# Project design document form
## (Version 11.0)

| BASIC INFORMATION | |
|---|---|
| **Title of the project activity** | 19.2 MWp Solar Power Project by HZL at Debari and Dariba, Rajasthan |
| **Scale of the project activity** | ☒ Large-scale<br>☐ Small-scale |
| **Version number of the PDD** | 02 |
| **Completion date of the PDD** | 20/06/2019 |
| **Project participants** | Hindustan Zinc Limited |
| **Host Party** | India |
| **Applied methodologies and standardized baselines** | ACM0002- Grid-connected electricity generation from renewable sources --- Version 19.0 |
| **Sectoral scopes** | Sectoral Scope 1: Energy Industries (renewable - /non-renewable sources) |
| **Estimated amount of annual average GHG emission reductions** | 24,054 $tCO_2e$ / annum |

## SECTION A. Description of project activity

### A.1. Purpose and general description of project activity

The main purpose of this project activity is to generate clean form of electricity through renewable solar energy source. Hindustan Zinc Ltd (HZL) is the promoter of the project activity. The project activity involves installation of 4.8 MWp (DC) solar power project at Villages: Dariba, Tehsil-Railmagra, Dist- Rajsamand, Rajasthan and 14.4 MWp (DC) Solar power project at Debari, Dist-Udaipur, Rajasthan. The project will replace anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 24,054 $tCO_2e$ per year, thereon displacing 24,919 MWh/year amount of electricity from the generation-mix of power plants connected to the Indian grid, which is mainly dominated by thermal/fossil fuel based power plant.

The power generated from the project activity will be utilized for captive consumption.
The details of the project and the state of installation are mentioned in the table:-

| Project Promoters' Name | Capacity in MW | Commissioning Date | Connection with Grid | State | Usage of Electricity |
|---|---|---|---|---|---|
| Hindustan Zinc Ltd. | 4.8 MWp (DC) | 26/03/2017 | Indian Grid | Rajasthan | Captive use |
| | 14.4 MWp (DC) | 25/03/2017 | | | |

The major milestones taken towards implementation of the project activity are as follows:

| Sr No. | Particulars | Date |
|---|---|---|
| 1 | Detailed Project Report submitted by third party | 15/07/2015 |
| 2 | Board Decision (=Investment decision date) for the Project activity | 30/06/2016 |
| 3 | Stakeholder Consultation | 18/11/2016 |
| 4 | Contract between HZL and L&T for project development | 03/12/2016 |
| 5 | Publication of PDD for Global Stakeholder Consultation | 22/12/2017 |
| 6 | Host Country Approval | 15/04/2019 |

Sectoral Scope: 01 : Grid-connected electricity generation from renewable sources
Methodology : ACM0002: Grid-connected electricity generation from renewable sources- Version 19.0 (EB 100 Annex 6)[1]
Project Type: (i) : Renewable energy projects

**Tools referred with above methodology are:**

Tool to calculate the emission factor for an electricity system - Version 07.0 (EB 100, Annex 04)[2]
Tool for the demonstration and assessment of additionality[3]- Version 07.0.0 (EB 70, Annex 08)

**Scenario existing prior to the implementation of project activity:**

[1] https://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD

[2] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

[3] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf

The scenario existing prior to the implementation of the project activity, is electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

**Baseline Scenario:**

As per the applicable methodology, a Greenfield power plant is defined as "*a new renewable energy power plant that is constructed and operated at a site where no renewable energy power plant was operated prior to the implementation of the project activity*".

As the project activity falls under the definition of a Greenfield power plant, the baseline scenario as per paragraph 22 of Section 5.2.1 of applied methodology is the following:

*If the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "TOOL 07: Tool to calculate the emission factor for an electricity system".*

Hence, pre-project scenario and baseline scenario are the same.

**Sustainable development indicators**

The National CDM Authority (NCDMA), which is the Designated National Authority (DNA) for the Government of India (GOI) under the Ministry of Environment and Forests (MoEF), has mentioned four indicators for the sustainable development in the interim approval guidelines for Clean Development Mechanism (CDM) projects from India[4].Thus the project's contribution towards sustainable development has been addressed based on the following sustainable development aspects:

**Social well-being**

The project activity provided / provides job opportunity to local people during erection, commissioning and maintenance of the solar project. Frequency of visiting villages and nearby areas by skilled, technical and industrialist increase due to installation /site visit/operation and maintenance work related to solar plant. This directly and indirectly positively effects the economy of villages and nearby area. HZL built the community hall as well as facilities at nearby temple for public use

**Environmental well-being**

Solar power is one of the cleanest renewable energy powers and does not involve any fossil fuel. There are no GHG emissions. The impact on land, water, air and soil is negligible. Thus the project activity contributes to environmental well-being without causing any negative impact on the surrounding environment. The project has been installed on the waste land parcel where no other activity can be done eg. Jarosite pond and tailing dam.

**Economic well-being**

The CDM project activity generates permanent and temporary employment opportunity within the vicinity of the project. The electricity supply in the nearby area improves which directly and indirectly improves the economy and life style of the area.

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

**Technological well-being**

The project activity is step forward in harnessing the untapped solar potential and further diffusion of the solar technology in the region. The project activity leads to the promotion and demonstrates the success of solar projects in the region which further motivate more investors to invest in solar power projects. Hence, the project activity leads to technological well-being.

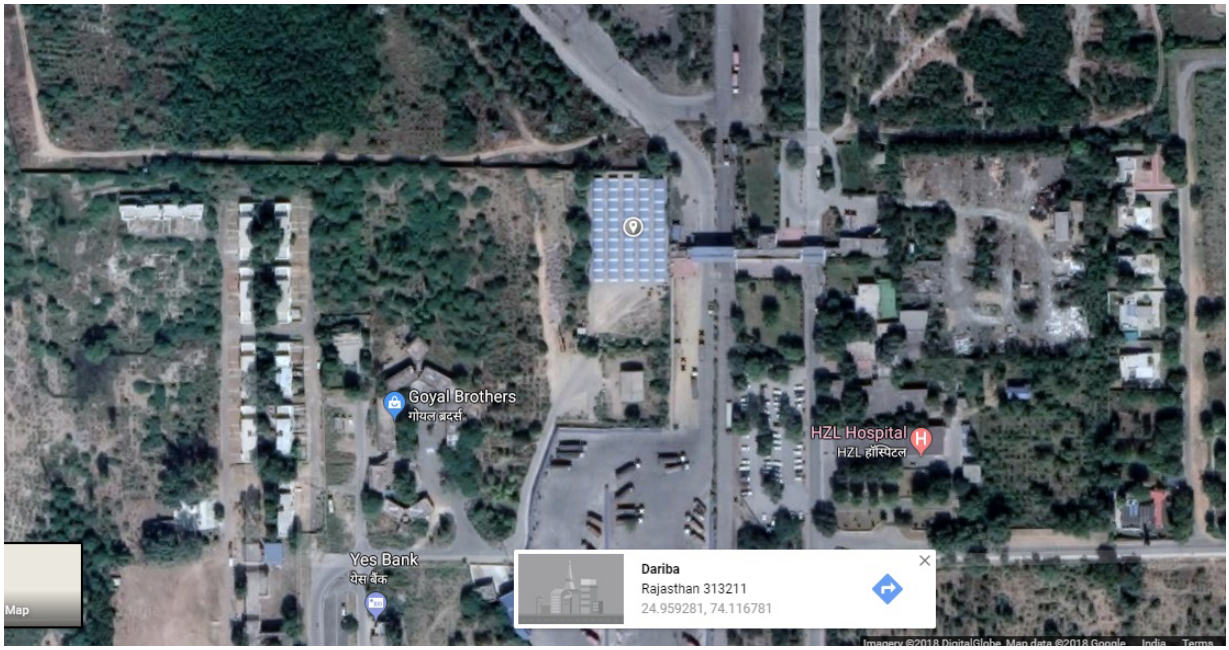
The Host County Approval issued by Indian DNA declaring acceptability of the Sustainable Indicators by the project activity is being submitted to DOE.

## A.2. Location of project activity

Village- Dariba and Debari, Dist- Rajsamand and Udaipur, State- Rajasthan, India.

Geo coordinates of Dariba site: 24°57'33.4"N 74°07'00.4"E
Geo coordinates of Debari site: 24°35'55.7"N 73°49'16.0"E

Map of the project site is as below:




## A.3. Technologies/measures

Sectoral Scope : 01 - Energy industries (renewable / non-renewable sources)
Project Type : I - Renewable Energy Projects
Project Category : ACM0002: Grid-connected electricity generation from renewable sources- Version 19.0 (EB 100)

The project activity aims to harness solar energy through installation of PV with total installed capacity of 19.2 MWp.

