Project design document form for small-scaleCDM project activities

(Version 06.0)

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	Solar Photovoltaic Power Project at Jalgaon, Maharashtra
Version number of the PDD	~~3~~5~~4~~
Completion date of the PDD	~~02/11/2012~~ 19~~30~~/11~~09~~/2015
Project participant(s)	Jain Irrigation Systems Limited (JISL)
Host Party	India
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	01 Energy industries (renewable - / non-renewable sources) as per 'Sectoral scopes related approved methodologies and DOEs.
Estimated amount of annual average GHG emission reductions	13,243

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>

Jain Irrigation Systems Limited (JISL) has planned to implement an 8.5 MW solar photovoltaic technology based power plant at village – Shirsoli in Jalgaon district of Maharashtra. The electricity generated from the project activity will be supplied to the regional NEWNE grid under the Power Purchase agreement with state electricity distribution company ~~the JISL manufacturing facility through the regional electricity grid under a wheeling agreement with the state distribution company.~~ JISL has decided to use multi-crystalline technology for its 8.5 MW project out of which 7.5MW will be mounted on fixed structure while 1 MW will use tracking to enhance the isolation period by a minimum of 25%. The prior intimation for the project activity was sent to UNFCCC with title "8.5 MW Solar Photovoltaic Power Project at Jalgaon, Maharashtra". The project activity was commissioned on 19 ~~04July~~ June 2012.

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 that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources". 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 proposed project activity would lead to an estimated electricity generation of 13,961 MWh per annum and emission reduction of 13,243tCO_2eannually 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:

Social wellbeing:

- The proposed project would lead to generation of direct and indirect 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.

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 wellbeing:

- 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 thuscontributing 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 wellbeing:

- The project activity uses 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 wellbeing.

A.2. Location of project activity

A.2.1. Host Party

>>
India

A.2.2. Region/State/Province etc.

>>
Maharashtra

A.2.3. City/Town/Community etc.

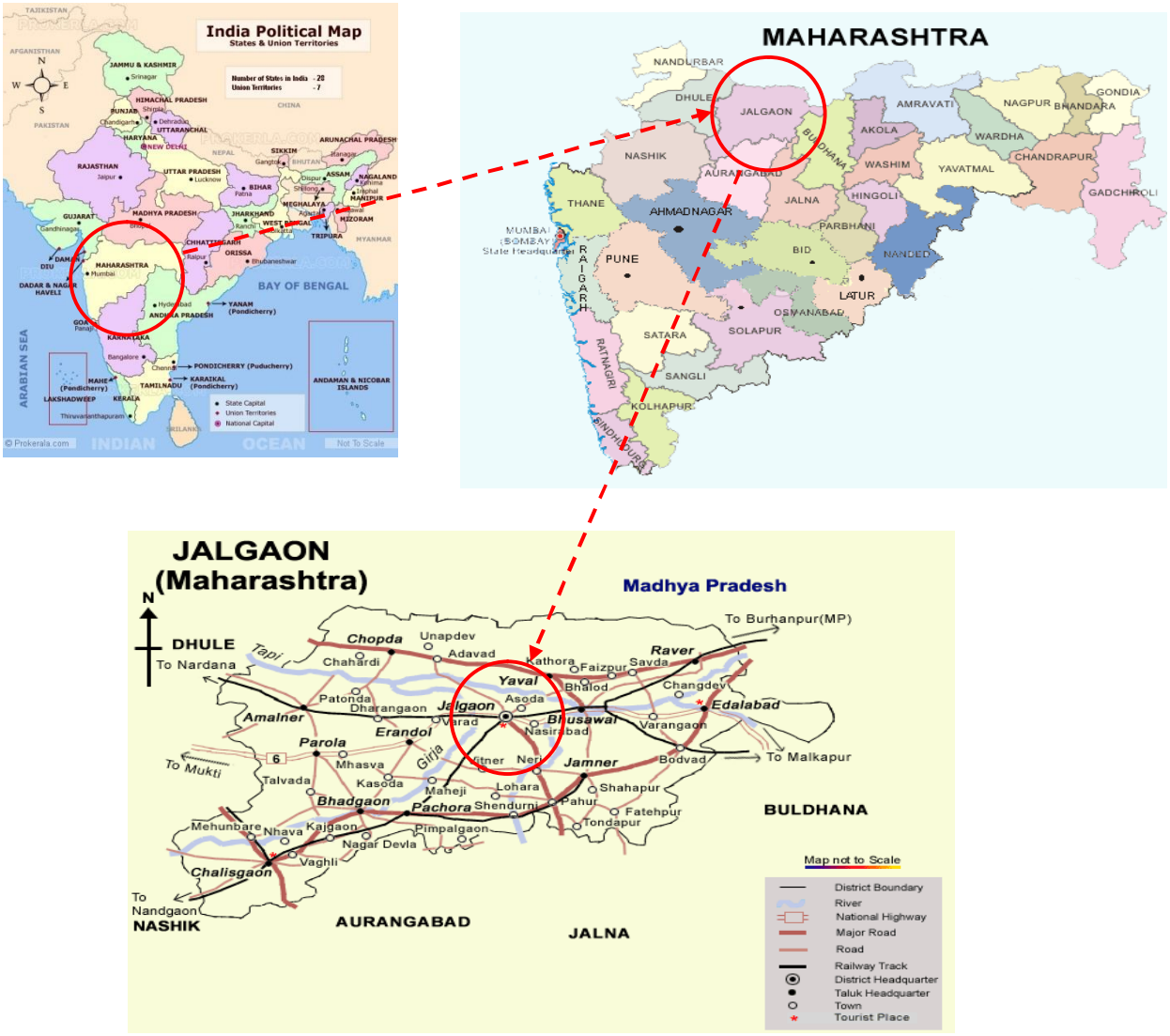
>>
District: Jalgaon
Village: Shirsoli

A.2.4. Physical/Geographical location

>>

Latitude: 20° 55’ 44.34” North
Longitude: 75° 33’ 47.32” East

The proposed project location is in Shirsoli village in Jalgaon district in the state of Maharashtra. The site is about 8 Km away fromJalgaon city which is the nearest city and is well connected through rail routes and roadways. The nearest railway station is theJalgaon Railway Station while the Aurangabad airport is the nearest airport.


