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

CONTENTS

Annexes

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:

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Grid connected solar PV power plant in Jodhpur, Rajasthan
Version: 02
Date: 24/07/2012

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

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Northwest Energy Private Limited (NWEPL) is envisaging implementation of 5 MW Solar photovoltaic technology based power plant in Village-Rawra, Tehsil-Phalodi of Jodhpur district in the state of Rajasthan, under Jawaharlal Nehru National Solar Mission (JNNSM) Phase-1. The electricity generated from the project activity will be exported to the state grid of Rajasthan which is a part of the integrated Northern, Eastern, Western, and North-Eastern (NEWNE) regional grid of India, and sold to NTPC Vidyut Vyapar Nigam Limited (NVVN) under a power purchase agreement.

Northwest Energy Private Limited has decided to use CIGS (CIS) thin film technology for its 5 MW project. The Solar power system will be designed with number of sub main plants and solar PV arrays. Solar grid connected inverters of suitable capacity will be used.

Since the proposed project activity is a Greenfield project, the approved small scale methodology AMS.I.D already prescribes the baseline scenario as being "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". The electricity exported by the proposed project activity would displace an equivalent amount of electricity generated by the power plants already operational and proposed to be added in the NEWNE Grid which relies predominantly on fossil fuels (particularly coal). Thus, it contributes towards reduction in the demand-supply gap during periods of electricity shortage and increase in the share of renewable energy in the grid mix.

The estimation of GHG emission reductions by the project activity is limited to carbon dioxide (CO_2) only and its primary source is the fossil fuels consumed in the NEWNE grid. The expected annual net electricity delivered to the grid by the proposed project activity is 8,966 MWh and the estimated annual emission reductions are 8,542 tCO_2e annually over the chosen crediting period.

View of the project participants on the contribution of the project activity to Sustainable Development:

Ministry of Environment and Forests, Govt. of India has stipulated the following indicators for sustainable development in the guidelines for CDM projects[1]:

Social well being:

- The proposed project would lead to generation of business opportunities and employment in the region thereby contributing towards social upliftment through direct and indirect benefits.
- The project activity in its execution will lead to development of infrastructure in the region and at the same time promote business in the region through the improvement in electricity generation capacity of the grid.

[1] http://www.cdmindia.gov.in/approval_process.php

Economic well-being:

- The project activity leads to an investment in the region accompanied with business and employment benefits along with improvement of grid supply which otherwise would not have happened in the absence of project activity.
- The clean electricity generated through solar power by the project activity would be fed into the local grid thereby improving the availability of electricity in the region. This would provide a better scenario for local industries and businesses to improve their production capacities thereby contributing towards the overall economic development of the region.

Environmental well being:

- The project activity employs solar power for generation of electricity thereby displacing fossil fuels which are being rapidly consumed to meet the growing demand of electricity in the country thus contributing towards reduction in GHG emissions.
- Solar power projects generate no end products in the form of solid waste (ash etc.) compared to alternative modes of power generation (e.g. coal based on which the Indian grid is primarily dependent). Hence the project activity is a cleaner source of power generation and is encouraging greener practice of power generation.
- The solar power project indirectly is contributing towards conservation of non–renewable resources which are under the constant threat of depletion due to excessive and rapid growth of energy demand. The growing threat of global warming which is a key concern is also addressed due to renewable energy use thereby mitigating climate change.

Technological well being:

- The project activity uses thin film solar photovoltaic technology for power generation thereby demonstrating the viability of solar based renewable energy generation in the region, which is fed into the nearest sub-station (part of the NEWNE Regional Grid), thus increasing energy availability under the service area of the substation. Hence the project leads to technological well being.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host party)	Private and/or public entity (ies) Project participants (*) (as applicable)	Kindly indicate if the party involved wishes to be considered as project participant (Yes/No)
India (Host Country)	Northwest Energy Private Limited (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):

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India

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

CDM – Executive Board

>>
Rajasthan

A.4.1.3. City/Town/Community etc:

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District: Jodhpur
Tehsil: Phalodi
Village: Rawra

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

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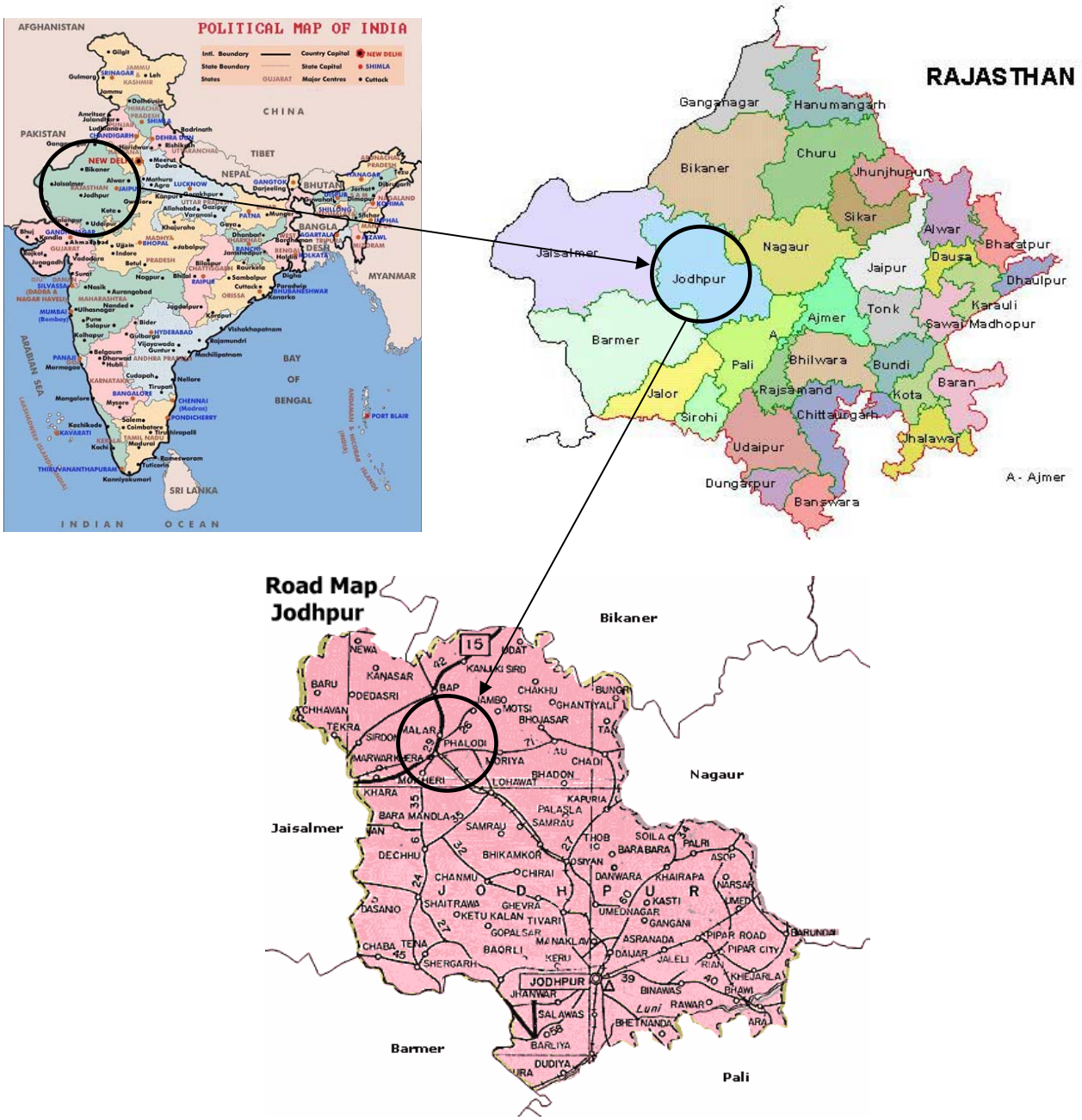
Latitude: 27° 24' 42.447" North
Longitude: 72° 12' 44.753" East

