Project design document form (Version 11.0)	
Title of the project activity	25.5 MW Wind Energy Farm at Nandurbar Maharashtra by HZL
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	07
Completion date of the PDD	17/12/2020
Project participants	Hindustan Zinc Limited (India) EKI Energy Services Limited (Australia)
Host Party	India
Applied methodologies and standardized baselines	**Methodology:** ACM0002- "Consolidated Baseline Methodology for grid connected electricity generation from renewable sources", Version 20[1] **Standardized Baseline:** Not Applicable
Sectoral scopes	1 : Energy industries (renewable - / non-renewable sources)
Estimated amount of annual average GHG emission reductions	42,416 tCO_2e per annum

[1] https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The project activity primarily aims at reducing Green House Gas (GHG) emissions through utilization of renewable energy technology for generation of electrical energy. The electricity generated from the project activity (approximately 45033 MWh annually) will displace equivalent electricity generation in grid connected power plants. The project activity will reduce the anthropogenic GHG emissions (approximately 42,416 tCO_2 annually associated with the equivalent amount of electricity generation from Indian grid connected power plants predominantly fossil fuel based.

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Measures Implemented within the Proposed Project Activity

The project activity involves installation and operation of Seventeen Suzlon makes 1.5 MW Wind Turbine Generators (WTGs) by Hindustan Zinc Limited (HZL) in the state of Maharashtra. The cumulative capacity of the project activity is 25.5 MW. The electricity generated from the project activity will be exported to regional Grid.
Baseline Scenario

The project activity is a Greenfield wind power project, supplying electricity to the fossil fuel dominated Indian grid system. In the absence of the project activity equivalent amount of electricity would have been generated in the Indian grid. Since the wind power project is a Greenfield project, there is no difference between the pre-project scenario and the baseline scenario.

Project's contribution to Sustainable Development

The Designated National Authority (DNA) for the Government of India (GoI) in the Ministry of Environment and Forests (MoEF), called the National CDM Authority (NCDMA), has stipulated four indicators for sustainable development in the interim approval guidelines for CDM projects **:**·
Social well being
The CDM project activity should lead to alleviation of poverty by generating additional employment, removal of social disparities and contribution to provision of basic amenities to people leading to improvement in quality of life of people.
The project activity would generate employment in the region during construction as well as operation of the project activity.
It would lead to generation of employment and development of the region.
It would augment power generation in the region that would aid the local population.
Economic well-being
The CDM project activity should bring in additional investment consistent with the needs of the people.
The project activity would lead to additional business for equipment suppliers, O&M contractors, civil work contractors etc.
It would also lead to additional investment for the development of infrastructure in the region like roads, communication facilities etc. and the same could be utilized by the local population.
Environmental well being
This should include a discussion of impact of the project activity on resource sustainability and resource degradation, if any, due to proposed activity; bio-diversity friendliness; impact on human health; reduction of levels of pollution in general.
The proposed project activity will reduce the GHG emissions associated with the combustion of fossil fuels in grid connected power plants.
The project activity utilizes wind power as the source of kinetic energy used to generate renewable power. Wind power generation does not consume any fuels or water for power generation.

Wind is a clean form of energy and electrical power generation using wind does not produce any solid waste products (such as ash from combustion), emissions of carbon dioxide, SOx, or NOx. ·

Technological well being
The CDM project activity should lead to transfer of environmentally safe and sound technologies with a priority to the renewable sector or energy efficiency projects that are comparable to best practices in order to assist in up-gradation of technological base. The proposed project activity will demonstrate the use of wind based electricity generation, which would serve as an example for other industries to replicate.

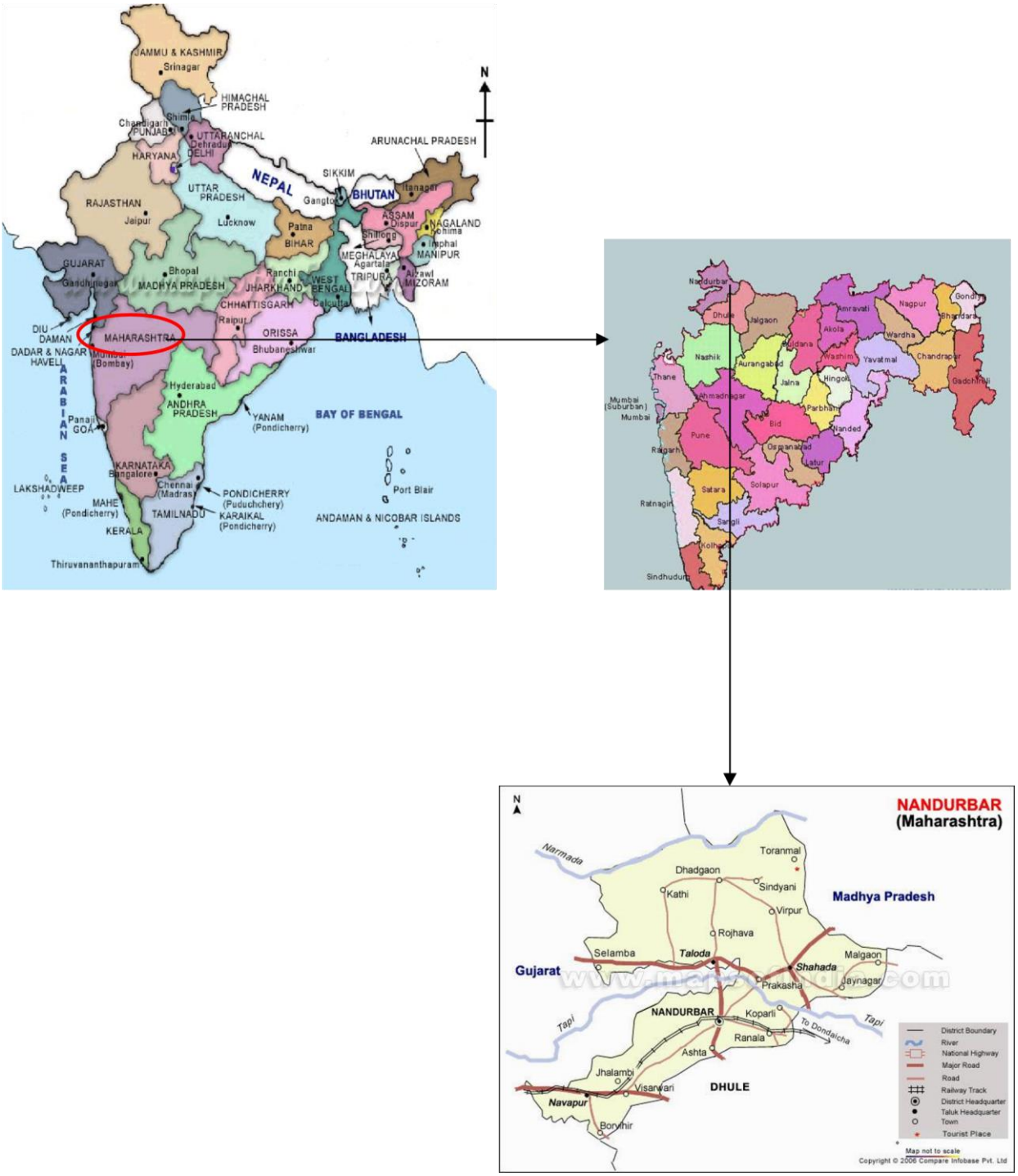
Technologies/measures
In wind energy generation, kinetic energy of wind is converted into mechanical energy and subsequently into electrical energy.