The technical specifications of project activity of 4.8 MWp by Hindustan Zinc Ltd are as follows[5]:

| Sr. No. | Particulars | Capacity |
|---|---|---|
| 1. | Technology used | 4.8 MW DC Polycrystalline |
| 2. | Rating of each module | 315 Wp |
| 3. | Angle from horizontal from which array is installed | 20 degree |
| 4. | Number of modules | 15,240 nos. |
| 5. | Make of modules | Phonosolar |
| 6. | Number of PCU's installed | 4 nos, 1000 KW each |
| 7. | Make of PCU | ABB India Ltd. |
| 8. | Status of installation | 100 % completed |
| 9. | Date of commissioning | 26th March, 2017 |
| 10 | Lifetime of project | 25 years[6] |

The technical specifications of project activity of 14.4 MWp by Hindustan Zinc Ltd are as follows[7]:

| Sr. No. | Particulars | Capacity |
|---|---|---|
| 1. | Technology used | 14.4 MW DC Polycrystalline |
| 2. | Rating of each module | 315 Wp |
| 3. | Angle from horizontal from which array is installed | 20 degree |
| 4. | Number of modules | 45,740 nos. |
| 5. | Make of modules | Phonosolar |
| 6. | Number of PCU's installed | 12 nos, 1000 KW each |
| 7. | Make of PCU | ABB India Ltd. |
| 8. | Status of installation | 100 % completed |
| 9. | Date of commissioning | 25th March, 2017 |
| 10 | Lifetime of project | 25 years[8] |

## A.4. Parties and project participants

| Parties involved | Project participants | Indicate if the Party involved wishes to be considered as project participant (Yes/No) |
|---|---|---|
| India | Hindustan Zinc Limited (Private Entity) | No |

## A.5. Public funding of project activity

[5] Technical specifications has been sourced from commissioning certificate of the project activity

[6] As per RRECL Tariff order and as per DPR of the project activity

[7] Technical specifications has been sourced from commissioning certificate of the project activity

[8] As per RRECL Tariff order and as per DPR of the project activity

There is no public funding from Annex 1 countries and no diversion of Official Development Assistance (ODA) involved in the project activity.

### A.6. History of project activity

The project activity is already commissioned and is being webhosted for the first time at UNFCCC.

### A.7. Debundling

Not Applicable as project is large scale project activity.

## SECTION B. Application of methodologies and standardized baselines

### B.1. References to methodologies and standardized baselines

**Title:** Grid-connected electricity generation from renewable sources[9]

**Reference:** The project activity meets the eligibility criteria of large scale project as it is more than 15MW
**Methodology** : ACM0002: Grid-connected electricity generation from renewable sources --- Version 19. (EB 100, Annex 6)[12]
**Type I** : Energy industries (renewable / non-renewable sources)
**Category** : Approved Consolidated Methodology (ACM0002)

**Tools referred with above methodology and applicable for project activity are:**

- Tool to calculate the emission factor for an electricity system- Version 07.0 (EB 100, Annex 04)[10]
- Tool for the demonstration and assessment of additionality[11]- Version 07.0.0 (EB 70, Annex 08)

### B.2. Applicability of methodologies and standardized baselines

The project activity involves generation of grid connected electricity from renewable solar energy. The project activity has an installed capacity of 19.2 MW (DC) which will qualify for a large CDM project activity under large scale methodologies. The project status is corresponding to the methodology ACM0002 version 19 (EB 100, Annex 6) and applicability of methodology are discussed below:

| Applicability | Project activity vis-à-vis applicability Conditions |
|---|---|
| This methodology is applicable to grid-connected renewable power generation project activities that:<br>a. install a Greenfield power plant;<br>b. involve a capacity addition to (an) existing plant(s);<br>c. involve a retrofit of (an) existing operating plants/units;<br>d. involve a rehabilitation of (an) existing plant(s)/unit(s) or<br>e. involve a replacement of (an) existing | The project activity is a Renewable Energy Project i.e. Solar Power Project which falls under applicability criteria option 1 (a) i.e., “Install a Greenfield power plant”. Hence the project activity meets the given applicability criterion. |

[9] http://cdm.unfccc.int/methodologies/PAmethodologies/approved

[10] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

[11] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf

| | |
|---|---|
| plant(s)/unit(s). | |
| The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; | The project activity is an installation of a new grid connected renewable energy solar power plant and hence this condition is met. |
| In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity; | The project activity does not involve any capacity additions, retrofits or replacements and therefore this condition is not applicable. |
| In case of hydro power plants, one of the following conditions shall apply:<br>a. The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or<br>b. The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 $W/m^2$; or<br>c. The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 $W/m^2$.<br>d. The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 $W/m^2$, all of the following conditions shall apply:<br>i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 $W/m^2$;<br>ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity;<br>iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 $W/m^2$ shall be;<br>a. Lower than or equal to 15 MW; and<br>b. Less than 10 per cent of the total installed capacity of integrated hydro power project. | The project activity is a grid connected renewable solar energy project. This condition is applicable only for hydro power plants and not applicable for solar projects. Therefore this condition is not applicable for project activity. |
| In the case of integrated hydro power projects, project participant shall:<br>i) Demonstrate that water flow from upstream | The project activity is a grid connected renewable solar energy project. This condition is applicable only for hydro |

| | |
|---|---|
| power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or<br>ii) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity. | power plants and not applicable solar projects.<br>Therefore this condition is not applicable for project activity. |
| Methodology is not applicable to the following<br>a. Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;<br>b. Biomass fired power plants/units | The project activity is an installation of a new grid connected renewable energy project and does not involve switching from fossil fuel to renewable energy and hence this criterion is not relevant to the project activity. |
| In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance". | The project activity is a new grid connected renewable solar energy plant and not a retrofits, replacement or capacity additions and therefore this criterion is not applicable to the project activity. |

Tool to calculate the emission factor for an electricity system- Version 07.0 (EB 100, Annex 04)[12]

| **Applicability Criterion (with Para number reference)** | **Project Case** |
|---|---|
| This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects). | The project is a grid connected Greenfield Solar power project and thus the tool is applicable. |
| Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project | Steps involved in calculation of Emission Factor is included in section B.6.3 of the PDD as per the requirement of the tool |

[12] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

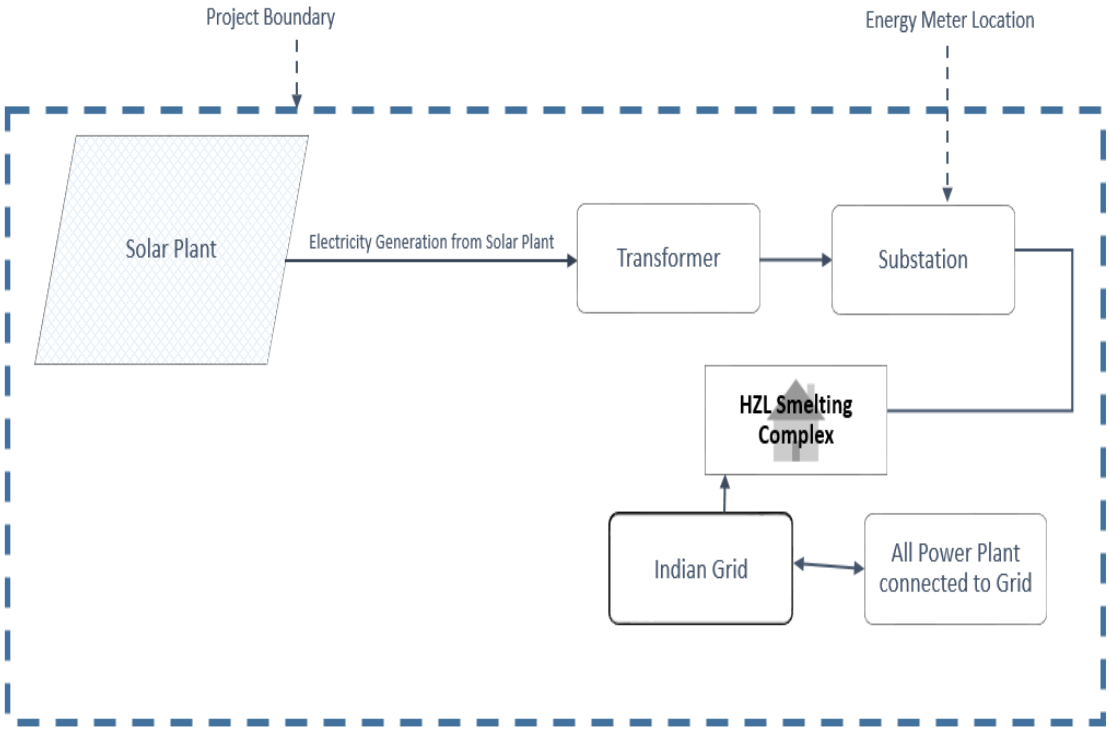
| Applicability Criterion (with Para number reference) | Project Case |
|---|---|
| participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified in "Appendix 2: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity. | |
| In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country. | Project is located in non-Annex I country and hence the tool is applicable |
| Under this tool, the value applied to the $CO_2$ emission factor of biofuels is zero. | The project is a Solar project and there is no involvement of biofuels. |

- Tool for the demonstration and assessment of additionality- Version 07.0.0 (EB 70, Annex 08)

### B.3. Project boundary, sources and greenhouse gases (GHGs)

As per ACM0002 version 19 - "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".

The project boundary includes the solar project, sub-stations, grid and all power plants connected to grid. The project activity will generate renewable energy and use for captive purpose. Therefore the captive consumption unit, entire Indian grid and all connected power plants have been considered in the project boundary for the proposed CDM project activity.




The GHG emission sources considered for the project boundary and their explanations are as follows:

| Source | | GHGs | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline scenario | Grid connected electricity generation. | $CO_2$ | Yes | Main emission source |
| | | $CH_4$ | No | Minor emission source |
| | | $N_2O$ | No | Minor emission source |
| Project scenario | Greenfield Solar PV Power Project Activity. | $CO_2$ | No | No $CO_2$ emissions are emitted from the project |
| | | $CH_4$ | No | Project activity does not emit $CH_4$ |
| | | $N_2O$ | No | Project activity does not emit $N_2O$ |

## B.4. Establishment and description of baseline scenario

As per the approved consolidated Methodology ACM0002 (Version 19.0, EB 100, Annex 6) para 22:

*"If the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "TOOL07: Tool to calculate the emission factor for an electricity system".*

The project activity involves setting up of solar projects to harness the power of sun to produce electricity and supply for captive consumption. In the absence of the project activity, the equivalent amount of power would have been supplied by the Indian grid, which is fed mainly by fossil fuel fired plants.