The proposed project site is located at Village Rawra, Tehsil – Phalodi, District – Jodhpur.



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

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Project type and category:

According to the Appendix B to the simplified modalities and procedures for small-scale CDM project activities, the proposed project activity falls under the following type and category:

Project type: Type I – Renewable Energy Projects
Category: D – Electricity generation for a system
Methodology: AMS I.D. ***Grid connected renewable electricity generation*** / Version 17;
Sectoral Scope: 01 Energy industries (renewable - / non-renewable sources) as per 'Sectoral scopes related approved methodologies and DOEs.

Technology to be employed by the project activity:
As stated above, the project activity is 5 MW capacity CIGS (CIS) thin film technology based solar photovoltaic plant. Since the project activity is a Greenfield installation there was no electricity generation at the project site prior to its implementation.

This project is designed such a way that the solar DC power generated is converted into AC by inverter and fed into the grid through a step up transformer with suitable voltage level available. The solar power is fed into the grid as long as grid is available and Inverter will stop feeding power in to the grid in case of grid failure. Energy meter will be used to register the solar power which is exported to the grid.

NWEPL will procure the modules from world's renowned module manufacturer. The technical specifications of plant are as follows:

Parameter	**Value**	
Project Technology	Thin Film	
Solar PV module make	Solar Frontier	
Solar PV module models	SF 145L	SF 155L
Capacity of Solar PV modules	145Wp	155Wp
Number of Solar PV modules installed	7,584	28,384
Total number of Solar PV modules	35,968	
Inverter make	PVI-Central-500-TL, Power One	
Inverter capacity	500 kW each	
Number of inverters	10	

Power evacuation infrastructure will be set up as per the guidelines of Jawaharlal Nehru National Solar Mission (JNNSM) Bidding, Central Electricity Regulatory Commission (CERC) and Rajasthan Rajya Vidyut Prasaran Nigam Limited (RRVPN). The proposed project will be connected to the nearest 133 kV or above grid. The grid connection unit will continuously synchronize the incoming solar power with the available grid for safe and efficient operation. The metering of net electricity generated will be undertaken at the grid interconnection point.

Solar energy is a pollution-free, infinitely sustainable form of energy. It does not use fuel. It does not produce greenhouse gases, and it does not produce toxic or radioactive waste. Therefore the technology for the project is environmentally safe and sound.Further, there is no technology transfer associated with the project activity.

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

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The chosen crediting period for the proposed project is 7 years, with renewal at most 2 times. Estimated amount of emission reductions over the 1st renewable crediting period of 7 years is as follows:

Years	Estimation of annual emission reductions in tonnes of CO_2 e
Year 1	8,542
Year 2	8,542
Year 3	8,542
Year 4	8,542
Year 5	8,542
Year 6	8,542
Year 7	8,542
Total estimated reductions (tonnes of CO_2e)	**59,794**
Total number of crediting years	**7**[2]
Annual average of the estimated reductions over the crediting period (tCO_2e)	**8,542**

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

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No public funding is availed for the project activity from parties included in Annex I.

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

According to Appendix C of simplified modalities and procedures for small scale CDM project activities, "debundling" is defined as the fragmentation of the large scale project activity into smaller parts. The proposed small scale project activity is not a "debundled" component of large scale project activity. If, there is no registered small scale CDM project activity or a request for registration by another small-scale project activity:

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

NWEPL has no registered small scale CDM project activity and has not requested registration for any other small scale project activity in the same project category and technology within 1 km of the proposed small-scale project activity. Hence, the project activity is not a de-bundled component of a larger activity and qualifies as a small scale project activity.

[2] Renewable crediting period of total 21 years

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:

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Title: Grid connected renewable electricity generation
Reference: Approved small scale methodology AMS I.D. (Version 17)[3].

The methodology refers to the following tools:

- Tool to calculate the emission factor for an electricity system version-2.2.1 (EB-63)[4].

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

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The methodology AMS.I.D Version 17 is being applied for the project activity. The reasons for the choice of project type and category for the project activity are as follows:

Criteria	Applicability to the project
1. This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass 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.	**Applicable and Fulfilled** The project is renewable energy generation through installation of photovoltaic modules. The project will supply electricity to the NEWNE grid.
2. Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A2) applies is included in Table 2.	**Applicable and Fulfilled** As per Table 2 of the AMS.I.D Version 17, project activities that supply electricity to the national/ regional grid are applicable under AMS.I.D Version 17. Since the proposed project activity under consideration will also supply electricity to the regional grid. Hence the project activity is applicable under AMS.I.D Version 17.
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; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	**Applicable and Fulfilled** The project activity is Greenfield installation of new power plant at a site where there was no renewable energy power plant operating prior to implementation of project.
4. Hydro power plants with reservoirs that satisfy	**Not applicable**

[3] http://cdm.unfccc.int/UserManagement/FileStorage/V9LRSXKP24Q7YT6HZDUBO3C0ING8AJ
[4] http://cdm.unfccc.int/filestorage/Z/U/L/ZULY095DAFBVKQ2IEXSM6HRT7NOG1C/eb63_repan19.pdf?t=V0V8bHZmMHkwfDDWOFGvs9-ffKxRWIrH38o-

at least one of the following conditions are eligible to apply this methodology: The project activity is implemented in an existing reservoir 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/m2; The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	The project activity is not a hydro power plant.
5. If new unit has both renewable and non renewable components (e.g.. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.	**Not applicable** The project activity has only renewable component i.e. solar PV generated power with 5 MWac (5.5 MWdc) capacity, which meets the eligibility of 15 MW for a small-scale CDM project activity. Further, the project does not involve any use of fossil fuel.
6. Combined heat and power (co-generation) systems are not eligible under this category.	**Not applicable** The project activity generates only power and hence is not a cogeneration system.
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 from the existing units.	**Not applicable** The project activity is Greenfield and there is no existing power generation facility at the site. As per the Power Purchase Agreement signed with NVVN, the project capacity is 5 MWac and hence the capacity of the plant will not exceed the small scale project limit of 15 MW over the crediting period of the project activity.
8. In the case of retrofit or replacement, to qualify as a small scale project, the total output of the modified or retrofitted or replacement unit shall not exceed the limit of 15 MW.	**Not applicable** Project activity is neither retrofit nor modification of existing facility. As per the Power Purchase Agreement signed with NVVN, the project capacity is 5 MWac and hence the capacity of the plant will not exceed the small scale project limit of 15 MW over the crediting period of the project activity.