India Political Map
States & Union Territories
MAHARASHTRA
NANDURBAR
DHULE
JALGAON
AMRAVATI
NAGPUR
GONDIA
BHANDARA
BULDHANA
AKOLA
WARDHA
NASHIK
AURANGABAD
WASHIM
YAVATMAL
CHANDRAPUR
THANE
AHMADNAGAR
JALNA
HINGOLI
GADCHIROLI
PARBHANI
MUMBAI (BOMBAY) State Headquarter
RAIGARH
PUNE
BID
NANDED
LATUR
OSMANABAD
SATARA
SOLAPUR
RATNAGIRI
SANGLI
KOLHAPUR
SINDHUDURG
JALGAON (Maharashtra)
Madhya Pradesh
To Burhanpur(MP)
DHULE
To Nardana
Tapi
Chopda
Unapdev
Chahardi
Adavad
Kathora
Faizpur
Savda
Raver
Yaval
Bhalod
Changdev
Patonda
Dharangaon
Jalgaon
Asoda
Edalabad
Amalner
Varad
Bhusawal
Varangaon
Erandol
Nasirabad
Parola
Mhasva
Girla
Jamner
Bodvad
To Malkapur
To Mukti
Talvada
Kasoda
Maheji
Lohara
Shahapur
Bhadgaon
Pachora
Shendurni
Pahur
Fatehpur
Tondapur
Mehunbare
Nhava
Kajgaon
Pimpalgaon
Nagar Devla
Vaghli
Chalisgaon
To Nandgaon
NASHIK
AURANGABAD
JALNA
BULDHANA
Map not to Scale
District Boundary
River
National Highway
Major Road
Road
Railway Track
District Headquarter
Taluk Headquarter
Town
Tourist Place

A.3. Technologies and/or measures

>>

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: I.D – Renewable Electricity Generation for a grid
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:

The project activity involves a total of 8.5 MWp of installed capacity of solar power generation. Out of this 7.5 MWp will be on fixed mounting structure while 1 MWp will be equipped with a tracking system to enhance the isolation period by a minimum of 25%. The detailed technical specifications are mentioned as follows:

a) 7.5 MWp solar power plant on fixed mounting structure:

The proposed project envisages the use of multi crystalline Silicon cell based Photo-Voltaic solar panels with a combined capacity of 8.5 MW. A major part of this power plant is based on fixed axis mounting structure and accounts for 7.5 MW of the installed capacity. The details of the PV cells are as follows:

S. No.	Parameters	Values
1.	Type of cell	Multi-Crystalline
2.	No. of cells	60 Nos/Panel
3.	Maximum power	230 Wp ± 3%
4.	Open circuit voltage (DC)	36.35 Vdc
5.	Short Circuit Current	8.15 Amp
6.	Maximum System Voltage	1000 Vdc
7.	Life of the SPV Panel	>20 years
8.	Guaranteed output up to 10 years	90%
9.	Guaranteed output after 10 years up to 25 years	80%
10.	Number of modules	33000
11.	Array direction	South – facing

The project will use a 640 KW high-efficiency central inverter for converting DC to AC. The inverter used will have a maximum efficiency of 98.3%. Even under a partial load of only 10% an efficiency of 97.5% will be achieved. The technical details of the inverter are as follows:

S. No.	Parameters	Values
1.	Rated AC power	640KW
2.	Maximum AC power	680KW
3.	Maximum AC current	1244A
4.	Line power factor	>0.98
5.	AC current distortion	<3%
6.	Rated PV-power	654KW
7.	Maximum PV-power	695KW

8.	Maximum PV-current	1308A
9.	Maximum PV no-load-voltage	900VDC

b) 1 MWp solar power plant equipped with tracker system:

Tracker improves the isolation period by a minimum of 25%. This increases the power generation output during the beginning of the day and end of the solar day. The tracking system installed at this project is expected to improve the capacity utilization factor from 18.25% to 22.5%[1] thereby leading to generation of more units of electricity. The technical details of the solar cells being used are as follows:

S. No.	Parameters	Values
1.	Type of cell	Multi-Crystalline
2.	No. of cells	60 Nos/Panel
3.	Maximum power	230 Wp ± 3%
4.	Open circuit voltage (DC)	36.35 Vdc
5.	Short Circuit Current	8.15 Amp
6.	Maximum System Voltage	1000 Vdc
7.	Life of the SPV Panel	>20 years
8.	Guaranteed output up to 10 years	90%
9.	Guaranteed output after 10 years up to 25 years	80%
10.	Number of modules	4356

The technical details of the inverters being used are as follows:

S. No.	Parameters	Values
1.	Rated AC power	640KW
2.	Maximum AC power	680KW
3.	Maximum AC current	1244A
4.	Line power factor	>0.98
5.	AC current distortion	<3%
6.	Rated PV-power	654KW
7.	Maximum PV-power	695KW
8.	Maximum PV-current	1308A
9.	Maximum PV no-load-voltage	900VDC

The proposed project will be connected to the nearest 33 KV line of MSEDCL. 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.

The technology for the project is environmentally safe and sound. The solar panels for the project are being produced in-house, while the inverters and ground support equipment will be procured from world's renowned manufacturers. Further, there is no technology transfer associated with the project activity.

[1] In accordance with the guidelines for reporting and validation of Plant Load Factors (EB 48, Annex 11), the PLF value was considered as 18.25% for 7.5 MW fixed and 22.5% for 1 MW tracker basedplant from the Yieldassessment study carried out by a third party contracted by JISL i.e. TUV Rheinland

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants(as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host Country)	Jain Irrigation Systems Limited (Private entity)	No

A.5. Public funding of project activity

>>

There is no recourse to any public funding in the proposed project activity. The project proponent hereby confirms that there is no diversion of Official Development Assistance (ODA) to the proposed project activity.

A.6. Debundling for 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. Further, as per the Guidelines on assessment of debundling for SSC project activities Version 03[2], a proposed small-scale project activity shall be deemed to be a debundled component of alarge project activityifthere is a registered small scale CDM project activity or an application to register 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.
-

The proposed small-scale project activity is not a debundled component of a large project activity as there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity by the project promoter in the same project category and technology within 1km of the project boundary.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

>>

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].