In the absence of the project activity, the equivalent amount of power would have been drawn from the Indian grid. Hence, the baseline for the project activity is the equivalent amount of power from the Indian grid.

Annexure 3 of the EB 22 states that national and/or sectoral policies and circumstances have to be accounted for when considering the baseline scenario.

Para 7(a) of the same 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 participant 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.

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

The combined margin of the Indian grid used for the project activity is as follows:

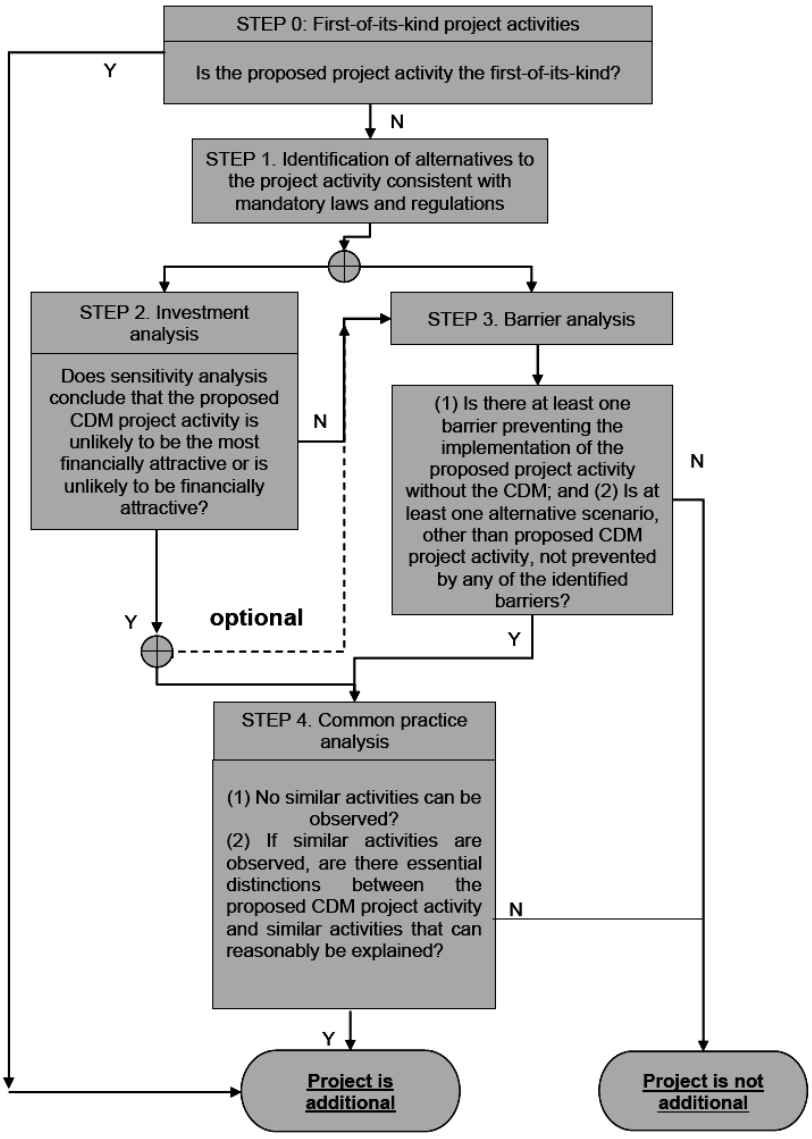
| Parameter | Value | Nomenclature | Source |
|---|---|---|---|
| $EF_{grid,y}$ | 0.9653 $tCO_2/MWh$ | Combined margin $CO_2$ emission factor for the project electricity system in year y | Calculated as the weighted average of the operating margin (0.75) & build margin (0.25) values, sourced from Baseline $CO_2$ Emission Database, Version 12.0, May 2017 published by Central Electricity Authority (CEA), Government of India |
| $EF_{grid,OM,y}$ | 0.9843 $tCO_2/MWh$ | Operating margin $CO_2$ emission factor for the project electricity system in year y | Calculated as the last 3 year (2013-14, 2014-15, 2015-16) generation-weighted average, sourced from Baseline $CO_2$ Emission Database, Version 12.0, May 2017 published by Central Electricity Authority (CEA), Government of India |
| $EF_{grid,BM,y}$ | 0.9083 $tCO_2/MWh$ | Build margin $CO_2$ emission factor for the project electricity system in year y | Baseline $CO_2$ Emission Database, Version 12.0, May 2017 published by Central Electricity Authority (CEA), Government of India |

## B.5. Demonstration of additionality

The table below is only applicable if the proposed project activity is a type of project activity which is deemed automatically additional, as defined by the applied approved methodology or standardized baseline.

| | |
|---|---|
| Specify the methodology or standardized baseline that establish automatic additionality for the proposed project activity (including the version number and the specific paragraph, if applicable). | NA |
| Describe how the proposed project activity meets the criteria for automatic additionality in the relevant methodology or standardized baselines. | NA |

The CDM project generates power using Solar PV energy which is a renewable, zero emission source of energy. Baseline considerations for the project are based on approved consolidated baseline methodology ACM0002 (Version 19.0). The methodology requires the project participant to determine the additionality based on "Tool for the demonstration and assessment of additionality", Version 7.0.0, EB 70, annex 08. The step-wise approach to establish additionality of the project activity has been followed, details of which are provided in the following paragraphs:




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

The proposed project activity is not the first of its kind. Hence, this step is not applicable.

**Step 1: Identification of alternatives to the project activity consistent with current laws and regulations**

As per the applied methodology ACM0002 version 19.0; Para 22, if the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity generated by the project activity would have otherwise been generated by the operation of grid connected power plant and by the addition of new generation sources.

As the baseline scenario is prescribed by applied methodology, hence no further analysis is carried out to identify alternatives.

**Step 2: Investment Analysis**

**Sub-step 2a: Determine appropriate analysis method**

As per "Tool for the demonstration and assessment of additionality" (version 07.0.0, EB 70 annex 08), for financial analysis of the project, the following three options are available:
Option I: Simple Cost Analysis
Option II: Investment Comparison Analysis
Option III: Benchmark Analysis

The project will generate revenues from savings accured from electricity generation from Solar PV plant being a captive project, therefore Option I is not applicable. Option II also does not apply since there is no comparable investment alternative available to the project participant. The most appropriate financial analysis method is therefore option III: the benchmark analysis, where the returns on investment in the project activity are compared to benchmark returns that are available to any investors in the country.

**Sub-step 2b: Option III. Apply benchmark analysis**

Project participant has considered Post-Tax Equity IRR for investment analysis at the time of decision-making. As Project participant is only interested in the returns project is generating on the portion of investment costs, which is financed by them in the form of equity.

The guidance of Investment Analysis is used for project activity. As per guidance Required/expected returns on equity are appropriate benchmarks for an equity IRR. Therefore, the Expected return on equity is considered appropriate benchmark.

Accordingly, the post-tax Equity IRR has been considered as the relevant financial indicator for Investment Analysis.

**Appropriateness of using benchmark analysis for additionality demonstration and its conformity to guidance 16 of Annex 8, EB 97[13] -**

Considering the fact that the alternative to the project is the supply of electricity from the grid & the choice of the developer is to invest or not to invest, benchmark analysis has been considered appropriate to circumstances where the baseline does not require investment or is outside the direct control of the project developer, i.e. cases where the choice of the developer is to invest or not to invest. Benchmark analysis has been considered appropriate for demonstration of additionality, which is in conformity with guidance 16 of Annex 8 EB 97.

**Benchmark Calculation**

[13] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v8.pdf

As per the guidelines of Methodological Tool- Investment Analysis para 15, "The applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity are appropriate benchmarks for an equity IRR. Benchmarks supplied by relevant national authorities are also appropriate". Since in this project activity, equity IRR has been considered as financial indicator, hence as per guidance 16, Required/expected returns on equity are considered as appropriate benchmarks and benchmark supplied by relevant national authorities has been used.

Since the choice of benchmark is based upon parameters that are standard in the market, hence as per Guidance 19 of EB 97 Annex 8, "the cost of equity should be determined either by: (a) selecting the values provided in the Appendix; or by (b) calculating the cost of equity using CAPM". Hence as per option (a), the default value for India is being considered as per the value provided in Appendix of EB 97 Annex 8[14]. The benchmark thus selected complies as per the relevant guidelines on Investment Analysis.

Further as per guidance 16 of EB 97 Annex 8, "In situations where an investment analysis is carried out in nominal terms and the available IRR benchmarks are in real terms, project participants shall convert the real term values of benchmarks to nominal values by adding the inflation rate. The inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period". Following the above guidance, the default value is being converted to nominal values by adding inflation rate for 10 years[15], as per the inflation forecast rate provided by Reserve Bank of India.

**Default Value Benchmark:**

The cost of equity is determined by selecting the values provided in the Appendix, i.e. Default values for cost of equity (expected return on equity) is presented below:

Appendix A in EB 97, Annex 8 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = **10.73%**

The Required return on equity (benchmark) was computed in the following manner:

Nominal Benchmark[16] = {(1+Real Benchmark)*(1+Inflation rate)}-1

Where:

- Default value for Real Benchmark = 10.73%

- Inflation Rate forecast for by Reserve Bank of India (RBI) (i.e. Central Bank of India) for India & in case where RBI Inflation forecast was not available Average Inflation rate forecast for India has been sourced from IMF web site.