As already been mentioned in the above table, as per the Power Purchase Agreement signed with NVVN, the project capacity is 5 MWac, and hence the capacity of the plant will not exceed the limit of 5 MW over the entire crediting period of the project activity. Thus, the project capacity will remain within the limits of small scale CDM projects over the entire crediting period of the project activity. From the above it is observed that, the project activity is applicable under AMS.I.D.

B.3. Description of the project boundary:

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As per Paragraph 9, 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*." Accordingly the project boundary includes solar PV power generation system and all power plants connected physically to the local grid to which the proposed project supplies renewable electricity to avoid GHG emissions. The proposed project is located in the state of Rajasthan and hence falls under the NEWNE grid (Integrated Northern, Eastern, Western and North Eastern Grid) of the Indian electricity system. The following diagram explains the project boundary for the proposed project activity.

B.4. Description of baseline and its development:

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According to the paragraph 10 of the applicable small scale 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."

Further as per paragraph 11 of 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."*

Therefore, the emission factor is calculated by using option (a) as per the paragraph 12 (a) of AMS.I.D (Version 17) i.e. as 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 2.2.1 (EB-63).

Key data/ parameters used for baseline calculation:

S. No.	Data Variable	Data Unit	Description	Data Source
1.	$EG_{BL,y}$	MWh	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh).	Monthly generation record
2.	$EF_{CO2,grid,y}$	tCO_2/MWh	CO_2 emission factor of the grid in year y.	CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority, Version 7.0.

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:

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Existing National and/or Sectoral Policies

Annexure 3 of the EB 22 states that national and/or sectoral policies and circumstances have to be accounted for when considering the baseline. Para 7(a) states that, only those national and/or sectoral policies or regulations under paragraph 6(a) i.e. type E+ policy that increase GHG emissions, that have been implemented before adoption of the Kyoto Protocol by the COP (decision 1/CP.3, 11 December 1997), shall be taken into account when developing a baseline scenario. The Electricity Act of 2003 promoted cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity (Refer Section 86(1) of Electricity Act 2003). Therefore, it could be seen that the provincial and sectoral policies are E- i.e., policies that decrease GHG emissions and are after November 2001.Hence the baseline scenario is the electricity generation by grid connected fossil fuel dominated power plants confirming to Annex 3 of EB 22.

Further, the baseline alternative mentioned above is in compliance with all the applicable regulatory policies and laws. Additionally, the project proponent is under no compulsion to opt for any particular technology or even a renewable mode of power generation. There is no governmental body or EB policy which requires a particular kind of fuel to be chosen and there is no legal requirement to which the above alternative does not conform.

Description on Prior CDM consideration

"Guidance on the demonstration and assessment of prior consideration of the CDM" (EB62, Annex 13), states that for project activities with a starting date on or after 02 August 2008, the project participant must inform a Host Party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status within six months of the project activity start date. In line with the above guidance, UNFCCC and Host Party DNA were intimated about the proposed

project through email communication dated 16th December, 2011, which is within 6 months of the start date of the project activity (12th October, 2011, as mentioned in section C.1.1). Hence from the above it can be clearly established that CDM was seriously considered in the decision to proceed with the proposed project activity.

Justification of Additionality:

The project activity being small scale, meets the eligibility criteria to use simplified modalities and procedure for small-scale CDM project activities as set out in paragraph 6 (C) of decision 17/CP.7. As per the decision 17/CP.7 Para 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. Further as per Attachment A to Appendix B of the Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories, a proposed small scale CDM project activity will be considered as additional if the project activity would not have occurred any way due to at least one of following barriers[5]:

a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;
b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

It goes on to provide a positive list of grid-connected renewable electricity generation technologies that are automatically defined as additional, without further documentation of barriers. The list 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).

Since the proposed project activity is a 5MW capacity grid connected solar photovoltaic technology based electricity generation project, Hence, as per Para 2, Annex 24, EB 63, project is listed under positive list of grid-connected renewable electricity generation technologies that are automatically defined as **additional**, without further documentation of barriers. Hence, it can be concluded that the project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The AMS.I.D methodology is applied in the context of the project in the following steps:

- Calculate the baseline GHG emissions
- Calculate the project GHG emissions
- Calculate the leakage emissions

[5] https://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid05.pdf

- Calculate the emission reductions

Baseline Emissions

As per para 11 and Equation No. 1 of the applicable small scale 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. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{BL,y} \times EF_{CO2,grid,y} \quad \textbf{(1)}$$

Where:

BE_y = Baseline emissions in year *y* (tCO_2)

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

$EF_{CO2,grid,y}$ = CO_2 emission factor of the grid in year y (t CO2/MWh)

Calculation of $EF_{CO2,grid,y}$

The emission factor is calculated ex-ante by using option (a) as per the paragraph 12 (a) of AMS.I.D (Version 17) i.e. as 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 2.2.1 (EB-63). The stepwise calculation is as follows:

Step 1: Identify the relevant electric power system

For the purpose of determining the electricity emission factors, a **project electricity system** and **connected electricity systems** are to be defined. The Indian power system is divided into two independent regional grids, namely NEWNE and Southern grid. Each grid covers several states. Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid.

Each state in a regional grid meets their demand with their own generation facilities and also with allocation from power plants owned by the central sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the central sector power plants. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. There are also electricity transfers between regional grids, and small exchanges in the form of cross-border imports and exports (e.g. from Bhutan). Recently, the Indian regional grids have started to work in synchronous mode, i.e. at same frequency.

Table 1: States connected to different regional grids

Regional grid	**NEWNE Grid**				**Southern grid**
	Northern	**Eastern**	**Western**	**North Eastern**	**Southern**
States	Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan, Uttar Pradesh and	Bihar, Orissa, West Bengal, Jharkhand and Sikkim	Gujarat, Madhya Pradesh, Maharashtra, Goa and Chattisgarh	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram,	Andhra Pradesh, Karnataka, Kerala and Tamil Nadu

	Uttarakhand			Nagaland and Tripura	
Union Territories	Delhi and Chandigarh	Andaman-Nicobar	Daman & Diu, Dadar & Nagar Haveli	-	Pondicherry, Lakshadweep

The NEWNE grid constitutes several states including Rajasthan. These states under the regional grid have their own power generating stations as well as centrally shared power-generating stations. While the power generated by own generating stations is fully owned and consumed through the respective state's grid systems, the power generated by central generating stations is shared by more than one state depending on their allocated share. Presently the share from central generating stations is a small portion of their own generation.