A.2. Location of project activity

District: Nandurbar
State: Maharashtra
Site: Chakla
Village: Akhatwade, Gangapur, Vasdara, Mandal, Thanepada
Country: India

The project activity consists of seventeen 1.5 MW wind turbines in the district of Nandurbar in the state of Maharashtra, India. The nearest railway station to Nandurbar is Nandurbar railway station and nearest airport is situated at Nasik which is 188 Kms from Nandurbar. The specific geographical coordinates of the individual WEGs are provided below.

Sr. No.	WTG. No.	Latitude	Longitude
1	C-02	21°18′10″N	74°18′32″E
2	C-03	21°17′55″N	74°18′28″E
3	C-04	21°17′17″N	74°18′16″E
4	C-05	21°17′30″N	74°18′32″E
5	C-06	21°17′47″N	74°18′09″E
6	C-07	21°17′59″N	74°18′05″E
7	C-18	21°17′14″N	74°17′51″E
8	C-19	21°17′29″N	74°17′51″E
9	C-20	21°17′43″N	74°17′49″E
10	C-26	21°18′47″N	74°17′09″E
11	C-27	21°18′54″N	74°16′51″E
12	C-28	21°17′31″N	74°17′05″E
13	C-29	21°17′38″N	74°16′56″E
14	C-30	21°17′25″N	74°16′42″E
15	C-32	21°17′17″N	74°16′10″E
16	C-37	21°15′45″N	74°19′33″E
17	C-67	21°15′06″N	74°16′20″E



Maps of project Locations

A.3. Technologies/measures

The technology employed by the project activity converts kinetic energy in wind to mechanical energy and mechanical energy to electrical energy using wind turbine generators (WTGs). In this process, there are no greenhouse gas emissions or burning of any fossil fuels. The electricity is generated through sustainable means without causing any negative effect to the environment and therefore the technology is environmentally safe and sound.
The technical specifications of the WTGs are as below:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as

reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

As the project developer is a company using the self

WTG (S82, 1.5 MW, 50 Hz) TECHNICAL DATA

Rated capacity: 1500 kW
Rotor diameter: 82 m
Hub height: 78.5 m

Rotor with Pitch Control
Type : Upwind rotor with active pitch control
Number of blades: 3
S wept area: 5281 m²
Blade material: The rotor blades are made epoxy bonded fibre glass
Rotor speed : 16.30 rpm
Tip speed : 70 m/s
Generator **:**
Type : Single fed Induction Generator with slip rings, variable rotor resistance with SUZLON FLEXI SLIP control system.

Hub **:** Cast spherical hub
Bearings **:** Spherical roller bearing
Tower **:** Steel Tubular, 76 m height

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 (Host Country)	Hindustan Zinc Limited (Private Entity)	No
Australia	EKI Energy Services Limited (Private Entity)	No

A.5. Public funding of project activity

The project participants have no public funding.

A.6. History of project activity

The project got registered on CDM on 27 Dec 12 Currently the Project Activity has applied for 2nd Renewable of Crediting Period.
The proposed CDM project activity is registered as a CDM project activity and not included as a component project activity (CPA) in a registered CDM programme of activities (PoA);

The proposed CDM project activity is not a project activity that has been deregistered.

The proposed CDM project activity was a not CPA that has been excluded from a registered CDM PoA;

No any registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) exists in the same geographical location as the proposed CDM project activity

A.7. Debundling

Not Applicable, as this is large scale project and de-bundling is not applicable.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

Title: Grid-connected electricity generation from renewable sources

Reference: Approved consolidated baseline methodology ACM0002 (Version 20.0[2])

ACM0002 draws upon the following tools which have been used in the PDD:

- Tool to calculate the emission factor for an electricity system[3] – Version 07 (EB 100, Annex 04)
- Tool for the demonstration and assessment of additionality[4] – Version 07.0.0

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B.2. Applicability of methodologies and standardized baselines

The project activity involves generation of grid connected electricity from renewable wind energy. The project activity has a proposed capacity of 25.5 MW which will qualify for a large scale CDM project activity under Type-I of the large scale methodologies. The project status is corresponding to the methodology ACM0002 version 20.0 and applicability of methodology are discussed below.

Para No.	Applicability Conditions as per ACM0002	Applicability to this Project Activity
1	This methodology is applicable to grid-connected renewable power generation project activities that: • install a Greenfield power plant; • involve a capacity addition to (an) existing plant(s); • involve a retrofit of (an) existing operating plants/units; • involve a rehabilitation of (an) existing plant(s)/unit(s) or • involve a replacement of (an) existing plant(s)/unit(s).	The project activity is grid connected renewable power generation from wind which falls under applicability criteria option 1 (a) i.e., “Install a Greenfield power plant”. Hence the project activity meets the given applicability criterion.
2	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 wind power plant and hence this condition is met.
3	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	The project activity does not involve any capacity additions, retrofits or replacements and therefore this condition is not applicable.