**Benchmark estimation:**

Appendix A in EB 97, Annex 8 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = **10.73%**

[14] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v8.pdf

[15] Since RBI provides inflation forecast only for 5 years and 10 years, hence inflation forecast for 10 years is being considered keeping in view length of crediting period to be 7 years.

[16] As per Pg. 320 of Corporate Finance, Second Edition of Aswath Damodaran

Inflation Forecast for India as per RBI website[17]:

| Project Investor | Inflation Forecast WPI Median value from RBI | Benchmark |
|---|---|---|
| Hindustan Zinc Limited. | 3.98% | 15.14% |

Thus benchmark of **15.14%** has been selected for this project activity.

**Sub-step 2c: Calculation and comparison of financial indicators (only applicable to Options II and III):**

Input values used in all investment analysis shall be valid and applicable at the time of the investment decision taken by the project participant which can be clearly validated by the DOE, thus it complies with guidance 10 of EB 97, Annex 8[18]. Key assumptions used for calculating post-tax Equity IRR applicable at the time of investment decision, which is in line with are set out below:

**Input Values for 12 MW Solar project are as follows:**

| Cost of the Project Activity | |
|---|---|
| Project Owner | **Hindustan Zinc Ltd** |
| Project Location | Debari |
| State | Rajasthan |
| Project Capacity (MW) | 12 |
| Expected Date of Commissioning | 31-Mar-2017 |
| Life of Plant in years | 25 |
| | **DPR** |
| | **15/July/15** |

in INR MN

| Items | Cost | Tax | Cost + Tax |
|---|---|---|---|
| Total Cost | 698.97 | - | 698.97 |
| **Total** | 698.97 | - | 698.97 |
| O&M Expenses | **6.00** | - | **6.00** |
| | 5% Escalation, starting from 2nd Yr. | | |

**Assumptions and Values considered for Financial Analysis are as follows:**

Considering the input values, Equity IRRs is given below:

| Project Owner - Hindustan Zinc Ltd | Equity IRR without CDM | Benchmark (Equity IRR) |
|---|---|---|
| | 5.11% | 15.14% |
| **Assumption and financial of the project** | | |

[17] https://rbi.org.in/Scripts/PublicationsView.aspx?id=17390

[18] It is to be noted here that at the time of investment making decision, Methodological Tool for Investment Analysis version 07 (EB 92 Annex 5) was applicable, however Request for Registration can be submitted only till 28/06/2018. Hence PP has used Methodological Tool for Investment Analysis version 08 for which RFR can be submitted till 26/07/2019.

| Details of the project | | Source | Link |
|---|---|---|---|
| State where the project is situated | Rajasthan | As per DPR | |
| Total Capacity (MW) | 12.00 | As per DPR | |
| Expected Date of Commissioning | 31-Mar-17 | As per offer letter | |
| Life of the plant (Yrs.) | 25 | As per DPR and also as per Rajasthan tariff order | http://rerc.rajasthan.gov.in/TariffOrders/Order216.pdf |
| **Generation of electricity** | | | |
| PLF (%) | 18.05% | As per DPR | |
| Annual generation (kWh) | 18,974,160 | Calculated Value | |
| Annual Degradation per year | 0.50% | As per DPR | |
| Tariff rate at the decision making (INR/kWh) | 3.75 | As per DPR | |
| Escalation in tariff rate | 0.0% | | |
| Transmission & Wheeling Losses (%) | 0.00% | | |
| **Operation and maintenance cost and Insurance** | | | |
| O & M Expenses (INR Mn.) | 6.00 | As per DPR | |
| O & M free for (Yr.) | - | | |
| Escalation in the operational expenses (%) | 5.00% | As per DPR | |
| Insurance (INR Mn.) | 6.99 | CERC order | http://www.cercind.gov.in/2016/orders/SO17.pdf |
| **Financial parameters** | | | |
| TOTAL COST (INR Mn.) | 698.97 | As Per DPR | |
| Loan Amount (INR Mn.) | - | No loan availed | |
| Equity Investment (INR Mn.) | 698.97 | Calculated Value | |
| **Term loan** | | | |
| **Book Depreciation (SLM Method)** | | | |
| Gross Depreciable Value (INR Mn.) | 698.97 | Calculated Value | |
| Salvage Value (%) | 10.00% | As per RERC order dt. 23.01.2009, Pg 20 | http://www.rerc.rajasthan.gov.in/Regulations/Reg%2076.pdf |
| Salvage value (INR Mn.) | 69.90 | Calculated Value | |
| Net Depreciable Value (INR Mn.) | 629.07 | Calculated Value | |
| Residual Value (INR Mn.) | 69.90 | Calculated Value | |
| **IT Depreciation** | | | |
| IT Depreciation (%) | 80.00% | IT act | http://www.taxafin.com/Income_Tax/Tax_Rates/Depreciation_Rates.html |
| **Income Tax** | | | |
| **Financial Year** | **FY 2016-** | | |

| | | | |
|---|---|---|---|
| | **17** | | |
| Income tax rate (%) | 30.00% | As Per Income Tax Rule, Pg 30 Para E(I) | http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf |
| Corporate Tax/MAT (%) | 33.33% | As Per IT rule | https://www.bankbazaar.com/tax/corporate-tax.html |
| Service Tax (%) | 15.00% | As Per Income Tax Rule | http://taxguru.in/service-tax/service-tax-rate-chart-effect-01062016.html |
| Surcharge (%) | 5.00% | As per RERC order dt. 16-Jul-2014, Para 32 | http://rerc.rajasthan.gov.in/TariffOrders/Order185.pdf |
| Education cess (%) | 3.00% | As Per Income Tax Rule, Pg 5, 11 and 12 | http://taxguru.in/income-tax/income-tax-rate-chart-slabs-for-ay-2017-18-fy-2016-17.html |
| **Final Tax rates** | | | |
| Income tax rate (%) | 32.45% | Calculated Value | |
| MAT (%) | 35.69% | Calculated Value | |
| Service Tax (%) | 15.45% | Calculated Value | |

Considering the above input parameters, sensitivity analysis for the above project is as follows:

| | Equity IRR without CDM | | Benchmark (Equity IRR) | |
|---|---|---|---|---|
| **Final Results** | 5.11% | | 15.14% | |
| **Sensitivity Analysis** | **Equity IRR** | | | |
| **Variation %** | **-10%** | **Normal** | **10%** | **Breaching Value** |
| **PLF** | **3.74%** | **5.11%** | **6.38%** | **98.03%** |
| **O&M** | **5.32%** | **5.11%** | **4.93%** | **-798.97%** |
| **Project Cost** | **6.32%** | **5.11%** | **4.08%** | **-52.78%** |
| **Tariff Rate** | **3.74%** | **5.11%** | **6.38%** | **98.03%** |

**Input Values for 4 MW Solar project are as follows:**

| **Cost of the Project Activity** | |
|---|---|
| Project Owner | **Hindustan Zinc Ltd** |
| Project Location | Dariba |
| State | Rajasthan |
| Project Capacity (MW) | 4 |
| Expected Date of Commissioning | 31-Mar-2017 |
| Life of Plant in years | 25 |
| | **DPR** |
| | **15/July/15** |

in INR MN

| Items | Cost | Tax | Cost + Tax |
|---|---|---|---|
| Total Cost | 233.50 | - | 233.50 |
| **Total** | 233.50 | - | 233.50 |
| O&M Expenses | **2.00** | - | **2.00** |
| | 5% Escalation, starting from 2nd Yr. | | |

**Assumptions and Values considered for Financial Analysis are as follows:**

| Project Owner - Hindustan Zinc Ltd | | Equity IRR without CDM | Benchmark (Equity IRR) |
|---|---|---|---|
| | | 5.08% | 15.14% |
| **Assumption and financial of the project** | | | |
| **Details of the project** | | **Source** | **Link** |
| State where the project is situated | Rajasthan | As per DPR | |
| Total Capacity (MW) | 4.00 | As per DPR | |
| Expected Date of Commissioning | 31-Mar-17 | As per offer letter | |
| Life of the plant (Yrs.) | 25 | As per DPR and also as per Rajasthan tariff order | http://rerc.rajasthan.gov.in/TariffOrders/Order216.pdf |
| **Generation of electricity** | | | |
| PLF (%) | 18.05% | As per DPR, pg no 91 | - |
| Annual generation (kWh) | 6,324,720 | Calculated Value | |
| Annual Degradation per year | 0.50% | As per DPR | - |
| Tariff rate at the decision making (INR/kWh) | 3.75 | As per DPR | - |
| Escalation in tariff rate | 0.0% | | - |
| Transmission & Wheeling Losses (%) | 0.00% | | - |
| **Operation and maintenance cost and Insurance** | | | |
| O & M Expenses (INR Mn.) | 2.00 | As per DPR | - |
| O & M free for (Yr.) | - | | |
| Escalation in the operational expenses (%) | 5.00% | As per DPR | - |
| Insurance (INR Mn.) | 2.34 | CERC order | http://www.cercind.gov.in/2016/orders/SO17.pdf |
| **Financial parameters** | | | |
| TOTAL COST (INR Mn.) | 233.50 | As Per DPR | |
| Loan Amount (INR Mn.) | - | No loan availed | |
| Equity Investment (INR Mn.) | 233.50 | Calculated Value | |
| **Term loan** | | | |
| **Book Depreciation (SLM Method)** | | | |
| Gross Depreciable Value (INR Mn.) | 233.50 | Calculated Value | |
| Salvage Value (%) | 10.00% | | - |
| Salvage value (INR Mn.) | 23.35 | Calculated Value | |
| Net Depreciable Value (INR Mn.) | 210.15 | Calculated Value | |
| Residual Value (INR Mn.) | 23.35 | Calculated Value | - |
| **IT Depreciation** | | | |