[2] https://cdm.unfccc.int/UserManagement/FileStorage/B2G0MI867OH5JVD9FYN4CXQPKEATWZ
[3] http://cdm.unfccc.int/UserManagement/FileStorage/V9LRSXKP24Q7YT6HZDUBO3C0ING8AJ
[4] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

B.2. Project activity eligibility

>>

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 • *supplying electricity to a national or a regional grid; or* • *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 be supplying electricity to the regional grid i.e. NEWNE grid~~its manufacturing facility located at Jalgaon via NEWNE grid~~through a~~power purchaseagreement~~wheeling agreement~~ with Maharashtra State Electricity Distribution Company Limited.
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~~will generate electricity by using renewable source of energy (i.e. solar) and supplies electricity to NEWNE grid~~~~that displace electricity consumption from the national/ regional grid~~ and are applicable under AMS.I.D Version 17. ~~The proposed project activity under consideration will also displace the electricity being imported from the grid by using the electricity generated for captive consumption at its manufacturing facility through a wheeling agreement with Maharashtra State Electricity Distribution Company Limited.~~Hence the project activity is applicable under AMS.I.D Version 17.
3. This methodology is applicable to project activities that: • *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);* • *involve a capacity addition;* • *involve a retrofit of (an) existing plant(s); or* • *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 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*	**Not applicable** The project activity is not a hydro power plant.

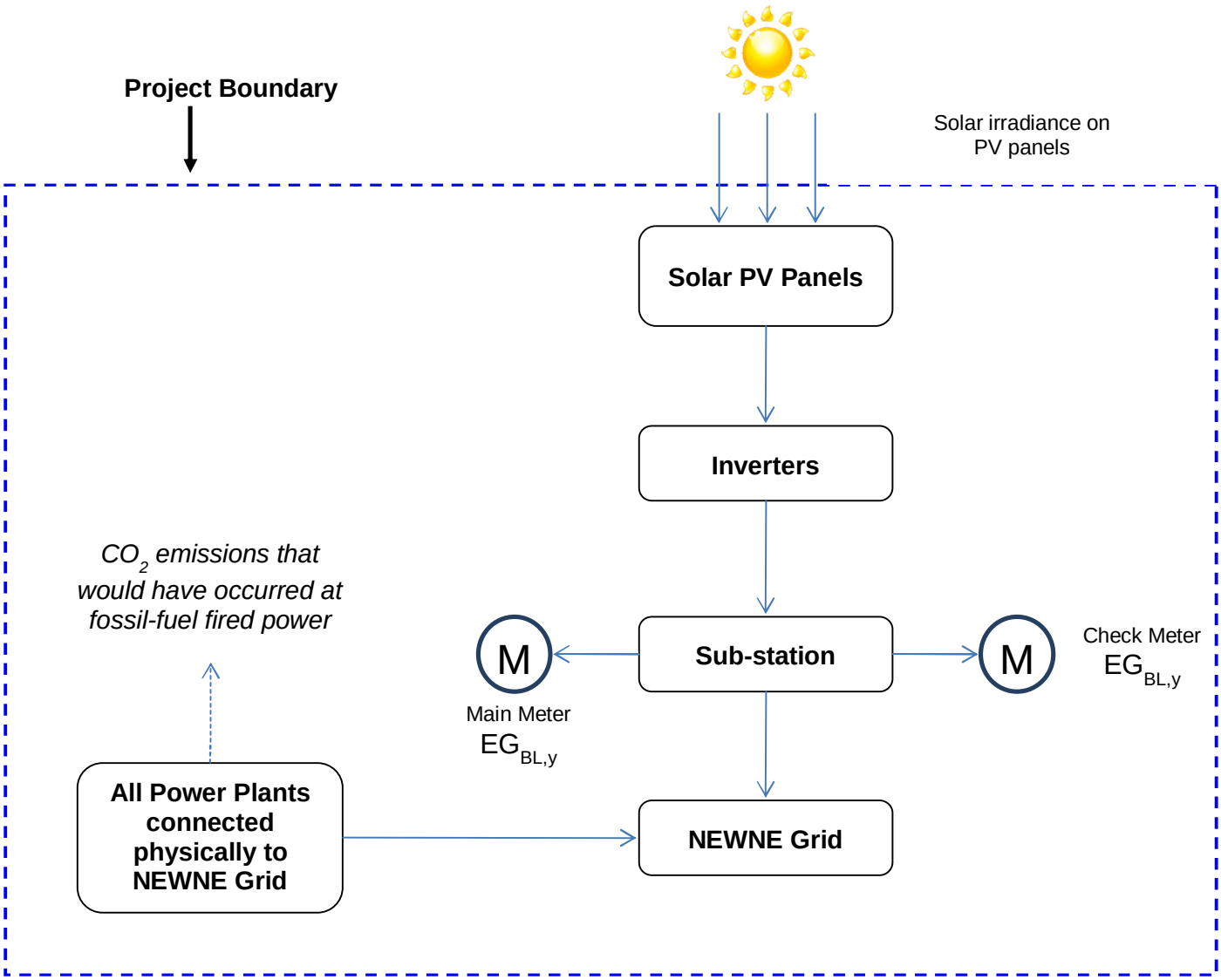
in the project emissions section, is greater than 4 W/m2; • *The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.*	
5. If new unit has both renewable and non-renewable components (e.g.. 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 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.
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. The project capacity is 8.5 MW and will not exceed the small scale project limit of 15 MW over the crediting period of the project activity.

As already been in the above table, the installed capacity of the plant is 8.5 MW and will not exceed the small scale limit of 15 MW 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. Project boundary

>>

The project boundary as described in AMS.I.D is the physical, geographical site of the renewable energy generation site. Accordingly the project boundary includes solar PV power generation system and the local grid to which the renewable electricity is supplied to avoid GHGemissions. The proposed project is located in the state of Maharashtra 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. Establishment and description of baseline scenario

>>

According to the guidelines 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."*

The baseline scenario of the project is that electricity delivered to the regional grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources in the regional grid.

As per 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."*

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

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 CO_2/MWh)

The emission factor is calculated as per the paragraph 12 (a) of AMS.I.D (Version 17) as a conservative estimate of 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 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).	Joint meter reading sheets
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 6.0.

B.5. Demonstration of additionality

>>

The total installed electricity generation capacity in India at the time of start of validation of the project activity was 186,654.62 MW. The details of the same (as on 31/12/2011) are shown in the table below[5]:

Type	Capacity Installed (MW)
Thermal	122,963.98
Hydro	38,748.40
Renewable	20,162.24
Nuclear	4,780.00
Total	**186,654.62**

Thus, renewable energy forms just about 11% of the total installed capacity (as on 31/12/2011). Also, as per the latest available report from Ministry of New and Renewable Energy (MNRE), the total capacity of grid connected solar power plants as on 24/11/2011 was 143.5 MW (http://mnre.gov.in/file-manager/UserFiles/powerplants_241111.pdf).