Since the CDM project would be supplying electricity to the NEWNE grid, it is preferable to take this grid as the project boundary rather than the state boundary. It also minimizes the effect of interstate power transactions, which are dynamic and vary widely. Considering free flow of electricity among the member states and the union territory, the entire NEWNE grid is considered as a single entity for estimation of baseline.

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

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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.

The project participants have chosen Option I for the calculation of the operating and build margin emission factor i.e. off-grid power plants are not being included in the calculation.

Step 3: Select an operating margin (OM) method

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.

As per the tool, any of the four methods can be used. For the proposed project activity, simple OM method has been chosen to calculate the operating margin emission factor ($EF_{grid, OM, y}$). However, 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. The low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.

Table: Share of Low Cost / Must-Run (% of Net Generation)

	2006-07	**2007-08**	**2008-09**	**2009-10**	**2010-11**
NEWNE	18.5%	19.0%	17.4%	15.9%	17.6%
South	28.3%	27.1%	22.8%	20.6%	21.0%
India	20.9%	21.0%	18.7%	17.1%	18.4%

Ref: CO_2 Baseline Database for the Indian Power Sector – CEA, Version 05, 06 and 07.[6]

Percentage of total grid generation by low cost/must run plants (on the basis of average of five most recent years) = 17.8 %

The calculation above shows that the generation from low-cost/must-run resources constitutes less than 50% of total grid generation, hence usage of the **Simple OM method** in the project case is justified.

The Simple OM emission factor can be calculated using either of the two following data vintages for years(s) *y*:

- Ex ante option: 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, without requirement to monitor and recalculate the emissions factor during the crediting period,

or

- Ex post option: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

The project proponents choose the *Ex ante* option for estimating the simple OM emission factor wherein as described above 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, without requirement to monitor and recalculate the emissions factor during the crediting period will be undertaken.

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

The simple OM method has been selected as justified above. The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units using the following formula:

$$EF_{grid,OM,simple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{grid,OMsimple,,y}$	=	Simple operating margin CO_2 emission factor of in year y (tCO_2/MWh)
$FC_{i,m,y}$	=	Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	=	Net electricity generated and delivered to the grid by power unit m in year y (MWh)
m	=	All power units serving the grid in year y except low-cost / must-run power units
I	=	All fossil fuel types combusted in power plant / unit m in year y

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

y = Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

In India, the Central Electricity Authority (CEA) has estimated the baseline emission factor for the power sector. This data has also been endorsed by the DNA and is the most authentic information available in the public domain. The details of same can be found on CEA website at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm.

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

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

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.

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 emissions 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.

The project proponents wish to choose option 1.

Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor.

The sample group of power unit's *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.

In India, the installed capacity and corresponding annual generation from power plants is quite high. The Central Electricity Authority (CEA) has estimated the annual electricity generation from $SET_{\geq 20\%}$ to be

larger than the generation from $SET_{5\text{-units}}$. The details of same can be found on CEA website at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm. Further, none of the power units in $SET_{\geq 20\%}$ started to supply electricity to the grid more than 10 years ago.

Therefore, SET_{sample} is selected as $SET_{\geq 20\%}$ for the estimation of build margin.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

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
Y	=	Most recent historical year for which electricity generation data is available

Calculations for the Build Margin emission factor $EF_{grid,BM,y}$ is based on the most recent information available on the plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of the power plant capacity additions in the electricity system that comprise 20 % of the system generation and that have been built most recently ($SET_{\geq 20\%}$).

Step 6. Calculate the combined margin emissions factor

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

(a) Weighted average CM; or

(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

The combined margin emissions factor is calculated as follows:

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

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$	=	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM}	=	Weighting of operating margin emissions factor (%)
w_{BM}	=	Weighting of build margin emissions factor (%)

The following default values should be used for w_{OM} and w_{BM}:

- Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.

- All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

As mentioned before, the baseline emission factors have been calculated as per CEA sourced data for various regional grids in India according to the formulas specified above. As this is the most authentic information available in the public domain, the baseline emission factor used in the calculation of baseline emissions for the proposed project activity is being referred from the same for transparency and conservativeness[7].

Project Emissions

As per para 20 of AMS.I.D, Version 17, since the proposed project activity is electricity generation based on solar photovoltaic technology, there will be no fossil fuel combustion during the project activity and hence there will be no project emissions.
Therefore, the project emissions, $PE_y = 0$

Leakage

According to AMS.I.D Version 17, if the energy generating equipment is transferred from another activity, leakage is to be considered. Since this is not the case in the proposed project activity, no leakage emissions are to be considered.

$LE_y = 0$

Emission Reductions

Emission reductions are calculated as follows (as per para 23 and Equation 10 of AMS.I.D Version 17):

$$ER_y = BE_y - PE_y - LE_y \quad \textbf{(10)}$$

Where:

ER_y = Emission reductions in year y (t CO_2/y)
BE_y = Baseline emissions in year y (t CO_2/y)
PE_y = Project emissions in year y (t CO_2/y)
LE_y = Leakage emissions in year y (t CO_2/y)

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

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO_2/MWh
Description:	Operating Margin emission factor for NEWNE grid
Source of data used:	Referred from CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority, Version 7.0. (http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm)
Value applied:	0.9842
Justification of the	The data (for the years 2008-09, 2009-10 and 2010-11) has been sourced from

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

<table>
<tr><td>choice of data or description of measurement methods and procedures actually applied :</td><td>CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority, Version 7.0.
<table>
<tr><th colspan="3">Operating Margin Estimation for NEWNE Grid (tCO_2 / MWh)</th></tr>
<tr><th>Year</th><th>Operating Margin (tCO_2e/MWh)</th><th>Net Generation (GWh)</th></tr>
<tr><td>2008-09</td><td>1.0066</td><td>421,803</td></tr>
<tr><td>2009-10</td><td>0.9777</td><td>462,327</td></tr>
<tr><td>2010-11</td><td>0.9707</td><td>476,987</td></tr>
<tr><td>Generation Weighted Average OM</td><td colspan="2">0.9842 tCO_2e / MWh</td></tr>
</table></td></tr>
<tr><td>Any comment:</td><td>The value has been fixed ex-ante.</td></tr>
</table>

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2/MWh
Description:	Build Margin emission factor for NEWNE grid
Source of data used:	Referred from CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority, Version 7.0. (http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm)
Value applied:	0.8588
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data (for the year 2010-11) has been sourced from CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority, Version 7.0.
Any comment:	The value has been fixed ex-ante.

Data / Parameter:	$EF_{grid,CM,y}$ or $EF_{CO2,grid,y}$
Data unit:	tCO_2/MWh
Description:	Combined Margin CO_2 emission factor for NEWNE grid
Source of data used:	Calculated as per 'Tool to calculate the emission factor for an electricity system' Version 2.2.1 (EB-63) (i.e. 75% of OM and 25% of BM values)
Value applied:	0.9528 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data has been sourced from CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority, Version 7.0. Since the proposed project activity is a solar power project, the combined margin emission factor is calculated as 75% of OM and 25% of BM emission factors.
Any comment:	The value has been fixed ex-ante.