| | | | |
|---|---|---|---|
| IT Depreciation(%) | 80.00% | IT act | http://www.taxafin.com/Income_Tax/Tax_Rates/Depreciation_Rates.html |
| **Income Tax** | | | |
| **Financial Year** | **FY 2016-17** | | |
| Income tax rate (%) | 30.00% | As Per Income Tax Rule, Pg 30 Para E(I) | http://taxguru.in/income-tax/income-tax-rate-chart-slabs-for-ay-2017-18-fy-2016-17.html |
| MAT (%) | 33.00% | As Per IT rule Pg 4 | http://taxguru.in/income-tax/income-tax-slab-financial-year-201516.html |
| Service Tax (%) | 15.00% | As Per Income Tax Rule | http://taxguru.in/service-tax/service-tax-rate-chart-effect-01062016.html |
| Surcharge (%) | 5.00% | As per RERC order dt. 16-Jul-2014, Para 32 | http://rerc.rajasthan.gov.in/TariffOrders/Order185.pdf |
| Education cess (%) | 3.00% | As Per Income Tax Rule, Pg 5, 11 and 12 | http://taxguru.in/income-tax/income-tax-rate-chart-slabs-for-ay-2017-18-fy-2016-17.html |
| **Final Tax rates** | | | |
| Income tax rate (%) | 32.45% | Calculated Value | |
| MAT (%) | 35.69% | Calculated Value | |
| Service Tax (%) | 15.45% | Calculated Value | |

Considering the above input parameters, sensitivity analysis for the above project is as follows:

| | Equity IRR without CDM | | Benchmark (Equity IRR) | |
|---|---|---|---|---|
| **Final Results** | 5.08% | | 15.14% | |
| **Sensitivity Analysis** | **Equity IRR** | | | |
| **Variation %** | **-10%** | **Normal** | **10%** | **Breaching Value** |
| PLF | 3.72% | 5.08% | 6.35% | 98.55% |
| O&M | 5.28% | 5.08% | 4.90% | -803.92% |
| Project Cost | 6.29% | 5.08% | 4.04% | -52.92% |
| Tariff Rate | 3.72% | 5.08% | 6.35% | 98.55% |

| S. No | Project Investor | Equity IRR without CDM | Benchmark (Equity IRR) |
|---|---|---|---|
| 1 | Hindustan Zinc Limited (12 MW AC) | 5.11% | 15.14% |

| S. No | Project Investor | Equity IRR without CDM | Benchmark (Equity IRR) |
|---|---|---|---|
| 1 | Hindustan Zinc Limited (4 MW AC) | 5.08% | 15.14% |

The CDM project activity cannot be considered as financially attractive as the equity IRR for the project activity is less than the Benchmark.

**Sub-step 2d: Sensitivity Analysis**

Addressing Guidance 27 & 28 of EB 97, Annex 8, only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation and the results of this variation should be presented in the PDD

and be reproducible in the associated spreadsheets. Guidance also states, “All parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude”. The Annex also states, as a general point of departure, variations in the sensitivity analysis should at least cover a range of +10% and –10%, unless this is not deemed appropriate in the context of the specific project circumstances.
Since the project cost is already firmed up, the cost is not variable. The tariff is determined by PPA which is fixed for years mentioned as per the tariff order and hence it need not be subjected to variation. All other expenses are much less than 20% of the total cost. Hence, only PLF needs to be subjected to reasonable variation. Nevertheless, following factors have been subjected to sensitivity analysis:

1. PLF
2. O&M Cost
3. Project Cost
4. Tariff

The rationale of sensitivity is, "The ultimate objective of the sensitivity analysis is to determine the likelihood of the occurrence of a scenario other than the scenario presented, in order to provide a cross-check on the suitability of the assumptions used in the development of the investment analysis."
The results of sensitivity analysis has been shown above.

Outcome of Step 2: From the above analysis, it can be seen that the equity IRR of the project activity remains well below the benchmark even under the sensitivity analysis. Therefore, it can be concluded that the proposed CDM project activity is unlikely to be the most financially/economically attractive and hence, additional.

| | **Probability to breach the benchmark** |
|---|---|
| PLF | PLF considered in financials for is as per Third Party DPR in line with **“Guidelines for the reporting and validation of Plant load factors” stated in EB48 Annex11 option 3(b)**.<br><br>The estimated PLF has been compared from real PLF achieved by the plant after commissioning, and was found that even after 10% increase in estimated PLF, the equity IRR of the project is well below the benchmark value and breaches at 98% which is highly unlikely scenario. |
| O&M | With the country experiencing 5% inflation on an average, the question of O&M coming down is ruled out. Moreover, the purchase order provides for a 5% escalation in the cost every year. Even the tariff order of all states provide for a 5% or more escalation in the O&M cost. |
| Project Cost | The estimated project cost has been compared with real project cost since the project cost is finalized as per the Purchase Order and company balance sheet. It was observed that even with actual project cost, equity IRR of the project is 6.68% and 5.82% respectively which is well below the benchmark value. The project cost breaches at -52% which is highly unlikely scenario. |
| Tariff Rate | The actual Tariff Rate has been determined based upon the Electricity bills and Annual Reports. Even with actual tariff rate, the equity IRR comes out to be 13.64% which is well below the benchmark value. The Tariff Rate breaches at 98.03% which is highly unlikely scenario. |

**Step 3: Barrier analysis**

Barrier analysis has not been used.

**Step 4: Common practice analysis**

For the concerned project activity, Common Practice Analysis has been carried out separately for the entire 19.2 MW DC capacity, as the project owner is the same company.

**1. Common Practice Analysis for Hindustan Zinc Ltd**

Stepwise approach for common practice analysis has been carried out as per Methodological tool "Common Practice", version 03.1 EB84, Annex 7:

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

| Range | Capacity | Unit |
|---|---|---|
| +50% | 28.8 | MW |
| Capacity of the proposed project activity | 19.2 | MW |
| -50% | 9.6 | MW |

**Step (2):** Identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:

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

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

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

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

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

(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

Identification of the similar projects (CDM and non-CDM) is carried out as per sub-steps of Step (2) as follows:

a) As the projects are located in Rajasthan state of India, therefore, projects in the geographical area of Rajasthan have been chosen for analysis. Each state have different policies regarding renewable energy, hence Rajasthan state is considered as geographical region for common practise analysis.

b) The project activity is a green-field solar power project and uses measure (b) "Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies". Therefore, projects applying same measure (b) are candidates for similar projects.

c) The energy source used by the project activity is solar. Hence, only solar energy projects have been considered for analysis.

d) The project activity produces electricity; therefore, all power plants that produce electricity are candidates for similar projects.

e) The capacity range of the projects is within the applicable capacity range from 9.6 MW to 28.8 MW.

f) The start date of the project activity is 03-Dec-2016. Therefore projects, which have started commercial operation before 03-Dec-2016, have been considered for analysis.

Numbers of Similar projects identified, which fulfil above-mentioned conditions are
**$N_{solar}$= 18**

The below sources are considered to determine the similar projects.
State wise commissioning status of grid connected Solar Power Projects (As on 31.03.2017)- MNRE, India and Publically available data for solar projects in Rajasthan till March 2017[19].
http://mnre.gov.in/file-manager/UserFiles/state-wise-commissioned-grid-connected-solar-power-projects.htm
List of Solar Projects in Rajasthan (RRECL- Website) as on 31.10.2015. The projects of having capacity of 9.6 MW to 28.6 MW was being considered from publically available data till Oct 2016
http://energy.rajasthan.gov.in/content/dam/raj/energy/rrecl/pdf/Activities/Solar/4.37%20Details%20of%20commissioned%20Solar%20Projects.pdf

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

CDM project activities, which have got registered or are under validation have been excluded in this step. The list of the power plants identified is provided to the DOE. After excluding the registered and under validation projects the total number of projects found to be 3.

**$N_{all}$ = 3**

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

As per the tool on Common Practice, the project activities have been separated from the different technologies on the basis two criteria:
1. Size of Installation – Since project activity is large scale project, small and micro scale projects are considered as different technology project. Based on this criteria, there are no any different technology project out of similar identified projects.
2. Investment climate on the date of the investment decision – The solar projects developed under different phases and different batches of National Solar Mission (NSM) can considered as different technology projects, since National Solar Mission have different target and the investment scenario is different. For proposed project activity, there are no any different technology project considered out of similar identified projects.

Hence, projects where either of the conditions is satisfied those projects are counted for calculating $N_{diff}$ projects.

**$N_{diff}$ = 0**

[19] The source does not provide the COD dates, however the list of eligible projects are being identified from the same source as it provides list of solar projects commissioned till 31/03/2017 and hence the latest available source of information. The list of identified projects are being crosschecked from the second source and all the projects falling in the identified range have been included for further consideration.

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

Calculate $F=1-N_{diff}/N_{all}$
$F = 1-(0/3) = 1$

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

Since for this project, F = 1 and $N_{all} – N_{diff}$ is equal to 3 hence the project activity is treated as not a common practise.

**Outcome of Common Practise analysis:**

As,
i. F = 1; is greater than 0.2
ii. $N_{all}-N_{diff} = 3$; is not greater than 3

The project activity does not satisfy second condition. Hence, project activity is not a common practice.

**Thus, the proposed project activity is not a "common practice" within a sector in the applicable geographical area.**

The above discussions show that solar power development is not a common practice and the project activity is not financially attractive; hence the project activity is additional.

**Prior Consideration of CDM**

CDM Project Standard Version 09.0, Section 6.5 states that "*For a proposed CDM project activity with a start date on or after 2 August 2008, project participants shall inform the host Party's designated national authority (DNA) and the secretariat of their intention to seek CDM status in accordance with the Project cycle procedure*".

