate the emission factor for an electricity system": *If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emission factor during the crediting period is required. For grid connected power plants use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation*

The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units for the last three years. The values of OM have been taken from CEA Database Version 06[15] which has been calculated based on "Tool to calculate the emission factor for an electricity system", version 2.2.1.

Year	Simple Operating Margin	Net Generation in Operating Margin including net imports (GWh)	Source of Data
2007-08	1.000 tCO_2/MWh	409834.204	http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf
2008-09	1.007 tCO_2/MWh	421802.633	
2009-10	0.978 tCO_2/MWh	462327.095	
Weighted Average Operating Margin ($EF_{grid,OM,y}$)			
0.994 tCO_2/MWh			

Step 5: Calculate the build margin (BM) emission factor:

The 'Tool to calculate the emission factor for an electricity system (Version 2.2.1)' provides two options for determination of build margin emission factor- *ex-ante* and *ex-post* determination of the Build Margin

[14] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

[15] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

(BM). For the project activity under consideration, the project proponent has selected Option-1 wherein the build margin emission factor is calculated *ex- ante* based on most recent information available on plants already built for sample group in NEWNE grid at the time of submission of the CDM- PDD to the DOE for validation. The sample group shall be the one having higher power generation between

(a) five power plants that have been built most recently and

(b) the capacity additions in the electricity system that comprises 20% of the system generation built most recently.

It is found that the option (b) has higher generation compared to option (a). Hence option (b) is selected. As per this guideline the Build Margin has been calculated for the most recent year (*i.e.* 2009-2010) at the time of submission of the CDM- PDD to the DOE for validation in accordance with the following formula:

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

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

i = All fossil fuel types combusted in power plant/ unit m in year y.

y = Most recent historical year for which power generation data is available at the time of submission of the CDM- PDD to the DOE for validation (*ex-ante* option)

In accordance with this guidance, the Central Electricity Authority (CEA) of Government of India has calculated the Build Margin for the NEWNE grid and the same is made available in the 'Baseline Carbon Dioxide Emission Database/Version 06[16]'. The same is presented as below:

Determination of Build Margin Emission Factor ($EF_{grid,BM,\,y}$)			
Parameter	Unit	2009-10	Source/ Remarks
Build Margin Emission Factor - $EF_{grid,BM,\,y}$	tCO_2/MWh	0.812	'Baseline Carbon Dioxide Emission Database/Version 06' published by Central

[16] Source: http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Determination of Build Margin Emission Factor ($EF_{grid,BM,y}$)			
Parameter	Unit	2009-10	Source/ Remarks
			Electricity Authority (CEA), Government of India

Step 6: Calculate the combined margin emission factor:

$$EF_{grid,CM,y} = EF_{grid,OM,y} X w_{OM} + EF_{grid,BM,y} X w_{BM}$$

Where,

$EF_{grid,CM,y}$	Combined Margin Emission Factor of the NEWNE grid
$EF_{grid,OM,y}$	Simple operating margin for NEWNE electricity grid (tCO2/MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
$EF_{grid,BM,y}$	Build margin for NEWNE electricity grid (tCO2/MWh)
w_{BM}	Weighting of build margin emissions factor (%)

As per the methodological tool "Tool to calculate the emission factor for an electricity system", version 2.2.1, the weighting for both operating margin should be taken as 0.75 and build margin as 0.25 for solar power generation projects

Now
Using the above equation the combined margin emission factor is($EF_{grid,CM,y}$) = 0.948 tCO_2/MWh
And,

$$EF_{grid,CM,y} = EF_{CO2,grid,y}$$

Where,

$EF_{CO2,grid,y}$	CO_2 emission factor of the grid in year y (tCO_2/MWh)
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor for the project electricity system in year y (tCO_2/MWh)

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

CDM Consideration:

As per the "***GUIDANCE ON THE DEMONSTRATION AND ASSESSMENT OF PRIOR CONSIDERATION OF THE CDM"***, VERSION-04, EB 62 Annex - 13–The project activity falls under "***New Project Activities***". The project participant informed the Host Party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM

status. The intimation to Host party DNA and the UNFCCC were sent on 01/09/2011 and this was made within six months of the project activity start date[17].