Combined Margin Estimation for NEWNE Grid (tCO_2e / MWh)	
Generation Weighted Average OM ($EF_{grid,OM,y}$)	**0.9842**
BM ($EF_{grid,BM,y}$ **)**	**0.8588**
Combined Margin ($EF_{grid,CM,y}$)	**0.9528**

B.6.3 Ex-ante calculation of emission reductions:

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Installed Capacity	5	MW
No. of Days of operation	365	Days
No of Hours	24	Hours
Capacity Utilization Factor	20.47[8]	%
Net Generation	8,966	MWh

Particulars	**Unit**	**2008-09**	**2009-10**	**2010-11**
Simple Operating Margin (incl. Imports)	tCO_2e/MWh	1.0066	0.9777	0.9707
Net Electricity Generation in Operating Margin (including imports)	GWh	421,803	462,327	476,987
Generation Weighted Average Operating Margin	tCO_2e/MWh	0.9842		

Particulars	**Unit**	**Value**	**Weight**
Generation Weighted Average Operating Margin	tCO_2e/MWh	0.9842	0.75
Build Margin (not adjusted for imports)	tCO_2e/MWh	0.8588	0.25
Combined Margin (incl. Imports) (Wt. Avg of OM & BM) Emission Factor	tCO_2e/MWh	0.9528	

Baseline Emissions BE_y (As per Equation (1) of AMS.I.D, Version 17),

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

Where,

$EG_{BL,y}$ = 8,966 MWh

$EF_{CO2,grid,y}$ = $EF_{grid,CM,y}$ = 0.9528 tCO_2e/MWh

Hence,

BE_y = 8,966 MWh * 0.9528 tCO_2e/MWh

= 8,542 tCO_2e

Project Emissions, PE_y = 0 (As explained in section B6.1)

Leakage Emissions, LE_y = 0 (As explained in section B6.1)

[8] In accordance with para 3 of the EB48 Annex 11, "Guidelines for the reporting and validation of plant load factors", the plant load factor for the project was determined by an independent third party agency.

Therefore the emission reductions, ER_y (As per Equation (10) of AMS.I.D, Version 17)

$$ER_y = BE_y - PE_y - LE_y$$
$$= 8{,}542 - 0 - 0$$
$$= 8{,}542\ tCO_2e$$

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

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Year	Estimation of Project emissions (tonnes of CO_2e)	Estimation of Baseline emissions (tonnes of CO_2e)	Estimation of Leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
Year 1	0	8,542	0	8,542
Year 2	0	8,542	0	8,542
Year 3	0	8,542	0	8,542
Year 4	0	8,542	0	8,542
Year 5	0	8,542	0	8,542
Year 6	0	8,542	0	8,542
Year 7	0	8,542	0	8,542
TOTAL (tonnes of CO_2e)	0	**59,794**	0	**59,794**

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/yr
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data to be used:	Calculated based on the difference between $EG_{export,y}$ and $EG_{import,y}$ (which will be further calculated based on an apportioning method explained in section B.7.2).
Value of data	8,966
Description of measurement methods and procedures to be applied:	The parameter will be determined by calculating difference between the electricity exported to and imported from the grid by the project activity. $EG_{BL,y} = EG_{export,y} - EG_{import,y}$ Where, $EG_{export,y}$ = Quantity of electricity exported by NWEPL plant to grid and it will be further calculated, using an apportioning method, taking into account the grid electricity export measured by main and check meters of NWEPL project installed at the switchyard of 5 MW Solar

	PV Power Plant by Viraj Renewables Energy Private Limited (hereafter called as VREPL plant[9]), grid electricity export measured by main and check meters of VREPL plant installed at VREPL plant and combined grid electricity export for NWEPL plant and VREPL plant measured at main and check meters at Bap Substation. $EG_{import,y}$ = Quantity of electricity imported by NWEPL plant from grid and it will be further calculated, using an apportioning method, taking into account the grid electricity import measured by main and check meters of NWEPL project installed at the switchyard of VREPL plant, grid electricity import measured by main and check meters of VREPL plant installed at VREPL plant and combined grid electricity import for NWEPL plant and VREPL plant measured at main and check meters at Bap Substation.
QA/QC procedures to be applied:	The calculated values will be cross checked with records for sold electricity (invoices).
Any comment:	The data will be archived electronically as well as in hard copy at the power plant and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	$EG_{export,y}$
Data unit:	MWh/yr
Description:	Apportioned quantity of electricity exported by the project plant to the grid in year *y*
Source of data to be used:	Calculated, using an apportioning method (explained in section B.7.2), taking into account the grid electricity export by NWEPL plant measured at VREPL plant, grid electricity export by VREPL plant measured at VREPL plant, and combined grid electricity export for NWEPL plant and VREPL plant measured at Bap Substation.
Value of data	8,966
Description of measurement methods and procedures to be applied:	The parameter will be determined by using an apportioning method as following: $EG_{export,y} = EG_{NWEPL,export,y} \times \frac{EG_{Substation,export,y}}{(EG_{NWEPL,export,y} + EG_{VREPL,export,y})}$ Where, $EG_{NWEPL,export,y}$ = Quantity of grid electricity export by NWEPL plant measured at VREPL plant $EG_{VREPL,export,y}$ = Quantity of grid electricity export by VREPL plant measured at VREPL plant $EG_{Substation,export,y}$ = Quantity of combined grid electricity export by VREPL and NWEPL plants measured at the Bap substation

[9] As per the power evacuation plan approved by the State utility, separate main and check meters for NWEPL plant will be installed at the VREPL plant and electricity from NEWPL and VREPL plants will be evacuated through one circuit of D/C line from VREPL's 33 kV switchyard state utility's 220/133 kV Bap Substation.

QA/QC procedures to be applied:	The calculated values will be cross checked with records for sold electricity (invoices).
Any comment:	The data will be archived electronically as well as in hard copy at the power plant and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	$EG_{import,y}$
Data unit:	MWh/yr
Description:	Apportioned quantity of electricity import by the project plant from the grid in year *y*
Source of data to be used:	Calculated, using an apportioning method (explained in section B.7.2), taking into account the grid electricity import by NWEPL plant measured at VREPL plant, grid electricity import by VREPL plant measured at VREPL plant, and combined grid electricity import for VREPL plant and NWEPL plant measured at Bap Substation.
Value of data	0
Description of measurement methods and procedures to be applied:	The parameter will be determined by using an apportioning method as following: $EG_{import,y} = EG_{NWEPL,import,y} \times \frac{EG_{Substation,import,y}}{(EG_{NWEPL,import,y} + EG_{VREPL,import,y})}$ Where, $EG_{NWEPL,import,y}$ = Quantity of grid electricity import by NWEPL plant measured at VREPL plant $EG_{VREPL,import,y}$ = Quantity of grid electricity import by VREPL plant measured at VREPL plant $EG_{Substation,import,y}$ = Quantity of combined grid electricity import by VREPL and NWEPL plants measured at the Bap substation
QA/QC procedures to be applied:	The calculated values will be cross checked with records for sold electricity (invoices).
Any comment:	The data will be archived electronically as well as in hard copy at the power plant and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	$EG_{NWEPL,export,y}$
Data unit:	MWh/yr
Description:	Quantity of electricity export by the project (NWEPL) to the grid in year *y*
Source of data to be used:	Monthly generation records of NWEPL meters at VREPL plant
Value of data	Value will be measured ex-post
Description of measurement methods and procedures to be applied:	Main meter and check meter for NWEPL plant will be installed at the VREPL plant to continuously monitor the grid electricity export. The generation data will be measured at least once in an hour basis. Further, these measurements will be recorded on a monthly basis by the representatives of the State utility and NWEPL.