In line with the above guidance, Hindustan Zinc Limited intimated the UNFCCC and host party DNA i.e. National CDM Authority (NCDMA) of its intention to seek CDM for the proposed project activity in a defined F-CDM form on 17/04/2017, which is within six months of the project activity start date i.e. 03/12/2016 (as mentioned in section C.1.1). The board decision taken towards CDM project registration was taken on 30/06/2016. Hence from the above it can be clearly established that CDM benefits was seriously considered in the decision to proceed with the proposed project activity.

## B.6. Estimation of emission reductions

### B.6.1. Explanation of methodological choices

**Baseline Emissions:**

As per the approved consolidated Methodology ACM0002 (Version 19.0, EB 100, Annex 6) para 42:
Baseline emissions include only $CO_2$ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected

power plants and the addition of new grid- connected power plants. The baseline emissions are to be calculated as follows:

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

Where:

$BE_y$ = Baseline emissions in year y (t $CO_2$/yr)

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

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

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

$CO_2$ Baseline Database for the Indian Power Sector, Version 12, May 2017, published by Central Electricity Authority (CEA), Government of India has been used for the calculation of emission reduction.

As per Methodological tool: Tool to calculate the emission factor for an electricity system (Version 07.0, EB 100, Annex 4), following six steps have been followed:

(a) **Step 1:** Identify the relevant electricity systems;

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

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

(d) **Step 4:** Calculate the operating margin emission factor according to the selected method;

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

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

**Step 1: Identify the relevant electricity systems**

As described in tool "For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity systems". It also states that "If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used". Keeping this into consideration, the Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern.

However since Since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this $CO_2$ Baseline Database. As of 31 December 2013, the Southern grid has also been synchronised with the NEWNE grid, hence forming one unified Indian Grid. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the Indian grid as per CM calculations will serve as the baseline for this project.

**Table: Geographical Scope of Indian Electricity Grid**

| Northern | Eastern | Western | North-Eastern | Southern |
|---|---|---|---|---|
| Chandigarh | Bihar | Chhattisgarh | Arunachal Pradesh | Andhra Pradesh |
| Delhi | Jharkhand | Gujarat | Assam | Karnataka |
| Haryana | Orissa | Daman & Diu | Manipur | Kerala |
| Himachal Pradesh | West Bengal | Dadar& Nagar Haveli | Meghalaya | Tamilnadu |
| Jammu & Kashmir | Sikkim | Madhya Pradesh | Mizoram | Puducherry |
| Punjab | Andaman & Nicobar | Maharashtra | Nagaland | Lakshadweep |
| **Rajasthan** | | Goa | Tripura | |
| Uttar Pradesh | | | | |
| Uttarakhand | | | | |

**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 Participant has chosen only grid power plants in the calculation.

**Step 3: Select a method to determine the operating margin (OM)**
The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods, which are described under Step 4:

(a) Simple OM; or

(b) Simple adjusted OM; or

(c) Dispatch data analysis OM; or

(d) Average OM.

The data required to calculate Simple adjusted OM and Dispatch data analysis OM is not possible due to lack of availability of data to project developers. The choice of other two options for calculating operating margin emission factor depends on generation of electricity from low-cost/ must-run sources. In the context of the methodology low cost/must run resources typically include hydro, geothermal, wind, low cost biomass, nuclear and solar generation.

**Share of Must-Run (Hydro/Nuclear) (% of Net Generation)**

| | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 |
|---|---|---|---|---|---|
| India | 19.6% | 16.9% | 18.6% | 16.8% | 15.1% |

*Data Source: Central Electricity Authority (CEA) database Version 12, May 2017*

The above data clearly shows that the percentage of total grid generation by low-cost/ must-run plants (on the basis of average of five most recent years) for the Indian grid is less than 50 % of

the total generation. Thus the Average OM method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation.

The simple OM emission factor is calculated as the generation-weighted average $CO_2$ emissions per unit net electricity generation (t $CO_2$/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

(a) **Ex-ante option:** if the ex-ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required.

**OR**

(b) **Ex-post option:** if the ex-post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

PP has chosen ex-ante option for calculation of Simple OM emission factor using 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.
OM determined at validation stage will be the same throughout the crediting period. There will be no requirement to monitor & recalculate the emission factor during the crediting period.

**Step 4: Calculate the operating margin emission factor ($EF_{grid,OMSimple,y}$) according to the selected method**
The operating margin emission factor has been calculated using a 3 year data vintage:

| | Net Generation in Operating Margin (GWh) (excl. Imports) | | |
|---|---|---|---|
| | 2013-14 | 2014-15 | 2015-16 |
| INDIAN Grid | 725,037 | 810,011 | 871,740 |

| | Simple Operating Margin ($tCO_2$/MWh) (incl. Imports) | | |
|---|---|---|---|
| | 2013-14 | 2014-15 | 2015-16 |
| INDIAN Grid | 1.0002 | 0.9903 | 0.9655 |

| Weighted Generation Operating Margin | |
|---|---|
| INDIAN Grid | **0.9843** |

**Step 5: Calculate the build margin (BM) emission factor ($EF_{grid,BM,y}$)**

As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, Annex 4) para 72:
In terms of vintage of data, project participants can choose between one of the following two options:
(a) **Option 1 -** for the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

(b) **Option 2 -** For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin 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.

Option 1 as described above is chosen by PP to calculate the build margin emission factor for the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PDD and is fixed for the entire crediting period.

| **Build Margin ($tCO_2$/MWh) (not adjusted for imports)** | |
|---|---|
| | 2015-16 |
| INDIAN Grid | **0.9083** |

**Step 6: Calculate the combined margin (CM) emission factor ($EF_{grid,CM,y}$)**

As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, Annex 4) para 81:

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.

PP has chosen option (a) i.e weighted average CM to calculate the combined margin emission factor for the project activity.
The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$$

Where:

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

$EF_{grid,OM,y}$ = Operating margin $CO_2$ emission factor in year y (t $CO_2$/MWh)

$W_{OM}$ = Weighting of operating margin emissions factor (per cent)

$W_{BM}$ = Weighting of build margin emissions factor (per cent)

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

Therefore, $EF_{grid,CM,y}$ = 0.9843*0.75 + 0.9083*0.25
= 0.9653 t $CO_2$/MWh

**Baseline emission factor ($EF_y$):**

The baseline emission factor is calculated using the combined margin approach as described in Step 6 above:

Therefore, $EF_y = EF_{grid,CM,y}$= 0.9653 t $CO_2$/MWh.

**Baseline Emissions:**

As per the approved consolidated Methodology ACM0002 (Version 19.0, EB 100, Annex 6) para 42:

Baseline emissions include only $CO_2$ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid- connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} = 24,919 * 0.9653 = 24,054 \text{ t } CO_2$$

**Leakage Emissions:**

No other leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport etc.) are neglected.

**Project Emissions:**

These emissions shall be accounted for as project emissions by using the following equation:

$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$ Equation(1)

Where:

$PE_y$ = Project emissions in year y (t $CO_2$e/yr)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (t $CO_2$/yr)

$PE_{GP,y}$ = Project emissions from the operation of dry, flash steam or binary geothermal power plants in year y (t $CO_2$e/yr)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (t $CO_{2e}$/yr)"

As the project activity is the installation of a new Solar PV project and does not involve any project emissions from fossil fuel, operation of dry, flash steam or binary geothermal power plants, and from water reservoirs of hydro power plants. Therefore $PE_{FF,y}$, $PE_{GP,y}$ , $PE_{HP,y}$ are equal to zero and thus, $PE_y = 0$.

**Emission reductions:**

Emission reductions are calculated as follows:

$ER_y = BE_y - PE_y$

Where:

$ER_y$ = Emission reductions in year y (t $CO_2$e/yr)

$BE_y$ = Baseline emissions in year y (t $CO_2$/yr)

$PE_y$ = Project emissions in year y (t $CO_2$e/yr)

### B.6.2. Data and parameters fixed ex ante

| Data / Parameter | $EF_{grid,OM,y}$ |
|---|---|
| Unit | $tCO_2$/MWh |
| Description | Operating Margin $CO_2$ emission factor in year y |
| Source of data | Calculated from CEA database, Version 12, May 2017[20] |
| Value(s) applied | 0.9843 |
| Choice of data or | Calculated as per "Tool to calculate the emission factor for an electricity |

[20] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf

| | |
|---|---|
| Measurement methods and procedures | system, version 07" as 3-year generation weighted average using data for the years 2013-14, 2014-15, & 2015-16. The data are obtained from "$CO_2$ Baseline Database for Indian Power Sector" version 12, published by the Central Electricity Authority, Ministry of Power, Government of India. |
| Purpose of data | For the calculation of the Baseline Emission |
| Additional comment | This parameter is fixed ex-ante for the entire crediting period. |

| | |
|---|---|
| Data / Parameter | $EF_{grid,BM,y}$ |
| Unit | $tCO_2/MWh$ |
| Description | Build Margin $CO_2$ emission factor in year y |
| Source of data | Calculated from CEA database, Version 12, May 2017[21] |
| Value(s) applied | 0.9083 |
| Choice of data or Measurement methods and procedures | Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0.0" BM is calculated ex-ante based on the most recent information available at the time of submission of PD and is fixed for the entire crediting period. The data is obtained from "$CO_2$ Baseline Database for Indian Power Sector" version 12.0, published by the Central Electricity Authority, Ministry of Power, Government of India. |
| Purpose of data | For the calculation of the Baseline Emission |
| Additional comment | This parameter is fixed ex-ante for the entire crediting period. |

| | |
|---|---|
| Data / Parameter | $EF_{grid,CM,y}$ |
| Unit | $tCO_2/MWh$ |
| Description | Combined Margin $CO_2$ emission factor in year y |
| Source of data | Calculated from CEA database, Version 12, May 2017[22] |
| Value(s) applied | 0.9653 |
| Choice of data or Measurement methods and procedures | The combined margin emissions factor is calculated as follows:<br>$EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$<br>Where:<br>$EF_{grid,BM,y}$= Build margin $CO_2$ emission factor in year *y* ($tCO_2/MWh$)<br>$EF_{grid,OM,y}$= Operating margin $CO_2$ emission factor in year *y* ($tCO_2/MWh$)<br>$W_{OM}$ = Weighting of operating margin emissions factor (%) = 75%<br>$W_{BM}$= Weighting of build margin emissions factor (%) = 25% |
| Purpose of data | For the calculation of the Baseline Emission |
| Additional comment | This parameter is fixed ex-ante for the entire crediting period. |