Different milestones of the project activity are as follows:

Awareness of CDM		
1.	As per 'Guidelines for selection of New grid connected Solar Power Projects' under JNNSM, solar power project has potential for earning carbon revenue. This guideline was made available to PTPL prior to making investment decision for the project.	July 2010
Board / Management Approval		
2.	The Board of PTPL decided to undertake the 5 MW solar PV based power project as a CDM project.	14.12.2010
First Real Action		
3.	Signing of EPC Contract with Vikram Proener Projects Pvt. Ltd	07.07.2011
4.	PTPL appointed CDM consultant for providing advisory services.	29.06.2011
5.	PTPL notified to the UNFCCC for prior consideration of CDM for the solar project.	01.09.2011

As per the decision 17/CP.7 paragraph 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity. According to the Appendix B of the Simplified Modalities and Procedures for small-scale CDM project activities the project proponent is required to demonstrate the additionality of the project activity as per the guidance provided in Attachment A to Appendix B. The additionality aspect of the project activity under consideration has been elaborated below following the guidelines of the "Guidelines on the demonstration of additionality of small-scale project activities (version 09.0)", EB 68 Annex 27 which states that *"The positive list of grid-connected renewable electricity generation technologies that are automatically defined as additional, without*

[17] http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html

further documentation of barriers, consists of the following grid-connected renewable electricity generation technologies of installed capacity up to 15 MW:

(a) Solar technologies (photovoltaic and solar thermal electricity generation);

(b) Off-shore wind technologies;

(c) Marine technologies (wave, tidal)"

(d) Building-integrated wind turbines or household rooftop wind turbines of a size up to 100 kW;

The project activity under consideration is a 5MW solar photovoltaic power plant that is supplying electricity to the NEWNE grid of India. Hence as per the guideline mentioned above the project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

This is a renewable power generation project, supplying the entire power generated from the solar farm to the NEWNE grid. This form of energy generation has no associated GHG emissions. So, the emission reduction is dependent on the quantity of electricity being supplied to the grid system.

Baseline emission (BE_y):

The baseline emissions is the product of electrical energy baseline $EG_{BL,y}$, expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

Baseline emission factor is calculated as combined margin, consisting of a combination of operating margin (OM) and build margin (BM) factors (Refer to section B.4 for detail calculation)

$BEy = EG_{BL,y} \times EF_{CO2,grid,y}$ *(1)*

Where,

BEy is the baseline emissions in year y, tCO_2

$EG_{BL,y}$ is the quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{CO2,grid,y}$ is the CO_2 emission factor of the grid in year y, tCO_2/MWh

Project emission (PE_y):

For most renewable energy project activities, PE_y = 0. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of ACM0002.[18]

- Emissions related to the operation of geothermal power plants (*e.g.* non-condensable gases, electricity/fossil fuel consumption);
- Emissions from water reservoirs of hydro power plants.

The project activity involves generation of electricity from solar energy and there is no fossil fuel consumption at the project site. Hence no emission resulting due to the project activity has been considered.

Since the project activity under consideration is a Greenfield solar project so the project emission for this project activity amounts to zero.

Leakage (LE_y):

Leakage due to transfer of equipments from another activity:

The equipments installed in the project activity are not transferred from any other activity. Hence leakage for this project activity is zero.

Emission reduction (ER_y):

The emission reduction achieved by the project activity will be the difference between the baseline emission and the sum of the project emission and leakage.

$$ER_y = BE_y - PE_y - LE_y \quad \text{……..(2)}$$

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**$EF_{grid, CM, y}$ / $EF_{grid,CO2,y}$**
Data unit:	tCO_2 / MWh
Description:	Combined Margin Emission Factor (or CO2 Emission Factor) of the NEWNE Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" version 06.0 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.948

[18] ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Justification of the choice of data or description of measurement methods and procedures actually applied :	Combined Margin Emission Factor has been calculated by the Central Electricity Authority, Govt. of India in accordance the ***"Tool to Calculate the emission Factor for an Electricity System"*** (Version 02.2.0, Annex 12, EB 61).
Any comment:	Computation with data published by authorized Government agency and statistics available in the public domain will ensure the reliability of the parameter. The value of the parameter will be kept fixed during the entire crediting period.

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2 / MWh
Description:	Build Margin Emission Factor (or CO2 Emission Factor) of the NEWNE Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" version 06.0 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.812
Justification of the choice of data or description of measurement methods and procedures actually applied :	Build Margin Emission Factor has been calculated by the Central Electricity Authority, Govt. of India in accordance the ***"Tool to Calculate the emission Factor for an Electricity System"*** (Version 02.2.0, Annex 12, EB 61).
Any comment:	Computation with data published by authorized Government agency and statistics available in the public domain will ensure the reliability of the parameter. The value of the parameter will be kept fixed during the entire crediting period.