	In the event that the main meter is not in service as a result of maintenance, repairs or testing, then the check meter will be used. All the meters will have an accuracy class of 0.2s.
QA/QC procedures to be applied:	Calibration of all the meters will be undertaken once in three years and faulty meters will be duly replaced immediately. Calibration will be done by an authorized agency or reputed laboratory. All the meters will be sealed by the State utility and will be in control of the State utility. The values in monthly generation records will be cross checked with the billing protocol attached with the records for sold electricity (invoices).
Any comment:	The data will be archived electronically as well as in hard copy at the NWEPL plant and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	$EG_{NWEPL,import,y}$
Data unit:	MWh/yr
Description:	Quantity of electricity import by the NWEPL plant from the grid in year *y*
Source of data to be used:	Monthly generation records of NWEPL meters at VREPL plant
Value of data	Value will be measured ex-post
Description of measurement methods and procedures to be applied:	Main meter and check meter for NWEPL plant will be installed at the VREPL plant to continuously monitor the grid electricity import. The import data will be measured at least once in an hour basis. Further, these measurements will be recorded on a monthly basis by the representatives of the State utility and NWEPL. In the event that the main meter is not in service as a result of maintenance, repairs or testing, then the check meter will be used. All the meters will have an accuracy class of 0.2s.
QA/QC procedures to be applied:	Calibration of all the meters will be undertaken once in three years and faulty meters will be duly replaced immediately. Calibration will be done by an authorized agency or reputed laboratory. All the meters will be sealed by the State utility and will be in control of the State utility. The values in monthly generation records will be cross checked with the billing protocol attached with the records for sold electricity (invoices).
Any comment:	The data will be archived electronically as well as in hard copy at the NWEPL plant and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	$EG_{VREPL,export,y}$
Data unit:	MWh/yr
Description:	Quantity of electricity export by the VREPL plant to the grid in year *y*
Source of data to be used:	Monthly generation records of VREPL meters at VREPL plant
Value of data	Value will be measured ex-post

Description of measurement methods and procedures to be applied:	Main meter and check meter will be installed at the VREPL plant to continuously monitor the grid electricity export. The generation data will be measured at least once in an hour basis. Further, these measurements will be recorded on a monthly basis by the representatives of the State utility and VREPL. In the event that the main meter is not in service as a result of maintenance, repairs or testing, then the check meter will be used. All the meters will have an accuracy class of 0.2s.
QA/QC procedures to be applied:	Calibration of all the meters will be undertaken once in three years and faulty meters will be duly replaced immediately. Calibration will be done by an authorized agency or reputed laboratory. All the meters will be sealed by the State utility and will be in control of the State utility. The values in monthly generation records will be cross checked with billing protocol attached with the records for sold electricity (invoices).
Any comment:	The data will be archived electronically as well as in hard copy at the non-PP power plant and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	$EG_{VREPL,import,y}$
Data unit:	MWh/yr
Description:	Quantity of electricity import by the VREPL plant from the grid in year *y*
Source of data to be used:	Monthly generation records from VREPL meters at VREPL plant
Value of data	Value will be measured ex-post
Description of measurement methods and procedures to be applied:	Main meter and check meter will be installed at the VREPL plant to continuously monitor the grid electricity import. The import data will be measured at least once in an hour basis. Further, these measurements will be recorded on a monthly basis by the representatives of the State utility and VREPL. In the event that the main meter is not in service as a result of maintenance, repairs or testing, then the check meter will be used. All the meters will have an accuracy class of 0.2s.
QA/QC procedures to be applied:	Calibration of all the meters will be undertaken once in three years and faulty meters will be duly replaced immediately. Calibration will be done by an authorized agency or reputed laboratory. All the meters will be sealed by the State utility and will be in control of the State utility. The values in monthly generation records will be cross checked with billing protocol attached with the records for sold electricity (invoices).
Any comment:	The data will be archived electronically as well as in hard copy at the plant and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	$EG_{Substation,export,y}$
Data unit:	MWh/yr
Description:	Quantity of combined electricity export by the NWEPL plant and VREPL plant to

	the grid in year *y*
Source of data to be used:	Monthly generation records at 133 kV Bap Substation
Value of data	Value will be measured ex-post
Description of measurement methods and procedures to be applied:	Main meter and check meter will be installed at the Bap substation to continuously monitor the combined grid electricity export. The generation data will be measured at least once in an hour basis. Further, these measurements will be recorded on a monthly basis by the representatives of the State utility, NWEPL and VREPL. In the event that the main meter is not in service as a result of maintenance, repairs or testing, then the check meter will be used. All the meters will have an accuracy class of 0.2s.
QA/QC procedures to be applied:	Calibration of all the meters will be undertaken once in three years and faulty meters will be duly replaced immediately. Calibration will be done by an authorized agency or reputed laboratory. All the meters will be sealed by the State utility and will be in control of the State utility. The values in monthly generation records will be cross checked with the billing protocol attached with the records for sold electricity (invoices).
Any comment:	The data will be archived electronically as well as in hard copy at Bap substation and will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	$EG_{Substation,import,y}$
Data unit:	MWh/yr
Description:	Quantity of combined electricity import by the NWEPL plant and VREPL plant from the grid in year *y*
Source of data to be used:	Monthly generation records at 133 kV Bap Substation
Value of data	Value will be measured ex-post
Description of measurement methods and procedures to be applied:	Main meter and check meter will be installed at the Bap substation to continuously monitor the combined grid electricity import. The import data will be measured at least once in an hour basis. Further, these measurements will be recorded on a monthly basis by the representatives of the State utility, NWEPL and VREPL. In the event that the main meter is not in service as a result of maintenance, repairs or testing, then the check meter will be used. All the meters will have an accuracy class of 0.2s.
QA/QC procedures to be applied:	Calibration of all the meters will be undertaken once in three years and faulty meters will be duly replaced immediately. Calibration will be done by an authorized agency or reputed laboratory. All the meters will be sealed by the State utility and will be in control of the State utility. The values in monthly generation records will be cross checked with the billing protocol attached with the records for sold electricity (invoices).
Any comment:	The data will be archived electronically as well as in hard copy at Bap substation and will be kept for two years after the end of the crediting period

	or the last issuance of CERs for this project activity, whichever occurs later.