[2] https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG
[3] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf
[4] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf

	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	
4	In case of hydro power plants, one of the following conditions shall apply: a. The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or b. The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 W/m^2; or c. The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m^2. 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: i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m^2; ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 shall be; a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project.	The project activity is a grid connected renewable wind energy project. This condition is applicable only for hydro power plants and not applicable for wind projects. Therefore, this condition is not applicable for project activity.
5	In the case of integrated hydro power	The project activity is a grid connected

	projects, project participant shall: i) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or 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.	renewable wind energy project. This condition is applicable only for hydro power plants and not applicable for wind projects. Therefore this condition is not applicable for project activity.
6	In the case of integrated hydro power projects, project participant shall: i) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or 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.	The project activity is a grid connected renewable wind energy project. This condition is applicable only for hydro power plants and not applicable for wind projects. Therefore this condition is not applicable for project activity.

	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.	
7	Methodology is not applicable to the following: a. Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; b. Biomass fired power plants/units	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.
8	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 wind energy plant and not a retrofits, replacement or capacity additions and therefore this criterion is not applicable to the project activity.

9. In addition, the applicability conditions included in the tools referred to below apply[5]: -

The project activity meets the applicability conditions of tools refereed in the methodology as follows:

S. No.	Relevant Applicability Criteria of "Tool for the demonstration and assessment of additionality"	Position of the project activity vis-à-vis applicability conditions
1.	Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory.	The tool is referenced in ACM0002. Application of the additionality tool is mandatory.

[5] The condition in "TOOL02: Combined tool to identify the baseline scenario and demonstrate additionality" that all potential alternative scenarios to the proposed project activity must be available options to project participants; does not apply to this methodology, as this methodology only refers to some steps of this tool.

2.	Project activities with a start date before the date of validation shall specifically take into account the guidance provided in Chapter B "Specific guidelines for completing the Project Design Document (CDM-PDD)" section B, sub- section B-5. The start date of a project activity. is as defined in paragraph 76 of thirty-third report of the Board.	The project start date is prior to the date of validation. The guidelines are taken into account in section B.5.
3.	Project activities that apply this tool in context of approved consolidated methodology ACM0002, only need to identify that there is at least one credible and feasible alternative that would be more attractive than the proposed project activity.	Only one alternative more attractive than the proposed project activity (no investment) has been identified.

S. No.	Relevant Applicability Criteria of "Tool to calculate the emission factor for an electricity system"	Position of the project activity vis-à-vis applicability conditions
1.	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity, i.e. where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	The project activity supplies electricity to the grid. Therefore the tool may be applied.
2.	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 Activity is located in India, which is not an Annex I Country. Therefore, the tool may be applied.

The description provided in table above shows that the project activity satisfies the applicable conditions of the methodology, ACM0002.

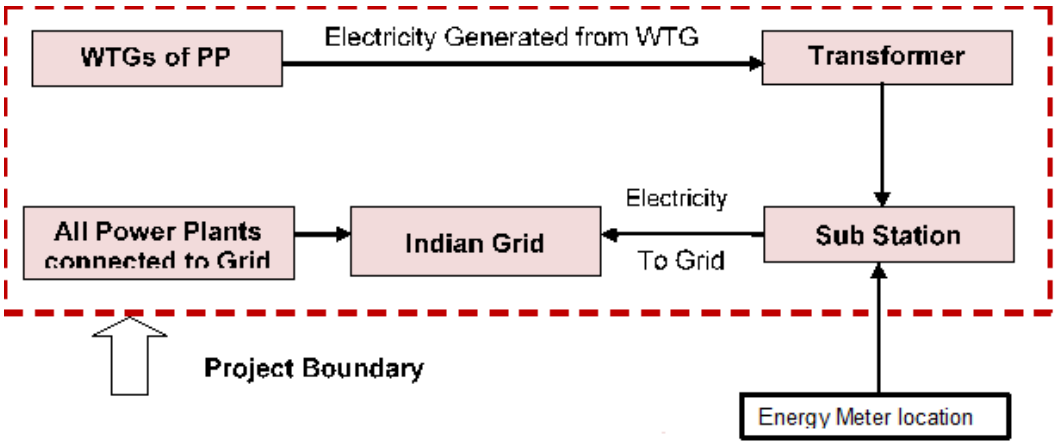
B.3. Project boundary, sources and greenhouse gases (GHGs)

ACM0002 specifies that the project boundary will be:
For emissions sources, only CO_2 emissions from electricity generation in fossil fuel fired power that is displaced due to the project activity.

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

The project feeds the electricity in the Indian Grid. The project have marginal impact on all the generation facilities in the Indian grid. Thus, all the power generation facilities connected to Indian grid form the project boundary for the purpose of baseline estimation. The grids are also interconnected with each other, however, the net exchange of energy within the regional grids is very small, and thus the other regional grids are not included in the boundary (however, for conservative and accurate estimation, the imports of electricity from other regional grids has been included in the baseline calculation).

Flow diagram of the project boundary:



The baseline study of Indian grid shows that the main sources of GHG emissions in the baseline are CO_2 emissions from the conventional power generating systems, the other emissions are that of CH_4 and N_2O but both emissions were conservative and are excluded for simplification of the project. The project activity is the emission free electricity generation from renewable sources and hence emits no gases in the atmosphere.

Following table indicates the sources and gases included in the project boundary:

	Source	GHG	Included?	Justification/Explanation
Baseline	Grid-connected electricity generation	CO_2	Yes	In the baseline scenario the electricity would have been sourced from the Southern grid which in turn would be connected to fossil fuel fired power plants which emit CO_2.
		CH_4	No	No methane generation is expected to be emitted.
		N_2O	No	No nitrous oxide generation is expected to be emitted.
Project activity	Greenfield wind energy conversion system	CO_2	No	The project activity does not emit any emissions.
		CH_4	No	No methane generation is expected to be emitted.
		N_2O	No	No nitrous oxide generation is expected to be emitted.