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO_2 / MWh
Description:	Operating Margin Emission Factor (or CO2 Emission Factor) of the NEWNE Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" version 06.0 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.994
Justification of the choice of data or description of measurement methods	Operating Margin Emission Factor has been calculated by the Central Electricity Authority, Govt. of India in accordance the "***Tool to Calculate the emission Factor for an Electricity System"*** (Version 02.2.0, Annex 12, EB 61).

and procedures actually applied :	
Any comment:	Computation with data published by authorized Government agency and statistics available in the public domain will ensure the reliability of the parameter. The value of the parameter will be kept fixed during the entire crediting period.

B.6.3 Ex-ante calculation of emission reductions:

Emission Reduction Calculations:

Baseline emissions:

Gross electricity generation = Capacity × No of days × No of hours × Plant load factor

= 5×365×24×19%

= 8,322 MWh/annum

Considering 0% auxiliary consumption the net generation of the project activity will be 8,322 MWh/annum.

Now, as mentioned in section B.6.1

$BEy = EG_{BL,y} \times EF_{CO2,grid,y}$

Here,

$EF_{CO2,grid,y}$ = 0.948 tCO_2/MWh

BEy = 8,322 MWh * 0.948 tCO_2/MWh

= 7,889 tonnes of CO_2 per annum

= 7,889 tCO_2/annum

Project emissions:

There is no project activity emissions associated with the project activity.

Leakage

There is no leakage associated with the project activity.

Therefore the total emission reduction for the proposed project activity over the entire crediting period of 10 years is 78,890 tCO_2. Hence the annual average estimated reductions over the crediting period of 10 years estimated reductions (tonnes of CO_2) is 7,889 CO_2/annum.

Justification for PLF Assumption

As per "***GUIDELINES FOR THE REPORTING AND VALIDATION OF PLANT LOAD FACTORS***" Version 01, EB 48, Annex 11 paragraph 3:

"*The plant load factor shall be defined ex-ante in the CDM-PDD according to one of the following three options:*

(a) The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval;

(b) The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company)"

The plant load factor for the project activity under consideration has been assumed to be 19%. This value is as per the PLF value provided in the DPR that has been provided to the banks while applying the project activity for project financing. The PLF value of 19% can be assumed to be correct based on the PLF guidelines mentioned above.

B.6.4 Summary of the ex-ante estimation of emission reductions:

Years	Estimation of project activity emissions (tCO_2)	Estimation of baseline emissions (tCO_2)	Estimation of leakage (tCO_2)	Estimation of overall emission reductions (tCO_2)
2012-13	0	7,889	0	7,889
2013-14	0	7,889	0	7,889
2014-15	0	7,889	0	7,889
2015-16	0	7,889	0	7,889
2016-17	0	7,889	0	7,889
2017-18	0	7,889	0	7,889
2018-19	0	7,889	0	7,889
2019-20	0	7,889	0	7,889
2020-21	0	7,889	0	7,889
2021-22	0	7,889	0	7,889

Total (tonnes of CO_2)	**0**	**78,890**	**0**	**78,890**

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	**$EG_{BL,y}$**
Data unit:	MWh
Description:	Quantity of net electricity supplied to the grid in year y
Source of data to be used:	The data for the net energy supplied to the grid would be calculated from the electricity exported from the project to the grid and the electricity imported from the grid. Electricity export and import value would be directly considered from the Joint Meter Readings (JMR) signed by NVVN(NTPC Vidyut Vyapar Nigam) and M/s Precision Technik Private Limited.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	8,322
Description of measurement methods and procedures to be applied:	Main meter and Check meter with 0.2 accuracy class having facilities to measure export & import of energy have been installed. The meters are sealed, maintained and calibrated by the DISCOM Net electricity supplied to the grid is calculated based on export & import data (Net electricity supplied to grid = Export electricity – Import electricity). The export and import energy is measured continuously using above mentioned Main & Check meters. Export & Import readings of Main & Check meters are taken on monthly basis by authorized officer of NVVN in the presence of PP or representative of PP. The Reading of main & Check meter (both Export & Import readings) are recorded in log book on monthly basis. Check meter reading are considered when Main meter is found to be defective or stopped. The emission reduction from the project activity will be computed on the basis of JMRs and same would be cross checked by the invoices prepared by M/s Precision Technik Private Limited. to NVVN.
QA/QC procedures to be applied:	The electricity meters are under the custody of the DISCOM and are calibrated

	by DISCOM as per their procedures. However, the project proponent would ensure that the meters are calibrated at least once in three years. Calibration certificates will be maintained at the plant and the net energy export figures would be cross verified against the monthly invoices. This approach is considered to be reliable and credible.
Any comment:	The recorded data is checked periodically by the General Manager and discussed thoroughly with the Site Manager. The report is prepared by General Manager and is reviewed and maintained by the CEO for Verification. The data will be achieved for the a period of two years beyond the crediting period.