B.7.2 Description of the monitoring plan:

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The solar DC power generated will be converted into AC power by inverter and fed into the grid through a step up transformer. The electricity generated will be evacuated to the nearby Bap substation. Main meters and check meters will be installed at the VREPL plant (Separate meters for NWEPL and VREPL plants) and Bap substation to continuously monitor the grid electricity export and import by NWEPL plant, grid electricity export and import by VREPL plant and combined grid electricity export and import by NWEPL and VREPL plants, respectively.

The net electricity supplied by the project activity (NWEPL plant) to the grid will be calculated as the difference between calculated values of grid electricity export and import by the project activity.

$$EG_{BL,y} = EG_{export,y} - EG_{import,y}$$

Where,

$EG_{BL,y}$ = Quantity of net electricity supplied by the project activity
$EG_{export,y}$ = Quantity of electricity exported by NWEPL plant to grid
$EG_{import,y}$ = Quantity of electricity imported by NWEPL plant from grid

Further, for calculating $EG_{export,y}$ and $EG_{import,y}$, the following apportioning method will be applied:

Apportioning Method for calculating $EG_{export,y}$ and $EG_{import,y}$:

For Calculation of $EG_{export,y}$ –

$$EG_{export,y} = EG_{NWEPL,export,y} \times \frac{EG_{Substation,export,y}}{(EG_{NWEPL,export,y} + EG_{VREPL,export,y})}$$

Where,
$EG_{NWEPL,export,y}$ = Quantity of grid electricity export by NWEPL plant measured at VREPL plant
$EG_{VREPL,export,y}$ = Quantity of grid electricity export by VREPL plant measured at VREPL plant
$EG_{Substation,export,y}$ = Quantity of combined grid electricity export by NWEPL and VREPL plants measured at the Bap substation

For Calculation of $EG_{import,y}$ –

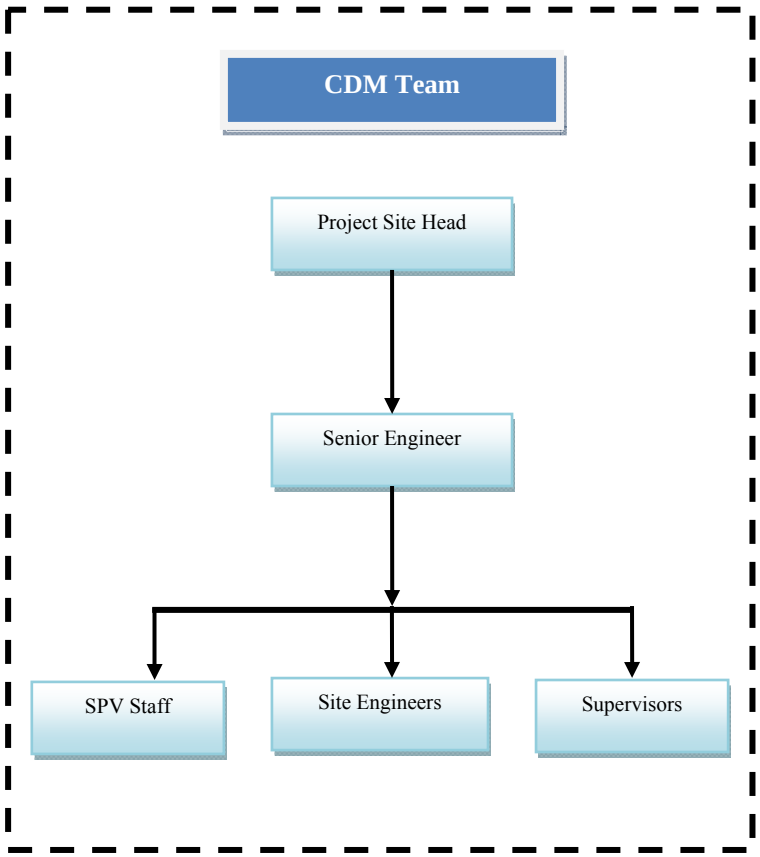
$$EG_{import,y} = EG_{NWEPL,import,y} \times \frac{EG_{Substation,import,y}}{(EG_{NWEPL,import,y} + EG_{VREPL,import,y})}$$

Where,
$EG_{NWEPL,import,y}$ = Quantity of grid electricity import by NWEPL plant measured at VREPL plant
$EG_{VREPL,import,y}$ = Quantity of grid electricity import by VREPL plant measured at VREPL plant
$EG_{Substation,import,y}$ = Quantity of combined grid electricity import by NWEPL and VREPL plants measured at the Bap substation

Organizational Structure for implementing the monitoring plan:

The organizational structure for the proposed power plant envisages a Senior Engineer as the in-charge for the entire power plant operations and maintenance. He will be assisted by Site Engineers and Supervisors.

The day-to-day operation like planning the routine maintenance, safety and environmental control will be placed under the care of the shift in charges. All administrative functions like personnel, industrial relations, labour welfare and financial functions will be looked after by Northwest Energy Private Limited (NWEPL). The organizational structure and responsibilities on project operation, monitoring and data recording has been mentioned below:



Responsibilities

- Reviewing the monthly and annual generation statistics.
- Evaluating the GHG performance of the project activity.
- Identify opportunities for further improvement.

- Implementation of appropriate corrective measures in case any discrepancies are identified in the reported parameters.
- Review of monthly reports.
- Ensuring calibration of the monitoring equipments as and when required

- Monitoring and reporting the GHG performance related parameters following the guidance provided in the Project Design Document
- Preparation of the monthly and annual generation statistics.
- Reporting of any discrepancies identified in the reporting parameters
- Ensuring calibration of the monitoring equipments as and when required.

Operation & Management Structure

Reading and Correction of Meters:

For the purpose of energy accounting, ABT compliant meters will be installed at the interface points. Interface metering will confirm to the Central Electricity Authority (Installation and Operation Meters) Regulation, 2006. Main meters and check meters will be installed at the VREPL plant (Separate meters for NWEPL and VREPL plants) and Bap substation to continuously monitor the grid electricity export and import by NWEPL plant, grid electricity export and import by VREPL plant and combined grid electricity export and import by NWEPL and VREPL plants, respectively. The measurements will be recorded on a monthly basis by representatives of the state utility and NWEPL at VREPL plant, by representatives of the state utility and VREPL at VREPL plant, and by representatives of the state utility, NWEPL and VREPL at Bap substation. In the event that the main meters are not in service as a result of maintenance, repairs or testing, the check meters will be used.

Calibration of Meters:

Calibration of all the meters will be undertaken once in three years and faulty meters will be duly replaced immediately. Calibration will be done by an authorized agency or reputed laboratory. All the meters will be sealed by the State utility and will be in control of the State utility.