B.4. Establishment and description of baseline scenario

Updated baseline for the second crediting period in line with the “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period.” Version 03.0.1.
This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 283 to 286 of Project Standard version 02.0.
The tool stipulates the following steps to be carried out.

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

The baseline scenario remains unchanged and is in compliance with all the relevant mandatory national and/or sectoral policies.

Step 1.2: Assess the impact of circumstances

The baseline scenario identified at the validation of the project activity was 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. Thus this project activity was a voluntary investment which intends to replace equivalent amount of electricity at grid from renewable source. PP was not bound to incur this investment; hence absence of project activity (i.e. the investment) does not lead to any continued baseline practice for PP within their scope whereas the continued operation of the project activity would continue to replace equivalent amount of electricity at grid. Hence, the same baseline as identified in the previous crediting period is still valid for the project. Therefore, the assessment of the changes in market characteristics is not required for the renewal of the project's crediting period under CDM.

Nevertheless, there is an impressive growth attained by the Indian Power Sector within the recent years, the installed capacity has grown from mere 1,713 MW in 1950 to 356,100.20 MW as on 31.03.2018, consisting of 226,279.34 MW Thermal, 77,641.63 MW Renew and 6,780 MW Nuclear. Sector-wise details of installed capacity are shown in Table 1. However, it is evident from Table 1[6] that the installed capacity is predominantly coal based and therefore, is a major source of carbon dioxide emissions in India. Hence, there exists scope for reducing the CO_2 emissions in the country by increased use of renewable energy sources.

Furthermore, project participant has considered the latest available CO_2 Baseline Database (CEA database, version 15) at the time of requesting renewal of the crediting period for establishing the baseline emission factor, which itself considered all the new circumstances. Hence, the new circumstances do not have an impact on the baseline emission. As per below table, the fossil fuel based thermal power generation is dominant over the renewable based power generation, thus baseline scenario remains same as original.

Table 1: Sector- wise installed capacity (MW) as on 31/03/2019 (CEA Database version 15)

Sector	Thermal				Nuclear	Hydro	RES	Total
	Coal	Gas	Diesel	Total				
State	65366.50	7118.71	363.93	72849.14	0.00	29878.80	2347.93	105075.86
Central	58820.00	7237.91	0.00	66057.91	6780.00	12126.42	1632.30	86596.63
Private	76518.00	10580.60	273.70	87372.30	0.00	3394.00	73661.40	164427.70
All India	200704.50	24937.22	637.63	226279.34	6780.00	45399.22	77641.63	356100.19

Thus, current baseline remain same and there is no impact if circumstances, existing at the time of requesting renewal of crediting period.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

[6] https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver15.pdf

As explained in step 1.2, the baseline scenario was the electricity import/generation from the power plants connected to the electricity grid. The project activity in green field project and there is no any baseline equipment or investment involved in project activity. Therefore this condition is not applicable to the project activity.

Step 1.4: Assessment of the validity of the data and parameters

This step stipulates that "Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the CDM project activity."

In the context of the present project activity the emission factor has been updated along with the approach used to calculate the emission factor.

Step 2: Update the current baseline and the data and parameters

As evident from the explanation provided above the baseline scenario remains unchanged. Only the approach used to calculate the baseline emission factor is updated as per the latest version of CEA database available at the time of PDD submission for renewal.

In line with the project standard version 02.0, the impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant EB guidance with regard to renewal of the crediting period at the time of requesting renewal of crediting period; and the correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period

Impact of the national and/or sectoral policies and circumstances upon the baseline scenario of the project activity

The Government of India enacted the Electricity Act in the year 2003 to harmonize and rationalize the provisions in the existing laws. The Act consolidated the laws relating to generation, transmission, distribution, trading and use of electricity. With the Enactment of the act, the then existing laws viz, The Indian Electricity Act 1910, The Electricity Supply Act, 1948 and The Electricity Regulatory Commissions Act, 1998 were repealed. The Electricity Act 2003 was in force at the time of the completion of the baseline study for the registered PDD.

Section 3 of the said act required the Central Government to prepare the national electricity policy and tariff policy, in consultation with the State Governments and the Authority for development of the power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy. In accordance with the section 3 of the Electricity Act 2003, the Central Government notified the National Electricity Policy[7] on 12th February 2005 which was in force at the time of completion of the baseline study as stated in the registered PDD of the project activity. This policy has not been revised since then and is currently in force as well.

In addition to the above policies, State Electricity Regulatory Commissions (SERCs) have announced preferential tariffs and Indian Renewable Energy Development Agency (IREDA) provides term loan assistance towards establishing biomass power projects. All these fiscal and financial incentives were in force at the time of completion of the baseline study for the registered PDD of the project activity and still continue to exist.

[7] http://www.cercind.gov.in/Act-with-amendment.pdf

The state electricity regulatory commission issues tariff order in respect of procurement of power generated wind generators and there is no mandatory national and/or sectoral policies have come into effect that would affect the compliance of the current baseline. Hence, it can be concluded the current baseline complies with all relevant mandatory national and/or sectoral policies that have come into effect after the submission of the project activity for validation and are applicable at the time of requesting renewal of the crediting period.

However, in spite of the financial incentives given by the government to renewable power projects in India the generation from the low cost must run resources connected to the Southern Grid has not increased to such an extent that this would lead to more than 50% contribution from the low cost must run resources towards the total generation from the Southern Grid.

The approved consolidated baseline methodology, ACM0002 (Version 20.0), has been used to determine the baseline and the estimation of emission reductions for the applicable crediting period. As referred in the methodology "*Tool to calculate the emission factor for an electricity system*" *(version 07.0)* has been used to determine continued validity of the baseline based on combined margin (CM) calculations.

The fossil fuel dominated electricity is more than renewable sector and is continuing with same pattern. In light of the above discussion it is to be concluded that in accordance with relevant guidelines stipulated in the Project Standard version 02.0, national and/or sectoral policies and circumstances had been considered towards formulating the OM & BM baseline scenario. Hence the baseline scenario as applied for the present project activity remains justified.