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 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" Version 04 (EB 62, 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. The project

[5] http://cea.nic.in/reports/monthly/executive_rep/dec11/8.pdf

proponent intimated the UNFCCC and the NCDMA of its intention to seek CDM for the proposed project activity vide its e-mail dated 24th September 2011. The project start date, as identified in section C.1.1, is 21st September 2011 which is well within 6 months of the intimation date as stipulated by the guidelines. Hence 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 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 the "Guidelines on the demonstration of additionality of small-scale project activities" Version 09, 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[6]:

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 technologies and project activity types that are automatically defined as additional for project sizes up to and including the small-scale CDM thresholds (e.g. installed capacity up to 15 MW), without further documentation of barriers. The list consists of:

a) The following grid-connected and off-grid renewable electricity generation technologies:
    i. Solar technologies (photovoltaic and solar thermal electricity generation);
    ii. Off-shore wind technologies;
    iii. Marine technologies (wave, tidal);
    iv. Building-integrated wind turbines or household rooftop wind turbines of a size up to 100 kW;
b) The following off-grid electricity generation technologies where the individual units do not exceed the thresholds indicated in parentheses with the aggregate project installed capacity not exceeding the 15 MW threshold:
    i. Micro/pico-hydro (with power plant size up to 100 kW);
    ii. Micro/pico-wind turbine (up to 100 kW);
    iii. PV-wind hybrid (up to 100 kW);
    iv. Geothermal (up to 200kW);
    v. Biomass gasification/biogas (up to 100kW);
c) Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM thresholds;
d) Rural electrification2 project activities using renewable energy sources in countries with rural electrification rates less than 20%; the most recent available data on the electrification rates shall be used to demonstrate compliance with the 20 per cent threshold. In no case shall data be used if older than three years from the date of commencement of validation of the project activity.

[6]http://cdm.unfccc.int/Reference/Guidclarif/meth/methSSC_guid05.pdf

Since the proposed project activity is an 8.5MW capacity grid connected solar photovoltaic technology based electricity generation project, Hence, as per Para 2, Annex 27, EB 68, 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

>>

The AMS.I.D version 17 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
- 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 CO_2/MWh)

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

In accordance with the "Tool to calculate the emission factor for an electricity system" Version 02.2.1, combined margin CO_2 emission factor for grid connected electricity generation is calculated stepwise as below:

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 Uttarakhand	Bihar, Orissa, West Bengal, Jharkhand and Sikkim	Gujarat, Madhya Pradesh, Maharashtra, Goa and Chattisgarh	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura	Andhra Pradesh, Karnataka, Kerala and Tamil Nadu
Union Territories	Delhi and Chandigarh	Andaman-Nicobar	Daman & Diu, Dadar & Nagar Haveli	-	Pondicherry, Lakshadweep

The NEWNE grid constitutes several states including Maharashtra. 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)

	2005-06	2006-07	2007-08	2008-09	2009-10
NEWNE	18.0%	18.5%	19.0%	17.4%	15.9%
South	27.0%	28.3%	27.1%	22.8%	20.6%
India	20.1%	20.9%	21.0%	18.7%	17.1%

Ref: CO_2 Baseline Database for the Indian Power Sector – CEA, Version 06.[7]

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

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

units

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

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 calculation of the emission factor has been explained as follows:

Particulars	**Unit**	**2007-08**	**2008-09**	**2009-10**
Simple Operating Margin (incl. Imports)	tCO_2e/MWh	0.9999	1.0066	0.9777
Net Generation in Operating Margin (incl. Imports)	GWh	409,834	421,803	462,327
Generation Weighted Average Operating Margin	tCO_2e/MWh	0.9942		

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 buildmargin emission factor.

The sample group of power units *m* used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

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

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity tithe 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 ($AEG_{SET-\geq 20\%}$, 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 athttp://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 ($SET_{\geq 20\%}$).

The value for build margin as per CEA database for the year 2009-10 is 0.8123 tCO_2e/MWh.

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}andw_{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[8]. The baseline emission factor calculated is 0.9491 tCO_2e/MWh. Following is the calculation for the baseline emissions:

Particulars	Unit	Value	Weight
Generation Weighted Average Operating Margin	tCO_2e/MWh	0.9942	0.75
Build Margin (not adjusted for imports)	tCO_2e/MWh	0.8123	0.25
Combined Margin (incl. Imports) (Wt. Avg of OM & BM) Emission Factor	tCO_2e/MWh	0.9486	

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)

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

B.6.2. Data and parameters fixed ex ante

>>

Data / Parameter	$EF_{grid,OM,y}$
Unit	tCO_2/MWh
Description	Operating Margin emission factor for NEWNE grid
Source of data	Referred from CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority, Version 6.0. (http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm)
Value(s) applied	0.9942
Choice of data or Measurement methods and procedures	Calculated it as CEA sourced data 3 years vintage data (2007-08, 2008-09 and 2009-10) and option of ex ante calculation based on Simple Operating Margin Method. Computed once during PDDfinalization.
Purpose of data	Used for emission reduction calculation
Additional comment	The value has been fixed ex-ante.

Operating Margin Estimation for NEWNE Grid (tCO_2 / MWh)

Year	Net Generation (GWh)	Operating Margin (tCO_2e/MWh)
2007-08	409,834	0.9999
2008-09	421,803	1.0066
2009-10	462,327	0.9777
Generation Weighted Average OM	**-**	**0.9942 tCO_2e/ MWh**

Data / Parameter	$EF_{grid,BM,y}$
Unit	tCO_2/MWh
Description	Build Margin emission factor for NEWNE grid
Source of data	Referred from CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority, Version 6.0. (http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm)
Value(s) applied	0.8123
Choice of data or Measurement methods and procedures	Calculated as per CEA sourced data for the year 2009-10. The build margin is calculated in this database as the average emissions intensity of the 20% most recent capacity additions in the grid based on net generation and option of ex ante calculation. Computed once during PDD finalization.
Purpose of data	Used for emission reduction calculation
Additional comment	The value has been fixed ex-ante.

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Combined Margin CO_2 emission factor for NEWNE grid
Source of data	Estimated figure based on 75% of OM and 25% of BM values
Value(s) applied	0.9486 tCO_2/MWh

Choice of data or Measurement methods and procedures	Calculated as per CEA sourced data with 3 years vintage data and option of ex ante calculation based on 75% of OM and 25% of BM values approach. Computed once during PDD finalization.
Purpose of data	Used for emission reduction calculation
Additional comment	The value has been fixed ex-ante.