### B.6.3. Ex ante calculation of emission reductions

Formula used to calculate the net emission reduction for the project activity is

$ER_Y = BE_Y – PE_Y$

Where,
$ER_Y$ = Emission Reduction in $tCO_2$/year
$BE_Y$ = Baseline emission in $tCO_2$/year
$PE_Y$ = Project emissions in $tCO_2$/year

[21] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf

[22] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf

**Baseline Emission ($BE_Y$)**

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

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

Where,
$EG_{PJ,y}$ = Total quantity of net electricity delivered to the recipient facility
$EF_{grid,CM,y}$ = Baseline emission factor
= 0.9653 $tCO_2$/MWh

$BE_y$ = 24,919 * 0.9653
= 24,054 $tCO_2$/year

Since $PE_Y = LE_Y = 0$

Hence $ER_Y = BE_Y$

Therefore, $ER_Y$ = 24,054 $tCO_2$/year

| Project Investor's Name | Capacity (in AC) | PLF (%) | Generated Power (MWh) p.a | Baseline Emission Factor ($tCO_2$/MWh) | Baseline Emissions ($tCO_2$/year) |
|---|---|---|---|---|---|
| Hindustan Zinc Limited. | 16 | 18.05% | 24,919 | 0.9653 | 24,054 |

### 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 $CO_2e$) |
|---|---|---|---|---|
| Year 1 | 24,421 | 0 | 0 | 24,421 |
| Year 2 | 24,298 | 0 | 0 | 24,298 |
| Year 3 | 24,176 | 0 | 0 | 24,176 |
| Year 4 | 24,054 | 0 | 0 | 24,054 |
| Year 5 | 23,932 | 0 | 0 | 23,932 |
| Year 6 | 23,810 | 0 | 0 | 23,810 |
| Year 7 | 23,688 | 0 | 0 | 23,688 |
| **Total** | **168,379** | 0 | 0 | **168,379** |
| **Total number of crediting years** | 7 | | | |
| **Annual average over the crediting period** | 24,054 | 0 | 0 | 24,054 |

### B.7. Monitoring plan

### B.7.1. Data and parameters to be monitored

| Data / Parameter | **$EG_{PJ,y}$** |
|---|---|
| Unit | MWh/y |
| Description | Quantity of net electricity generation supplied by the project plant/unit for captive purpose in year y in MWh |

| | |
|---|---|
| Source of data | Monthly joint meter reading reports signed by HZL as well as O&M partner. |
| Value(s) applied | 24,919 |
| Measurement methods and procedures | The electricity exported / supplied by the project activity is measured through meters (ABT Meters) having accuracy class of 0.2s. It is difference of export and import of project activity. |
| Monitoring frequency | Continuous measurement & monthly recording |
| QA/QC procedures | The frequency of calibration is once in 5 years.[23] The monthly electricity supplied by the project activity in the JMR report is cross checked with daily generation reports. In the absence or delay in the meter calibration appropriate Guidelines will be applied appropriately to confirm the conservativeness of metering. |
| Purpose of data | Calculation of baseline emissions |
| Additional comment | Data will be archived in paper & electronic form for two years after the end of crediting period or of the last issuance of CERs for this project activity, whichever occurs later. |

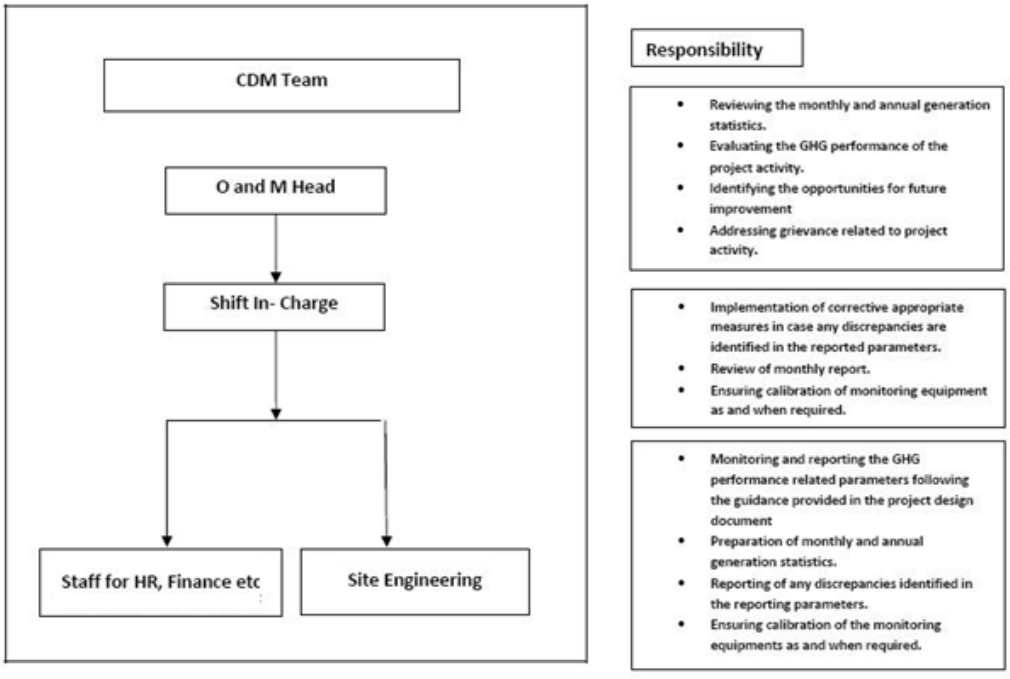
### B.7.2. Sampling plan

No sampling is required

### B.7.3. Other elements of monitoring plan

The monitoring plan is developed in accordance with the modalities and procedures for CDM project activities and is proposed for grid-connected solar power project being implemented in Rajasthan, India. The monitoring plan, which will be implemented by the project participant describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

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




[23] http://www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf

**Data Measurement**

The export and import energy will be measured continuously using meters. Readings of meters shall be taken on monthly basis by authorized officer of EPC contractor in the presence of PP or representative of PP. Based on the Meter Reading Statement to HZL, the electricity being utilized for captive consumption will be evaluated. The metered data can be cross checked with other suitable data source (like daily generation report).

**Data collection and archiving**

Readings from meters will be collected in the presence of the plant in-charge. Export and Import data would be recorded and stored in logs as well as in electronic form on a daily basis. The records are checked periodically by the Plant Manager and discussed thoroughly with the plant supervisor. The period of storage of the monitored data will be 2 years after the end of crediting period or till the last issuance of CERs for the project activity whichever occurs later.

**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.

**Personnel training**

In order to ensure a proper functioning of the project activity and a properly monitoring of emission reductions, the staff (CDM team) will be trained. The plant helpers will be trained in equipment operation, data recording, reports writing, operation and maintenance and emergency procedures in compliance with the monitoring plan.

In case of mismatch between billing (JMR) period cycle and monitoring period cycle, the daily generation electricity data will be used to calculate the electricity for specific period.

## SECTION C. Start date, crediting period type and duration

### C.1. Start date of project activity

Start date of the project activity is the date of EPC Contract with L&T as on 03/12/2016.

### C.2. Expected operational lifetime of project activity

25 Years 00 Months

### C.3. Crediting period of project activity

#### C.3.1. Type of crediting period

Renewable crediting period of 7 years 00 Months have been opted for the project activity. This is the first crediting period of the project activity.

#### C.3.2. Start date of crediting period

30/06/2019 or Date of submission of complete request for registration by the DOE whichever is later.

#### C.3.3. Duration of crediting period

07 Years 00 Months

## SECTION D. Environmental impacts

### D.1. Analysis of environmental impacts

Not Applicable

### D.2. Environmental impact assessment

The project activity has no significant impact on the environment. Solar PV projects are not included in the Schedule I of the EIA notification S.O.1533 (E) dated 14th September 2006[24] 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[25] has re-affirmed this and exempted Solar PV power plants from EIA and EC requirement.

## SECTION E. Local stakeholder consultation

### E.1. Modalities for local stakeholder consultation

The Local Stakeholder Meetings were organized for local stakeholder consultation and informed local stakeholder regarding the meeting. The followings are the local stakeholders for the project activity:

- Local community
- Local village administration
- Technology suppliers
- Local vendors

All the stakeholders have been invited through Public Notice to attend the stakeholders meeting.