B.7.2 Description of the monitoring plan:

The project proponent is following the following operational & management structure in order to monitor the emission reduction. The organization structure for the proposed power plant comprises of a General Manager as the in-charge for the entire power plant operations and maintenance. He is positioned at site and directly reports to the Chief executive officer. He is assisted by Site Manager and Site supervisor. The day-to-day operation like planning the routine maintenance, safety and environmental control are placed under the care of the Site manager. The organizational structure and responsibilities on project operation, monitoring, data recording and ER calculation has been mentioned below:

Designation	Responsibilities
Chief Executive officer (CEO)	▶ Holds complete control over monitoring aspects ▶ pertaining to the project ▶ Review of Monitoring report ▶ Training of the staff. ▶ Emission reduction calculation is maintained by the CEO for verification.
General Manager	▶ Entire power plant operation & maintenance ▶ Periodic checking of recorded & stored data. ▶ Emission reduction calculation & Monitoring ▶ Report preparation.
Site Manager & Site Supervisor	▶ Day to day Operation ▶ Storage of data ▶ Data Recording

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

The date of completion of baseline and monitoring methodology is 25/07/2011.

The contact details of the entity responsible for the same is mentioned in Annex 1

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

07/07/2011 (Date of signing the EPC contract)

C.1.2. Expected operational lifetime of the project activity:

25 years (As per Central Electricity Regulatory Commission. India)[19]

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

Not Applicable

C.2.1.2. Length of the first crediting period:

Not Applicable

C.2.2. Fixed crediting period:

10 years

C.2.2.1. Starting date:

31/10/2012 or date of registration of the project activity whichever is later

C.2.2.2. Length:

10 years

[19] http://cercind.gov.in/2010/ORDER/February2010/53-2010_Suo-Motu_RE_Tariff_Order_FY2010-11.pdf

SECTION D. Environmental impacts

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D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

Solar energy is one of the cleanest sources of renewable energy, with no associated emissions and waste products. As per the latest notification issued on 01/12/2009 for Environment Impact Analysis (EIA) by Ministry of Environment and Forests (MoEF), Government of India[20] solar power project need not to get Prior Environmental Clearance (EC) either from State or Central Govt. authorities.

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

The project activity does not have any significant adverse environmental impacts and also it does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India Hence, EIA is not required by the host party.

[20] http://moef.nic.in/downloads/rules-and-regulations/3067.pdf

SECTION E. Stakeholders' comments

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E.1. Brief description how comments by local stakeholders have been invited and compiled:

The stakeholders identified for the project activity were as under:

1) Consultant
2) NGO
3) Village Panchayat
4) Employees Union

The identified stakeholders were invited by sending one to one invitation letters. The stakeholder consultation meeting was held on 25/11/2011. The minutes of the meeting will be provided to the DOE during validation.

E.2. Summary of the comments received:

The project has not resulted in any major displacement of any local population. Also, the installation of transmission lines has not created any inconvenience to the local population. In summing up, the project activity has received complete support from the local populace.

The Government of India, through Ministry of New and Renewable Energy (MNRE), has been promoting energy conservation, demand side management and renewable energy projects including wind, small hydro, solar and bio-mass power.

The Ministry of Environment & Forests is the Designated National Authority in India. The Government of India, through Ministry of Environment and Forests (MoEF) is encouraging project participants to take up such environment-friendly initiatives

E.3. Report on how due account was taken of any comments received:

The project has not received any negative or discouraging feedback from the stakeholders concerned. All the stakeholders have appreciated and encouraged the project proponent for taking up this project activity.

In view of various direct and indirect benefits (social, economical, and environmental), all the stakeholders have supported the project activity. The documents supporting the stakeholder consultation have been submitted to the DOE.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	M/s. Precision Technik Private Limited (PTPL)
Street/P.O.Box:	9, Vivekananda Road
Building:	
City:	Kolkata
State/Region:	West Bengal
Postcode/ZIP:	700007
Country:	India
Telephone:	+91 33 40191919
FAX:	+91 33 40043025
E-Mail:	ptpl1995@gmail.com
URL:	www.sonthaliagroup.com/
Represented by:	
Title:	Executive Director
Salutation:	Mr.
Last name:	Sonthalia
Middle name:	
First name:	Prateek
Department:	
Mobile:	+91-9831174211
Direct FAX:	+91 33 40043025
Direct tel:	+91 33 40191919
Personal e-mail:	prateeksonthalia@sonthaliagroup.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in this project activity

Annex 3

BASELINE INFORMATION

Please refer section B.4 and section B.6.1 of this document

Annex 4

MONITORING INFORMATION

Monitoring plan has been discussed in section B.7 of this document.

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