Combined Margin Estimation for NEWNE Grid (tCO_2e/ MWh)	
Generation Weighted Average OM ($EF_{grid,OM,y}$)	**0.9942**
BM ($EF_{grid,BM,y}$)	**0.8123**
Combined Margin ($EF_{grid,CM,y}$)	**0.9486**

B.6.3. Ex ante calculation of emission reductions

>>

a) Solar panels installed on fixed axis

Installed Capacity	7.5	MW
No. of Days of operation	365	Days
No of Hours	24	Hours
Capacity Utilization Factor	18.25	%
Net Generation	11,990	MWh

a) Solar panels installed on tracker

Installed Capacity	1	MW
No. of Days of operation	365	Days
No of Hours	24	Hours
Capacity Utilization Factor	22.50	%
Net Generation	1,971	MWh

Particulars	**Unit**	**2007-08**	**2008-09**	**2009-10**
Simple Operating Margin (incl. Imports)	tCO_2e/MWh	0.9999	1.0066	0.9777
Net Generation in Operating Margin (incl. Imports)	GWh	409,834	421,803	462,327
Generation Weighted Average Operating Margin	tCO_2e/MWh	0.9942		

Particulars	**Unit**	**Value**	**Weight**
Generation Weighted Average Operating Margin	tCO_2e/MWh	0.9942	0.75
Build Margin (not adjusted for imports)	tCO_2e/MWh	0.8123	0.25
Combined Margin (incl. Imports) (Wt. Avg of OM & BM) Emission Factor	tCO_2e/MWh	0.9486	

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,

$EG_{BL,y}$ = (11,990+1,971) MWh = 13,961 MWh

$EF_{CO2,grid,y}$ = $EF_{grid,CM,y}$ = 0.9486 tCO_2e/MWh

Hence,

BE_y = 13,961 MWh * 0.9486 tCO_2e/MWh
= 13,243 tCO_2e

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

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

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

$ER_y = BE_y - PE_y - LE_y$
= 13,243 – 0 – 0

= 13,243 tCO_2e

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
2012-13[9]	13,243	0	0	13,243
2013-14	13,243	0	0	13,243
2014-15	13,243	0	0	13,243
2015-16	13,243	0	0	13,243
2016-17	13,243	0	0	13,243
2017-18	13,243	0	0	13,243
2018-19	13,243	0	0	13,243
Total (tonnes of CO_2e)	**92,701**	0	0	**92,701**
Total number of crediting years	**7**			
Annual average over the crediting period	**13243**	**0**	**0**	**13243**

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$EG_{BL,y}$
Unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*.
Source of data	Joint Meter Reading Sheets

[9] The crediting period will start from 15th December 2012 or date of registration whichever is later. The year 2012-13, 2013-14, 2014-15 etc. refer to one complete year.

Value(s) applied	13,961
Measurement methods and procedures	The net electricity supplied to the grid by the project activity will be calculated from the difference of the net energy exported to the grid and the net energy imported from the grid as measured by the bi-directional main energy meter at the grid inter-connection point. A check meter will also be installed as a back-up at this point. The meters will be of accuracy class 0.2s.
Monitoring frequency	The monitoring will be on a continuous basis and monthly recording will be undertaken. The log-books will be maintained at the project site for this purpose.
QA/QC procedures	The calibration of all the meters will be undertaken ~~once in three years~~annually ~~in accordance with the General Guidelines to SSC CDM Methodologies~~. In the event that the main meter is not in service as a result of maintenance, repairs or testing, the check meter will be used. The meter readings will also be cross checked with records for sold electricity (invoices).
Purpose of data	Calculation of baseline emissions
Additional comment	The data 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	$EG_{BL,Export,y}$
Unit	MWh/yr
Description	Quantity of total electricity exported by the plant to the regional grid during the year *y*.
Source of data	Joint Meter Reading Sheets
Value(s) applied	13,961
Measurement methods and procedures	The gross exported to the grid by the project activity will be measured by the bi-directional main energy meter at the grid inter-connection point. A check meter will also be installed as a back-up at this point. The meter will be of accuracy class 0.2s.
Monitoring frequency	The monitoring will be on a continuous basis and monthly recording will be undertaken. The log-books will be maintained at the project site for this purpose.
QA/QC procedures	The calibration of all the meters will be undertaken~~once in three years~~ annually ~~in accordance with the General Guidelines to SSC CDM Methodologies~~. In the event that the main meter is not in service as a result of maintenance, repairs or testing, the check meter will be used. The meter readings will also be cross checked with records for sold electricity (invoices).
Purpose of data	Calculation of baseline emissions
Additional comment	The data 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	$EG_{BL,import,y}$
Unit	MWh/yr
Description	Quantity of total electricity imported by the project plant/unit from the grid during year *y*.
Source of data	Joint Meter Reading Sheets
Value(s) applied	0

Measurement methods and procedures	The electricity imported from the grid by the project activity will be measured by the bi-directional main energy meter at the grid inter-connection point. A check meter will also be installed as a back-up at this point. The meter will be of accuracy class 0.2s.
Monitoring frequency	The monitoring will be on a continuous basis and monthly recording will be undertaken. The log-books will be maintained at the project site for this purpose.
QA/QC procedures	The calibration of all the meters will be undertaken~~once in three years~~annually~~in accordance with the General Guidelines to SSC CDM Methodologies~~. In the event that the main meter is not in service as a result of maintenance, repairs or testing, the check meter will be used. The meter readings will also be cross checked with records for sold electricity (invoices).
Purpose of data	Calculation of baseline emissions
Additional comment	The data 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. Sampling plan

>>

There are no parameters in section B.7.1 that are to be determined by sampling approach.

B.7.3. Other elements of monitoring plan

>>

Monitoring Plan Objective and Organisation

The purpose of the monitoring plan is to measure the net electricity delivered to the electricity grid. Within the CDM team, a supervisor will be designated for the solar power site, which will be responsible for compiling, monitoring and reporting of GHG performance related parameters (Process Parameters, Procedures, Calibration).