As per the approved consolidated Methodology ACM0002 (Version 20.0) 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 "Tool to calculate the emission factor for an electricity system".

The project activity involves setting up wind project to produce electricity and supply to the grid. 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.

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 CEA database version 15 is the latest available data at the time of PD submission to DOE for validation, hence same is considered for emission factor calculations.

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

Parameter	Value	Nomenclature	Source

$EF_{grid,CM,y}$	0.9419 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 (0.25) & build margin (0.75) values, sourced from Baseline CO_2 Emission Database, Version 15.0, Dec 2019 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,OM,y}$	0.9622 tCO_2/MWh	Operating margin CO_2 emission factor for the project electricity system in year y	Calculated as the last 3 year (2016-17, 2017-18, 2018-19) generation-weighted average, sourced from Baseline CO_2 Emission Database, Version 15.0, Dec 2019 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,BM,y}$	0.8811 tCO_2/MWh	Build margin CO_2 emission factor for the project electricity system in year y	Baseline CO_2 Emission Database, Version 15.0, May 2019 published by Central Electricity Authority (CEA), Government of India

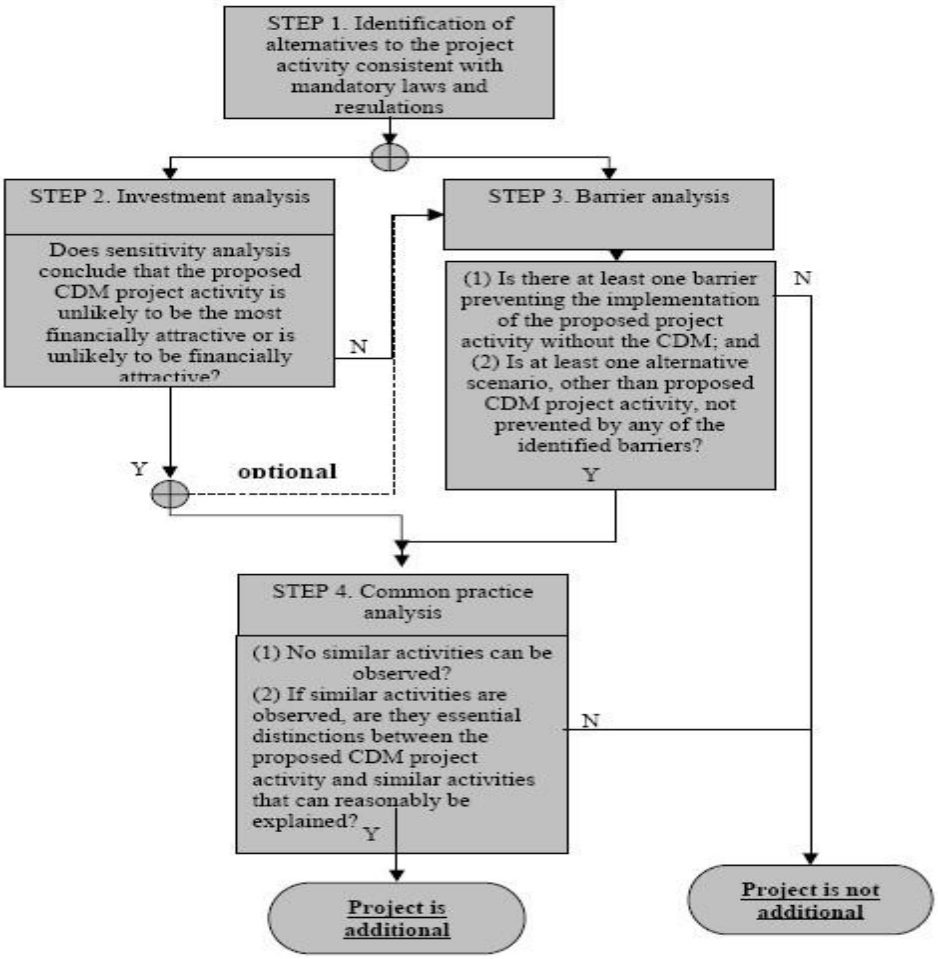
B.5. Demonstration of Additionality

In accordance with "Guidance on the demonstration and assessment of prior consideration of the CDM" Version 3, since the start date of the project activity falls after 02 August 2008, the project participant is required to inform the host party DNA and UNFCCC Secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. This notification was made by Hindustan Zinc Limited to the UNFCCC Secretariat and Ministry of Environment and Forests on 16/05/2011 which is within six months of the project activity start date and contains the precise geographical location and a brief description of the proposed project activity.
HZL took continuing and real actions to secure CDM status for the project in parallel with its implementation. The chronology of events for project implementation and CDM consideration are as follows:

Date	Project Activity	CDM activity
4-Dec-10	Offer Letter from Suzlon	Offer Letter from Suzlon
10-Dec-10	Note for approval for the project activity	Investment Decision Date
28-Mar-11	Purchase order raised for Civil works, electrical works, O&M	Project activity Start date
15-June-2011	-	Acknowledgment from UNFCCC for Receipt of Prior CDM Consideration
18-May-2011	-	Acknowledgment from DNA for Receipt of Prior CDM Consideration
26-Aug-11	-	Appointment of DOE
13-Sep-11	Commissioning of 9 WTGs	
16-Sep-11	Commissioning of 4 WTGs	
22-Sep-11	Commissioning of 2 WTGs	
30-Sep-2011	Commissioning of 2 WTGs	
10-Feb-2012	-	Validation Start day (PDD webhosting date)

Demonstration of Additionality for the project activity

As required in ACM0002 Version 12.3.0, additionality has been demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality", Version 06.00



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

Define realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps:

Sub-step (1a): Define alternatives to project activity

Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity. These alternatives are to include:

(a) The proposed project activity undertaken without being registered as a CDM project activity;

(b) Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario that deliver outputs services (e.g., cement) or services (e.g. electricity, heat) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology;

(c) If applicable, continuation of the current situation (no project activity or other alternatives undertaken).