The Local Stakeholder Meetings were organized for the local stakeholder consultation and the local stakeholders were informed regarding the meeting by means of Public Notice. The details are mentioned below.

| Sr No. | Project Detail | Place / Location of Project activity | Meeting Date | Date of Invitation |
|---|---|---|---|---|
| 1. | Dariba site | Site Office- Dariba village, Rajsamand district | 18/11/2016 | 10/11/2016 |
| 2. | Debari site | Site Office- Debari village, Udaipur district | 18/11/2016 | 10/11/2016 |

The names of the Stakeholder Meeting Participants for 12 MW project site at Debari are as follows:

1. Amit Kumar- Villager
2. Ajay Singh- Farmer, debari
3. Ram Lal- Shopkeeper
4. Jagmohan Singh- Driver
5. **Nathu Lal**- Villager
6. Omkar Lal- Farmer
7. Nikunj- Farmer
8. Madhav Rao- Shopkeeper

The names of the Stakeholder Meeting Participants for Dariba site are as follows:

[24] http://envfor.nic.in/legis/eia/so1533.pdf
[25] http://moef.nic.in/downloads/public-information/OM-SolarPV.pdf

1. Pankaj- Shopkeeper
2. Mahavir Singh- Fruit seller
3. Kamal Rawat- Sales Man
4. Mayank Kumar- Driver
5. Chetan Singh- Villager
6. Brijmohan- Farmer
7. Dev Singh- Vegetable Seller
8. Champak- Villager
9. Lakhan Singh- Farmer

In the introductory speech, the representatives of the project participants welcomed the gathering and gave a brief about the CDM project activity. Subsequent to the introductory speech, stakeholders were explained about the electricity generation from solar PV project is an environmental friendly power generation technology contributing to reduction in GHG emissions. They were also explained about the benefits of the solar PV power projects like, increasing energy availability and improving quality of power and its assistance to the local population by providing employment opportunities to both skilled & unskilled labours.

The stakeholders were also explained about the main purpose of the project activity i.e. to generate electrical energy through green energy generation resource & to utilize the generated output for selling it to the state electricity utility. Furthermore, it was elaborated that the said project also conceives the following:-

- Indian economy is highly dominated by generation of electricity using fossil fuel, & coal is majorly used in thermal power plants to generate energy & for production processes, yet the basic necessity of large section is not being met. Use of renewable form of energy generation will change consumption pattern & will mitigating the immense stress on the environment.

- Spread of the commercialization of the solar projects in the region.

- Contribute to sustainable development of the region, socially, environmentally & economically.

The Minutes of meeting with commenting sheet from LSH, invitation letter receipt copy shall be submitted to the DOE.

### E.2. Summary of comments received

Meeting started with opening speech by representative of project participant. He introduced all guests on dais. The representative of project participant explained Technical aspects of project to stakeholders. He also explained about social, environmental & economic benefits of the project. He also elaborated about CDM & its requirement for the current project.

After the detailed discussion, some of the stakeholders raised questions on the proposed wind energy based power project to clear their doubts.

### E.3. Consideration of comments received

The questions asked by the stakeholders in the meeting organized at Debari Site on 18/11/2016 have been summarized below:

| | |
|---|---|
| Name of the Stakeholder | Amit Kumar |
| Occupation | Villager |
| 1. Will it use Coal?<br>Answer: The project will not use coal. | |

2. Will it cause noise pollution?
Answer: There will be no pollution from the project activity.

3. Will it provide free electricity to the village?
Answer: The investor cannot sell power directly. The power will be utilized for captive consumption

| Name of the Stakeholder | Ajay Singh |
|---|---|
| Occupation | Farmer |

1. Will the project provide employment opportunity?
Answer: Employment will be generated and the locals will be given preference.

2. Will it help in development of road?
Answer: Roads will be developed near the project site.
3. Will it supply power to our village?
Answer: Due to the project the share of power will increase and it will reduce the power cut problem.

| Name of the Stakeholder | Ram Lal |
|---|---|
| Occupation | Shopkeeper |

1. When project work will be completed?
Answer: The project work will be completed next year march.

2. How power will be generated from project?
Answer: The wind turbine rotates and produces electricity.

3. Will the project provide employment opportunities?
Answer: Employment opportunity will be provided to local people.

| Name of the Stakeholder | Jagmohan Singh |
|---|---|
| Occupation | Driver |

1. For how many years electricity will be generated from the project?
Answer: Electricity will be generated upto the lifetime of the project which is 20-25 years.

2. Will it provide employment opportunities?
Answer: Employment opportunity will be given to the locals.

3. Will it impact our crop fields?
Answer: It will not harm the crop fields.

| Name of the Stakeholder | Nathu Lal |
|---|---|
| Occupation | Villager |

1. Till when will the project work?
Answer: The project will work till its lifetime.

2. What are the opportunities for employment?
Answer: For project operation manpower will be required and the locals will be given preference.

The questions asked by the stakeholders in the meeting organized at Dariba Site on 18/11/2016 have been summarized below:

| Name of the Stakeholder | Pankaj |
|---|---|
| Occupation | Shopkeeper |

1. Will it generate smoke?
Answer: The project will not generate any kind of smoke.

2. Will it cause noise pollution?

| |
|---|
| Answer: There will be no pollution from the project activity.<br><br>3. Will it provide free education?<br>Answer: The project owner will provide education facility to the children |

| | |
|---|---|
| Name of the Stakeholder | Mahavir Singh |
| Occupation | Fruit Seller |
| 1. Will the owner provide loan?<br>Answer: No loan will be provided by the project owner.<br><br>2. Will it help in street lighting?<br>Answer: Street lights will be installed by the project owner.<br>3. Will it supply power to our village?<br>Answer: No power will be supplied to villagers directly | |

| | |
|---|---|
| Name of the Stakeholder | Kamal Rawat |
| Occupation | Salesman |
| 1. Will the villagers get employment?<br>Answer: Yes the villagers will get employment opportunity in the project activity.<br><br>2. How power will be generated from project?<br>Answer: The power will be generated using solar PV modules<br><br>3. Will the project provide employment opportunities?<br>Answer: Employment opportunity will be provided to local people. | |

| | |
|---|---|
| Name of the Stakeholder | Mayank Kumar |
| Occupation | Driver |
| 1. For how many years electricity will be generated from the project?<br>Answer: Electricity will be generated upto the lifetime of the project which is 20-25 years.<br><br>2. Will it provide employment opportunities?<br>Answer: Employment opportunity will be given to the locals.<br><br>3. Will it impact our crop fields?<br>Answer: It will not harm the crop fields. | |

| | |
|---|---|
| Name of the Stakeholder | Chetan Singh |
| Occupation | Villager |
| 1. How the project generates power?<br>Answer: The project will generate power using solafr PV modules.<br><br>2. What are advantage of solar power?<br>Answer: Solar energy is clean form of energy and doesnot creates any pollution. | |

All the queries have been suitably and satisfactorily replied / clarified by project participant's representatives. There were no major comments or protest raised by the stakeholders and they were totally in support for setting up of these kinds of projects in the region.

The meeting was concluded by vote of thanks to all the participants.

## SECTION F. Approval and authorization

The project has been awarded Host Country Approval letter from MOEFCC dated 15th April 2019 vide ref. no 13008/81/2017-CC.

# Appendix 1. Contact information of project participants

| | |
|---|---|
| **Organization name** | Hindustan Zinc Limited |
| **Country** | India |
| **Address** | Yashad Bhawan, Udaipur- 313004 (Rajasthan) |
| **Telephone** | +91-294-6604000 |
| **Fax** | +91-294-2427734 |
| **E-mail** | V.Jayaraman@vedanta.co.in |
| **Website** | www.hzlindia.com |
| **Contact person** | Mr. V. Jayaraman |

# Appendix 2. Affirmation regarding public funding

No public funding for this project activity was received from annex 1 parties.

# Appendix 3. Applicability of methodologies and standardized baselines

Please refer section B of the PDD for the same.

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

Please refer section B.6.3 and B.6.4 for information on emission reduction calculation.

# Appendix 5. Further background information on monitoring plan

Please refer section B.7 for information on monitoring plan.

# Appendix 6. Summary report of comments received from local stakeholders

Please refer section E.2 for detailed information.

# Appendix 7. Summary of post-registration changes

Not Applicable.

- - - - -

## Document information

| *Version* | *Date* | *Description* |
|---|---|---|
| 11.0 | 31 May 2019 | Revision to:<br>• Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN);<br>• Make editorial improvements. |
| 10.1 | 28 June 2017 | Revision to make editorial improvement. |
| 10.0 | 7 June 2017 | Revision to:<br>• Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms;<br>• Make editorial improvement. |
| 09.0 | 24 May 2017 | Revision to:<br>• Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0);<br>• Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM);<br>• Make editorial improvement. |
| 08.0 | 22 July 2016 | EB 90, Annex 1<br>Revision to include provisions related to automatically additional project activities. |
| 07.0 | 15 April 2016 | Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0). |
| 06.0 | 9 March 2015 | Revision to:<br>• Include provisions related to statement on erroneous inclusion of a CPA;<br>• Include provisions related to delayed submission of a monitoring plan;<br>• Provisions related to local stakeholder consultation;<br>• Provisions related to the Host Party;<br>• Make editorial improvement. |
| 05.0 | 25 June 2014 | Revision to:<br>• Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0));<br>• Include provisions related to standardized baselines;<br>• 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 Appendix 1;<br>• Change the reference number from F-CDM-PDD to CDM-PDD-FORM;<br>• Make editorial improvement. |
| 04.1 | 11 April 2012 | Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b. |

| *Version* | *Date* | *Description* |
|---|---|---|
| 04.0 | 13 March 2012 | Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8). |
| 03.0 | 26 July 2006 | EB 25, Annex 15 |
| 02.0 | 14 June 2004 | EB 14, Annex 06b |
| 01.0 | 03 August 2002 | EB 05, Paragraph 12<br>Initial adoption. |

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