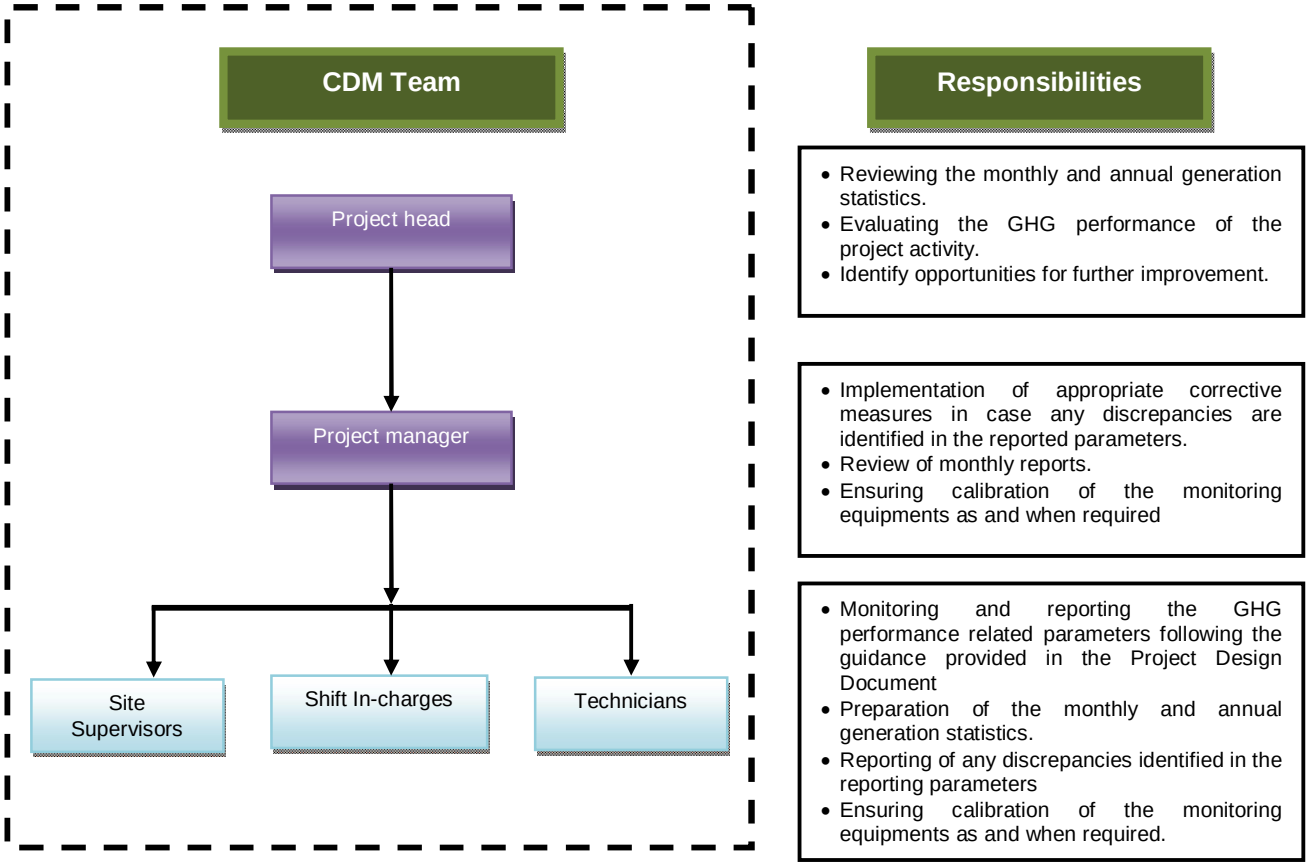
This data collated from the site will be aggregated by the next superior CDM team member. The data and documents received from the site supervisor will be compiled in a format called the CDM format / report. Quality checks will also be undertaken at this level to ensure all discrepancies are addressed. The net electricity attributable to the project activity will be calculated by subtracting the total electricity imported from the total electricity exported to the grid. The onus of reviewing, storing and archiving of all CDM related information relevant to the project activity in a suitable manner would rest with this team member.

The Project Manager will aggregate and review all the data received from site supervisors. The review will be conducted to ensure compliance to the requirements of the monitoring plan and other CDM modalities and procedures including calibration frequency. Corrective measures will be applied in case any discrepancy is observed. The Project Manager will further submit a consolidated report to the Project Head who will finally review and sign the monthly performance from the project activity. To ensure that the data is reliable and transparent, the project entity will establish Quality Assurance and Quality Control (QA&QC) measures to effectively control and manage data reading, recording, auditing as well as archiving data and all relevant documents.

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

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, labor welfare and financial functions will be looked after by Jain Irrigation

Systems Limited (JISL). The organizational structure and responsibilities on project operation, monitoring and data recording has been mentioned below:



Operation & Management Structure

Reading and Correction of Meters:

For the purpose of energy accounting, JISL will install ABT compliant energy meter at the grid interconnection point. The meters installed will account for the export as well as import of electricity at the project site. The amount of electricity imported from the grid will be deducted from the net electricity exported to calculate the emission reductions. In the event that the main meter is not in service as a result of maintenance, repairs or testing, the check meter will be used. If during the periodic tests, both main and check meters are found to be beyond the permissible limits of error, both the meters shall be calibrated immediately. Further, the error identified in the calibration test of the main meter would be conservatively applied as a correction factor to its reading to arrive at the quantity of electricity exported to/imported from the grid.JMR is taken on monthly basis. In case dates of verification period does not match with dates of JMRs then daily readings would be considered of same meter of which JMR readings are taken

Calibration of Meters:

The main and check meters will be calibrated once in~~three years~~ayearinaccordance with the Power Purchase Agreement signed with state electricity distribution company~~General Guidelines to SSC CDM Methodologies~~.

Recording:

JISL will keep complete and accurate records of operating log at the Power Plant with records of real and reactive power generation, frequency, transformer tap position, bus voltage, main and

check meter readings, any unusual conditions found during operation/inspections, chart and printout of event loggers for system disturbances/outages.

Monitoring and archiving of data:

The net electricity delivered to the local regional grid by the project needs to be monitored. The monitoring data will be derived from periodic electricity meter records kept by the project owners and/or the grid company, which are crosschecked with actual invoices sent by project owners to the grid company. The CDM team within the operator of the power plant will be responsible for collecting the monitoring data and will provide the meter readings for electricity delivered and if available calibration certificates.

The electricity data will be recorded by the shift in-charge in the site log books and would be forwarded to the site manager. On regular basis, as decided by the CDM team, the site manager would prepare and forward the reports to the designated site supervisor of the CDM team for review and archiving.

The data will be archived electronically and be stored for 2 years after the end of the crediting period of the project activityor the last issuance of CERs for this project activity, whichever occurs later.~~.~~

Emission reduction calculation:

Emission reduction report will be prepared based on the conservative value of export and import data. The report will be prepared by the CDM coordinator and will be reviewed and maintained by the site-in-charge for verification.