The proposed project activity is a wind power project involving supply of electricity to NEWNE grid. Hence, according to baseline methodology ACM0002 Version 12.3.0, since the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

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

Paragraph 105 of the "Clean Development Mechanism Validation and Verification Manual" Version 01.2 states that "*The PDD shall identify credible alternatives to the project activity in order to determine the most realistic baseline scenario, unless the approved methodology that is selected by the proposed CDM project activity prescribes the baseline scenario and no further analysis is required.*"

Since, the methodology has prescribed the baseline scenario as given above, there is no further analysis required of alternative scenarios that deliver output services with comparable quality, properties and application areas.

Therefore the following baseline alternatives are considered for further analysis:

Sl No.	Alternative
1	*The proposed project activity undertaken without being registered as a CDM project activity;*
2	*Continuation of the current situation (no project activity or other alternatives undertaken)*

Sub-step (1b): Consistency with mandatory laws and regulations

The baseline alternative identified above is in compliance with the applicable legal and regulatory requirements as follows:

- The implementation of project activity is a voluntary initiative and it is not mandatory or legal requirement. For power generation, the Indian Electricity Act of 2003 does not restrict or empower any authority to limit the fuel choice[8].
- The applicable environmental regulations do not restrict the use of wind energy
- There is no legal requirement on the choice of a particular technology.

Thus, the baseline alternative is in line with the applicable legal and regulatory requirements.
The "Tool for the demonstration and assessment of additionality" (Version 06.00) states that project participants may choose to apply Step 2 (Investment analysis) OR Step 3 (Barrier analysis) to demonstrate the additionality of the project. In the present case, Step 2 is used to demonstrate the additionality of the project.

Step 2: Investment Analysis

Sub-step 2a. Determine appropriate analysis method

As the electricity generated from the project activity will be sold to the state utility, it will generate financial benefits in terms of revenues from the sale of electricity units. Thus simple cost analysis (option I) cannot be applied to the proposed CDM project activity.

Amongst the other two options – investment comparison analysis (option II) and benchmark analysis (option III), the benchmark analysis has been adopted in accordance with the guidance on the assessment of investment analysis wherein the Internal Rate of Return (IRR) of the project activity serves as a financial indicator to assess the financial attractiveness of the project activity. The financial indicator therefore chosen is Post tax equity IRR.

[8] http://www.powermin.nic.in/acts_notification/electricity_act2003/pdf/The%20Electricity%20Act_2003.pdf

The Guidelines on the Assessment of Investment Analysis', EB 62, Annex 5, Paragraph 19, states that "*If the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate.*"

Since the project activity supplies electricity to the grid and since the baseline scenario does not involve any investment, a benchmark analysis has been applied to the project activity.

Option III assesses if the project's returns are sufficient for investors to make the initial investment and further bear the associated costs of successfully operating the project activity over the crediting period of the project.

Sub-step 2b (Option III) - Apply benchmark analysis

As per paragraph 14 in the Guidelines on the Assessment of Investment Analysis, EB 62 Annex 5: "In the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on parameters that are standard in the market."

In accordance with the guideline, the benchmark has been determined using parameters standard in the market, and is based on the expected return on equity calculated using the Capital Asset Pricing Model (CAPM). The Capital Asset Pricing Model (CAPM) is a well-accepted methodology for estimating the expected rate of return on equity. The reliability of CAPM as a tool for evaluating the minimum rate or return for an investor, is well documented.

It may be noted that there market indices (BSE Sensex, BSE 100, and BSE 200) were analyzed for calculating the market returns and the most conservative value of the market return has been used while calculating the Benchmark for the project activity. BSE 500 is not considered in the analysis since the index was launched in the year 1999 and BSE 500 data is available for only 10 years which is not comparable to the project life time of 20 years. Similarly, other market indices listed are not considered as the available data is not comparable to the project lifetime and/or because they are sectoral indices and not representative of the market. The benchmark calculation applying the three market indices is provided in the consolidated excel sheet.

As per CAPM, the required return on investment is computed as follows:

$$\mathbf{K_e = R_f + \beta \times (R_m - R_f)}$$

where:
K_e = Rate of return on equity capital;

R_f = Risk-free rate of return;

β (Beta) = The stock's risk relative to that of the whole market;

$R_m - R_f$ = Market risk premium;

Risk free rate:

The risk free rate is considered the rate of return on an asset that is theoretically free of any risks. Therefore the yield of Government of India Securities applicable at the time of investment decision is considered as risk free rate. This data is published by Reserve Bank of India and the latest risk free rate available (published on 09th December 2010 by RBI) has been applied. The risk free rate corresponding to 20 years maturity period was considered appropriate, as the lifetime of the project activity is also 20 years.

The applicable risk free rate is 8.43%.

(reference: http://www.rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=11808)

Risk Premium:
The market risk premium is the premium above the risk-free rate of return that investors expect to earn on a well-diversified portfolio of equities. The most common approach for estimating the risk premium is to base it on historical data. The premium is estimated by looking at the difference between average return on stocks (market rate of return) and return on government securities over a period of time.

The market rate of return for BSE 100, BSE 200, and BSE Sensex has been evaluated from January 1991 onwards, thus providing the market returns for 19.92 years which is comparable with the operational lifetime of the project activity (20 years). Further, the use of data from 1991 is appropriate as the economic liberalization of the Indian economy started in 1991.[9] The economic growth path of India changed from 1991 and the use of data from this year provides a realistic representation of the market returns used to estimate the benchmark.

The market rate of return was evaluated as the compounded annual growth rate of the respective market index from January 1991 to November 2011 (prior to investment decision). The historical market index was taken from the BSE web-site (http://www.bseindia.com/index_op.htm), and the market rate or return for the three indices was determined to be:
BSE 100: 16.37%
BSE 200: 15.87%
BSE Sensex: 16.19%

On a conservative basis, the market returns are applied in accordance with BSE 200.
Market rate of return, R_m = 15.87%

The risk premium has been calculated as the difference in market rate of return and the risk risk free rate available at the time of decision making. The detailed calculations are presented in the benchmark calculation spreadsheet submitted to the DOE.