Emergency Preparedness and Uncertainty Procedure:

In case any of the Main meters or check meters is found to be outside the acceptable limits of accuracy or faulty or not functioning properly, it will be repaired, recalibrated or replaced as soon as possible. In the event that any of the main meters is not in service as a result of maintenance, repairs or testing, then corresponding check meter will be used.

Data Recording and Archiving:

NWEPL will keep complete and accurate records of operating log at the Power Plant. The data will be archived electronically as well as in hard copy for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

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

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Date of completion of the application of the baseline study: 01/12/2011

Name of person/entity determining the baseline: Northwest Energy Private Limited has determined the baseline for the project activity. The entity is also the project participant listed in Annex-I where the contact information has also been provided.

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:

>>
12/10/2011 (Date of release of first purchase order that was released for purchase of solar PV modules)

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

>>
25 years and 0 months

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

The project activity will use the renewable crediting period instead of fixed crediting period.

C.2.1. Renewable crediting period

The project activity will use renewable crediting period. The maximum length of the first crediting period will be 7 years and 0 months, and it can be renewed two times.

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

>>
01/08/2012 or date when DOE submits the complete request for registration whichever is later.

C.2.1.2. Length of the first crediting period:

>>
7 years and 0 months

C.2.2. Fixed crediting period:

Not opted for

C.2.2.1. Starting date:

>>
Not applicable

C.2.2.2. Length:

>>
Not applicable

SECTION D. Environmental impacts

>>

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

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The project activity has no significant impact on the environment. Solar PV power projects are not included in this schedule –I of the EIA notification S.O.1533 (E) dated 14th September 2006 and thus an EIA is not required. Ministry of Environment & forests vide their OM J-11013/41/2006 –IA II(I) dated 13th May 2011 has reaffirmed this and exempted the Solar PV power plants from EIA and EC requirement.

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:

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As discussed above, the project activity would not have any adverse environmental impacts. The project activity 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 to be undertaken by the host party for the proposed project activity.

SECTION E. Stakeholders' comments

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

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Northwest Energy Private Limited conducted a local stakeholders' consultation meeting on 24th November, 2011 near the project site in Rawra village of Phalodi, Jodhpur. The stakeholders were invited through personal invitation letters dated 7th November, 2011. Around 40 people attended the meeting. The stakeholders identified were villagers of Rawra village and employees of NWEPL.

A record of the people attending the meeting was maintained and all comments from the stakeholders received during the meeting were recorded and compiled in the minutes of meeting.

The meeting covered a brief introduction on NWEPL, details about the project and various initiatives taken by them in the field of CDM. This was followed by a question-answer session where all the queries of the stakeholders were satisfactorily answered. The villagers were happy on this environmental initiative taken by the company and no adverse comments were received.

The meeting was chaired by Mr. Neeraj Agarwal (Project Manager, NWEPL), who welcomed the gathering and extended his regard for attending the meeting in large numbers. Mr. Agarwal introduced the company and its initiative to those present. He gave a brief description about the company informing them about the commitment of the company towards clean technology. He informed the stakeholders present at the meeting about the capacity of the solar PV power project and the technology proposed to be employed for the power generation. He informed them about the fact that it would lead to generation of clean power as it would be fired by solar power which is a renewable source of energy.

Mr. Agarwal then invited Mr. Someshwer Dutt Sharma (Technology Expert) to apprise the stakeholders about the technology proposed for the 5 MW solar PV power project by NWEPL. Mr. Sharma explained the process of solar power generation through solar PV modules. He explained that the technology produces no sound pollution, air pollution or water pollution.

Mr. Agarwal invited the CDM consultant to explain the CDM aspects of the proposed project. CDM consultant briefed the stakeholders on the possible threat of climate change caused due to increased concentration of Greenhouse gases in the atmosphere. He further briefed the gathering about Kyoto Protocol, Clean Development Mechanism and its associated benefits. He described the project activity in relation to CDM and discussed the benefits of implementing the project. He described that the project, if implemented, would result in reduction of Greenhouse gases in the atmosphere by feeding power to the fossil fuel fired grid system. Thus, he explained that the project activity would be beneficial to the environment and the society as a whole.

Mr. Agarwal then requested the stakeholders to share their queries, suggestions and concerns with respect to the proposed CDM project activity and replied to the same.
Finally, Mr. Agarwal thanked all the stakeholders for attending this meeting on invitation from NWEPL. He also expressed that NWEPL is committed to its social and environmental obligations and invites various participants to keep on giving their feedback on a continuous basis so that if any improvements are called for, those could be implemented in various operations of the project.

E.2. Summary of the comments received:

>>

Stakeholder Comments

Sly. No.	*Question*	*Stakeholder*	*Answer*
1.	Will the operation of the plant affect the animals in the surrounding areas due to electrocution etc.?	Nakad Singh (Resident of Rawra Village)	The electricity generated will be transferred to the grid through overhead transmission lines and hence will not have any dangers of electrocution.
2.	A large number of glass plates in the region will result in huge reflection of sun's rays and will negatively affect the life in the region.	Kishna Ram (Resident of Rawra Village)	The PV modules installed in a solar PV plant do not act as mirrors and hence no reflection occurs from the PV modules. Thus, the proposed plant will not have any harmful effects.
3.	Will the power plant result in increase in temperature of surrounding areas?	Simarta Ram (Resident of Rawra Village)	The PV modules will absorb the sun's rays and hence there will be no increase in the temperature of the surrounding region due to the operation of the plant.
4.	How will the implementation of the plant benefit the local villagers of Rawra?	Bhagwana Ram (Resident of Rawra village)	Villagers from Rawra will be given priority while hiring people during the implementation of the plant. The vehicles such as tractors etc. for various purposes during the implementation of the project will be preferred to be hired from villagers of Rawra.

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

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All the stakeholders were appreciative that the CDM project activity in their locality is contributing to a global cause and they commended the NWEPL management for their initiatives in the area of solar power development. All the questions asked by the stakeholders were satisfactorily explained to the participants by the project promoter. The project promoter explained about the technical details, feasibility of the project activity and its impacts on environment. The stakeholders appreciated the project promoter for the environmental friendly measures. Considering the comments made by the stakeholders, no significant negative impacts due to the project activity had been identified.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Northwest Energy Private Limited
Street/P.O.Box:	Phase-1, Logitech Park, Andheri Kurla Road, Andheri (E)
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Represented by:	
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Salutation:	Mr.
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Middle Name:	
First Name:	Amod
Department:	Finance
Mobile:	+91-9820766332
Direct FAX:	
Direct tel:	
Personal E-Mail:	nwepl.rajasthan@gmail.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no recourse to any public funding by the project proponents to implement the proposed project activity.

Annex 3

BASELINE INFORMATION

Information with respect to the baseline has already been explained under section B.6.

Annex 4

MONITORING INFORMATION

The monitoring information has already been provided under section B.7.

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