Quality Assurance and Quality Control

The meters are installed at the interconnection point with the grid. JISL will implement QA&QC measures to calibrate and guarantee the accuracy of metering and safety of the project operation. The metering devices will be calibrated annually. ~~and inspected properly and periodically every three years as per the simplified modalities for small scale CDM projects~~.

The CDM team will meet periodically to review project parameters, check data collected, emissions reduced etc. The following will be the procedure for taking corrective action and addressing any non-conformances discovered:

- All the mismatching data along with the name of the respective site manager and in-charge of logbooks name will be recorded in a Note Book.
- The respective site supervisors in the CDM team will send FAR (Forward Action Request) or CAR (Corrective Action Request) to the concerned CDM Member.
- After receipt of the communication, within one week, the concerned site in-charge will correct the data and will reply to the site supervisor in the CDM team.

The corrected data will then be compiled by the respective site supervisors

Training:

Operating and maintaining a solar PV power plant requires certain degree of skills and exposure. In order to maintain a close knit operation and safe maintenance, sufficient training will be imparted to the O&M team before the implementation of the project.

Emergency Preparedness:

The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. No need for emergency preparedness in data monitoring is visualized. However in order to ensure the accuracy of data in the case of failure of the main meters or any such unavoidable circumstances, check meters will be installed in addition to the main meters at the project site to measure the export and import of electricity. Check meter will be considered only when the main meters are found to be defective or stopped.

B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

>>

Date of completion of the application of the baseline study:30/09/2011

Name of person/entity determining the baseline: Jain Irrigation Systems 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 and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>

21/09/2011 (Date of First purchase requisition)

C.1.2. Expected operational lifetime of project activity

>>

25 years and 0 months

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>

Renewable crediting period has been chosen.

C.2.2. Start date of crediting period

>>

15/12/2012 or date of CDM registration whichever is later.

C.2.3. Length of crediting period

>>

7 years and 0 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>

The project activity has no significant impact on the environment.Solar PV power projects are not included in schedule –I of the EIA notification S.O.1533 (E) dated 14th September 2006 or its amendment notification S.O.-3067(E) dated 1/12/2009[10]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.

However, the environmental aspects and impacts for the project activity were analyzed and it was inferred that there are no significant negative environmental impacts on air, water, noise and ecology. The summary of findings is given below:

During construction phase:

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

The construction phase involves erection of panels in their respective location. Although movement of materials for erection produced some dust, the impacts were negligible and did not have any significant impact on the environment.

During operation phase:

Impact on air:

There is no generation of emissions or dust during the operation of the project activity. Thus, there are no negative impacts on air due to the project activity.

Impact on water:

There is no consumption of water required for the project activity and no effluent is discharged either. Therefore there is no negative impact on water due to the project activity.

Impact due to noise:

There is no generation of noise from the operation of the project. Therefore, there are no negative impacts due to noise.

Impact on ecology:

There is no negative impact on ecology due to the project activity.

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. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

For the purpose of seeking comments and local stakeholders' views on the project activity, stakeholder consultation meeting was organized by JISL Management on 15th December 2011 at the project site. Approximately 100 people attended the meeting. The meeting was called upon through individual invitations letters to identified stakeholders on 28th November 2011.Representatives of the following villages/talukas attended this meeting:

1. Shirsoli
2. Mohadi
3. KhediKadoli
4. Jalgaon

Also present in the meeting were the employees of JISL, contractors, NGO, local authorities including MPCB and MSECL, suppliers etc. A record of the people attending the meeting has been maintained and all comments from the stakeholders received during the meeting were recorded.

E.2. Summary of comments received

>>

The meeting was presided over by Mr. ArunPapadkar (Zonal Executive Officer, MSEDCL). The welcome address was given by Mr. Vinod Rapatwar (Executive, Corporate communication, JISL). He introduced other representatives of the company and dignitaries present on the dais. He also mentioned the importance of a responsible corporate citizen in light of the commitment of JISL towards society and environment. He then asked Dr. Santosh Deshmukh (Chief coordinator, Sustainability, JISL) to address the gathering and give a brief about the proposed project. Dr.Deshmukh informed the stakeholders about the details of the project activity and the fact that it would lead to generation of clean power by tapping of solar power which is a renewable energy source. Healso stated that the project, if implemented, would result in reduction of Greenhouse gases in the atmosphere by avoiding the use of GHG generating fossil fuels. He also impressed upon the fact that the project will eventually lead to conservation of precious natural resources in the form of fossil fuels thereby benefitting the society as a whole. He then also discussed in brief about the Clean Development Mechanism and Carbon credits.

Thereafter the stage was opened for the representatives of various stakeholder groups to express their opinions about the project.

First to speak was Mr. Bhim Singh (Senior representative, village Shirsoli). He expressed his appreciation of JISL's endeavour. He discussed the scarcity of electricity supply in some of the nearby areas and said that he hoped that such initiatives will improve the availability of electricity for the common people and agriculture sector. Mr. Sanjeev Phadnis (Associate Vice President, JISL) then discussed about the technology being employed in the project. He also discussed various other products being developed and manufactured by the company that are environmentally friendly and employ solar energy for their operation. Mr. A G Kude (Regional officer, MPCB, Jalgaon region) also appreciated the new initiative and expressed the need to spread such technology to other industry sectors as well. At the same time, he also expressed

gratitude towards JISL for sharing the burden for environmental care as the initiative will help MPCB in maintaining a clean and green environment.

Mr. Papadkar expressed his concern over the increasing demand for electricity and at the same time the dwindling natural resources with every passing day. He appreciated the initiative taken by JISL and commented that this project will contribute towards the sustainable development of the nearby communities as well as the nation as a whole. He also said that this project will help improve the availability of electricity in the area.

The representatives from local NGOs praised JISL for its various revolutionary contributions to the society and the environment. They expressed their full support for this project and pledged to help in any way they can. Representing School of Environment, Khandesh Nature Conservation Society and Upaj were Mr. RajendraNannaware, Mr. AbhayUjagare and Dr.SurendraChaudhari respectively.