The applicable risk premium is determined as: 15.87% – 8.43% = 7.44%.

Beta:
Beta (β) indicates the sensitivity of the company to market risk factors. For companies that are not publicly listed, the beta is determined by referring beta values of publicly listed companies that are engaged in similar types of business. The project activity type is wind power generation; the approach therefore should be to base the beta for the project on the beta values of listed wind power generation companies in India. However, in the absence of adequate data on companies which are exclusively into the exactly same type of business (i.e. wind power projects), the next best option for assessing the risk of these projects is to consider the data available on companies which are involved in similar businesses.

Therefore, we have considered beta values of electricity generating companies in India. The group of companies considered includes renewable as well as conventional power generating companies. Investors demand a higher return from renewable energy projects than from conventional energy ones, given the higher risks in renewable, including risks of technology, risks from significantly varying and unpredictable resource availability and a lower established support base for such projects relative to that for conventional power (e.g. grid connections, bank finance, suppliers, etc.). The use of this Beta value is therefore considered conservative, as it does not add for the higher risk of non conventional energy.

[9] Reference: http://www.indiainbusiness.nic.in/economy/economic_reforms.htm

The beta value taken for the analysis is based on the beta values of the listed power producing companies estimated by regressing monthly returns on stock against local index, using 5 years[10] of data. The beta value for PTC has not been considered in the analysis as it is a power trading company. Further, companies with less than 5 years of data (date of listing after December 2005) have not been considered in the analysis.

Data on stock value of companies and indices has been sourced from the BSE web-iste. Data on debt, equity, and effective tax rates has been sourced from audited financial statements of respective companies available on www.moneycontrol.com, and links for each company have been provided in the benchmark analysis spreadsheet. The beta values for the five years period prior to the time of investment decision (December 2005 to November 2010) has been evaluated. The beta values determined applying **BSE 200** are as follows:

Name	Effective Tax	Debt/Equity	Levered Equity beta	Unlevered Equity Beta
CESC Ltd.	17%	0.621	1.1187	0.7401
Gujarat Industries Power Co Ltd	17%	0.725	1.2568	0.8134
TATA Power	25%	0.525	1.0568	0.7560
Reliance Infrastructure Limited	11%	0.425	1.8683	1.3828
Neyveli Lignite Corporation	22%	0.379	1.4784	1.1689
BF Utilities	29%	1.101	2.2979	1.6537
NTPC	20%	0.563	0.6781	0.4885
Jaiprakash Power Venture Limited	17%	1.586	1.7475	0.7587
Average				**0.9211**

The average asset beta of companies engaged in power sector is thus **0.9211**

The required return on equity computing using CAPM, is **15.29%** based on the average beta value and market risk premium for BSE 200, and risk free rate as given above.

The required rate on equity based on BSE 200 is the most conservative among the three indices as tabulated below:

Market Index	Average Beta	Return on Equity
BSE 100	0.9304	15.82%
BSE 200	0.9211	15.29%
BSE Sensex	0.9703	15.96%

The detailed benchmark calculation spreadsheets for all three market indices have been submitted to the DOE.

Therefore, the benchmark for the project activity is applied as **15.29%** on a conservative basis.

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

[10] Five years of Beta value has been chosen in line the Crisil Report on Cost of Capital for Central Sector Utilities which states that 'for such economies, and for companies whose capital structure and operating environment has been changing, the time period over which beta is calculated should be small',

The project proponent has opted to demonstrate the additionality of the project activity by performing an investment analysis using post tax equity IRR. Post tax equity IRR is one of the well-known financial indicators used by banks, financial institutions and project developers for making investment decisions. The chosen indicator, post tax equity IRR, represents the overall returns from an investment, and therefore, is duly considered as the financial indicator for the project activity.

The assumptions used to calculate the post tax equity IRR are listed below:

Capacity			
Project Size	25.5	MW	Offer letter from Suzlon Energy Limited dated 04/12/2010 to Hindustan Zinc Limited
Total Project Cost	155.87	INR (x 10 Million)	Offer letter from Suzlon Energy Limited dated 04/12/2010 to Hindustan Zinc Limited
Means of Finance			
Debt (0%)	0	INR (x 10 Million)	Investment decision
Equity (100%)	155.87	INR (x 10 Million)	Investment decision
Total Project Cost	155.87	INR (x 10 Million)	Investment decision
Operating Parameters			
PLF *	24.67	%	Estimated Electricity Generation specified in Offer Letter from Suzlon dated 04/12/2010
Net Energy Generation	55,107.85	MWh	Calculated based on the PLF stated above
Life of the WTG assumed	20	Years	WTG technical specifications from Suzlon Energy Limited
Operation & Maintenance Cost			
O & M Cost Exemption	2.00	Years	Offer letter from Suzlon Energy Limited dated 04/12/2010 to Hindustan Zinc Limited
O & M Cost	0.1425	(x 10 Million)/WTG	Offer letter from Suzlon Energy Limited dated 04/12/2010 to Hindustan Zinc Limited
O & M escalation	5.0	%	Offer letter from Suzlon Energy Limited dated 04/12/2010 to Hindustan Zinc Limited
Tax on OMS	10.30	%	Offer letter from Suzlon Energy Limited dated 04/12/2010 to Hindustan Zinc Limited
Insurance cost			
Insurance Cost	0.01	(x 10 Million)/WTG	Insurance costs incurred in previously commissioned wind power projects (Policy schedule from the Oriental Insurance Company for the period 17/08/2010 to 16/08/2011)
Depreciation Rate			

Yearly book depreciation	5.28%	%	As per Companies Act[11]
Yearly tax depreciation	7.69%	%	As per IT Act[12] 13
Tax			
Income Tax Rate	33.22%	%	As per IT Act[14]
Minimum Alternate Tax	19.93%	%	As per IT Act[10]
Tariff			
Tariff	4.41	INR	MERC Tariff Regulations, dated 4 July 2010 for wind zone 2
GBI	0.5	INR / kWH	http://mnre.gov.in/filemanager/UserFiles/faq_wind.pdf
Maximum benefit under GBI	6.2	INR Million/MW	http://mnre.gov.in/filemanager/UserFiles/faq_wind.pdf

* The PLF considered for the investment analysis is based on the estimated generation indicated by the equipment supplier in the offer letter dated 04/12/2010, which corresponds to a PLF of 24.67%. This PLF is applicable at the time of investment decision and is in compliance with with EB 62 Annex 5, Paragraph 6 . However, in line with the requirements of EB 48, Annex 11, PLF has also been evaluated based on an independent third party assessment by Power and Energy Consultants dated 26/12/2011 (after the investment decision for the project activity). However, as the PLF based on the offer letter (24.67%) is more conservative than the PLF based on the third party assessment (20.16%), the offer letter has been taken as the basis of the PLF applied for computation of the post tax equity IRR.