Stakeholder Comments

Sly. No.	***Question***	***Stakeholder***	***Answer***
1.	When is the project expected to get commissioned?	NGO	The project is expected to get commissioned by the end of March 2012
2.	How many Carbon credits is the project expected to generate every year?	NGO	The project is expected to generate around 12,400 Carbon credits per annum
3.	How will the project improve the availability of electricity for the common people?	Village sarpanch	The electricity produced through the solar power project will replace an equivalent amount which was previously being purchased from the grid. This in turn will lead to an improvement in the availability of electricity for the common people.
4.	Are there any subsidies provided by the government for the project under the JNNSM?	NGO	There are no subsidies being availed from the government for this project.

Mr. LimjiJalgaonwala (Coordinator, Corporate sustainability and responsibility cell, JISL) thanked all the participants for attending this meeting on invitation from JISL. He also expressed that JISL is committed to their social and environmental obligations and invite 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. All local stakeholders expressed their consent for successful installation and operation of solar PV power plant by JISL in the region.

E.3. Report on consideration of comments received

>>

All the stakeholders were appreciative that the CDM project activity in their locality is contributing to a global cause and they praised the JISL 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 negative impacts due to the project activity had been identified.

SECTION F. Approval and authorization

>>

The host country i.e. India has provided letter of approval for the project activity and same is submitted to DOE.

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Jain Irrigation Systems Limited
Street/P.O. Box	P. O. Box: 72, N.H. No. 6
Building	Jain Plastic Park
City	Jalgaon
State/Region	Maharashtra
Postcode	425 001
Country	India
Telephone	+91 – 257 – 2260033/44
Fax	+91 – 257 – 2261155/44
E-mail	solar@jains.com
Website	www.jains.com
Contact person	
Title	
Salutation	Dr.
Last name	Deshmukh
Middle name	
First name	Santosh
Department	Sustainability
Mobile	+91 – 94030 80103
Direct fax	
Direct tel.	
Personal e-mail	deshmukh.santosh@jains.com

Appendix 2. Affirmation regarding public funding

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

Appendix 3. Applicability of methodology and standardized baseline

Information with respect to the baseline has already been explained under section B.6 and information on applicability of methodology is provided in section B.2.

Appendix 4. Further background information on ex ante calculation of emission reductions

The project activity uses the data published by Central Electricity Authority of India to calculate the grid emission factor, following the rules defined in "Tool to calculate the emission factor of an electrical system" Version 2.2.1 (EB-63). Details of the used tools is given in section B.1 of the PDD.

Appendix 5. Further background information on monitoring plan

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

Appendix 6. Summary of post registration changes

Project participant seeks following post registration changes:-

1. **Corrections**

Sl. No.	Description in registered PDD	Section Reference	Actual scenario	Time period when deviation occurred	Reason
1.	The project activity was commissioned on 04 July 2012.	A.2	The project was commissioned on 19th June 2012 itself.	Since the commissioning i.e. 19/06/2012	According to the commissioning certificate commissioning date of the project was 19/06/2012 and the issuance date

Sl. No.	Description in registered PDD	Section Reference	Actual scenario	Time period when deviation occurred	Reason
					of the certificate was 04/07/2012. Thus the commissioning date was erroneously mentioned in the PDD. Therefore, PP is requesting the correction for this editorial error.

2. **Permanent changes from registered monitoring plan:-**

Sl. No.	Description in registered PDD	Section Reference	Actual scenario	Time period when deviation occurred	Reason
1.	The calibration of all the meters will be undertaken once in three years in accordance with the General Guidelines to SSC CDM	B.7.1	The calibration of all the meters will be undertaken annually as per clause 7.3 of PPA.	Since the commissioning i.e. 19/06/2012	The calibration procedures are followed by latest signed PPA between JISL and MSEDCL. As per PPA frequency is once in a year. Thus, conservatively PP revises the calibration frequency from once in three year to once in a year.
2.	The metering of net electricity generated will be undertaken at the grid interconnection point i.e. 132kV MSEDCL/MSETCL	B.7.1	As per the clause 7.1 of the Power Purchase Agreement the metering of net electricity generated will be undertaken at the	From 1st April 2014 onwards	Clause 7.1 of PPA.

Sl. No.	Description in registered PDD	Section Reference	Actual scenario	Time period when deviation occurred	Reason
	Substation		grid interconnection point i.e. 33 kV MSEDCL Substation at JISL premise		

3. **Changes to project design of registered project activity:-**

Sl. No.	Description in registered PDD	Section Reference	Actual scenario	Time period when deviation occurred	Reason
1.	The electricity generated from the project activity will be supplied to the JISL manufacturing facility through the regional electricity grid under a wheeling agreement with the state distribution company.	A.2	The electricity generated from the project activity is not being supplied to the JISL manufacturing facility. However, in actual scenario, the electricity generated from the project activity is supplied to the grid under a Power Purchase agreement with MSEDCL.	Since the commissioning i.e. 19/06/2012	The project activity was initially planned as a solar wheeling power project which would generate electricity from 8.5 MW Solar Plant at Jalgaon and the generated electricity was to be wheeled via regional grid (NEWNE Grid) for captive consumption. The same was mentioned in CDM PDD during validation. However, the wheeling could not be possible as the approval of circular no. 155 of MSEDCL which deals with the open access for captive

Sl. No.	Description in registered PDD	Section Reference	Actual scenario	Time period when deviation occurred	Reason
					consumption is still under consideration in MERC (Maharashtra Electricity Regulatory Commission) Hence, the PPA was signed later on and project became supply to grid instead wheeling for captive consumption.

JMR is taken on monthly basis. In case dates of verification period does not match with dates of JMRs then daily readings would be considered of same meter of which JMR readings are taken

- - - - -

Document information

Version	*Date*	*Description*
06.0	9 March 2015	Revisions to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Editorial improvement.

Version	*Date*	*Description*
05.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the project design document form for small-scale CDM project activities (these instructions supersede the "Guidelines for completing the project design document form for small-scale CDM project activities" (Version 01.1)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and **Error! Reference source not found.**~~Appendix 1~~; • Change the reference number from *F-CDM-SSC-PDD* to *CDM-SSC-PDD-FORM*; • Editorial improvement.
04.1	11 April 2012	Editorial revision to change history box by adding EB meeting and annex numbers in the Date column.
04.0	13 March 2012	EB 66, Annex 9 Revision required to ensure consistency with the "Guidelines for completing the project design document form for small-scale CDM project activities"
03.0	15 December 2006	EB 28, Annex 34 • 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.
02.0	08 July 2005	EB 20, Annex 14 • 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>.
01.0	21 January 2003	EB 07, Annex 05 Initial adoption.

Decision Class: Regulatory
Document Type: Form
Business Function: Registration
Keywords: project design document, SSC project activities