Using the assumptions in the table above, the post-tax equity IRR for the project activity works out to be **11.75%,** calculated in accordance with the "Guidance on the Assessment of Investment Analysis" Version 05. The project activity is not financially attractive as the equity IRR is much below the selected benchmark.

Sub-step 2d: Sensitivity analysis (only applicable to options II and III):

A sensitivity analysis has been carried out, by varying the critical parameters of the project activity. As per paragraph 20 of the "Guidance on Assessment of Investment Analysis", EB 62 Annex 5: "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."

Sensitivity analysis has been carried out considering variations in PLF, tariff rate, O&M cost, and project cost. In accordance with Paragraph 21 of the guidance, a range of +10% to -10% has been considered as the range of variation.

Upon introducing the variation of 10% in crucial parameters the IRR figures do not surpass the benchmark. The results of sensitivity analysis for the project activity are as given below:

[11] http://asa-india.com/asa/Depreciation%20Rates%20Companies%20Act.pdf

[12] http://law.incometaxindia.gov.in/DIT/File_opener.aspx?page=ITRU&schT=rul&csId=2f13c0bd-dec4-4df6-a273
[13] e3b91a01b&rNo=&sch=&title=Taxmann%20-%20Direct%20Tax%20Laws

[14] http://www.incometaxindiapr.gov.in/incometaxindiacr/contents/forms2010/pamphets/COMPANIES_2012_13.htm

S. No.	Parameters	Variation	IRR without CDM
1.	PLF	+ 10 %	13.61%
		- 10 %	9.85%
2.	Tariff rate	+10 %	13.57%
		-10 %	9.88%
3.	O&M Cost	+10%	11.54%
		-10 %	11.95%
4.	Project Cost	+10%	10.00%
		-10 %	13.86%

It is evident from the above that the IRR without CDM benefits is consistently below the benchmark of 15.29%, even after introducing variation of 10% in the critical parameters.
An assessment was also carried out of the variation in parameters required for the equity IRR to reach the benchmark and the results are tabulated below.

S. No.	Parameters	Variation for IRR with out CDM revenue to attain benchmark
1.	PLF	+20%
2.	Tariff rate	+20%
3.	O&M Cost	-190%
4.	Project Cost	-16%

It is unlikely that the above variations would be achieved as:

- The PLF considered for investment analysis (based on offer letter from equipment supplier) is conservative. The PLF based on third party assessment is around 18% lower than the PLF applied for investment analysis. Therefore, an increase of 20% is highly unlikely.
- The project proponent has entered into a power purchase agreement at a price of 4.67 which is within the range of +10%. Varying the tariff by +10 % from takes the IRR to 13.57%, which is much below the benchmark. The tariff would not be varying further as the PPA has been signed. At the end of the PPA term (thirteen years), even if there is an increase of tariff by 20%, the IRR would remain below the benchmark as the change would apply only to the last 7 years of the project life time.
- The equity IRR remains below the benchmark at no O&M costs (-100% of O&M costs) and it is not possible for O&M costs to be reduced below -100%.
- The purchase orders for the project have been signed based on the offer letter considered at the time of investment decision. The actual PO values (actual implemented project cost) is same as the cost considered for financial analysis. Therefore any decrease in the investment cost is not possible.

Conclusion

The project activity was not financially viable to the project proponent considering the low financial returns as described above. The investment decision was approved after considering the CDM revenues, which would be accrued upon registration of the project activity with UNFCCC.

Step 4: Common Practice Analysis

Sub-step 4a: Analyze other activities similar to the proposed project activity:

Provide an analysis of any other activities that are operational and that are similar to the proposed project activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc. Other CDM project activities (registered project activities and project activities which have been published on the UNFCCC

website for global stakeholder consultation as part of the validation process) are not to be included in this analysis. Provide documented evidence and, where relevant, quantitative information. On the basis of that analysis, describe whether and to which extent similar activities have already diffused in the relevant region.

Paragraph 47 of the Additionality Tool Version 06.0.0 has been applied for the analysis of other activities similar to the proposed project activity. The following step-wise procedure is applied.

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

As the proposed project activity is of 25.5 MW capacity, the applicable output range for the identification of projects is 12.75 MW to 38.25 MW.

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities shall not be included in this step.

For this analysis the applicable geographical area is applied in accordance with the definitions given in the Additionality Tool Version 06.0.0. As per the tool, "the applicable geographical area" covers the host country by default; however project participants may provide justification that the applicable geographical area is smaller than the host country for technologies that vary considerably from location to location depending on local conditions. Further, "different technologies" are defined as technologies that deliver the same output but differ by any of various factors including investment climate, energy source / fuel, feed stock, size of installation, etc. In India the regulatory regime and tariff structure is unique for each state[15], and therefore the investment climate varies considerably from state to state. Therefore, the applicable geographical area for the analysis is considered as the state of Maharashtra.

Further, all types of power plants have been considered for the common practice analysis. Similar project activity is being considered as any wind project with an installed capacity between 12.75 MW to 38.25 MW and set up by a single private investor within a particular time frame in the state of Maharashtra for the sale of power to the grid. Projects commissioned before the start date of the project activity have been considered in the analysis.

The Following is the result of this analysis[16]:

Technology Area	Projects in applicable capacity range	Projects excluding CDM projects in applicable capacity range, N(all)	N(diff)
Thermal	3	3	3
Hydro	17	17	17
Wind	22	4	4
Nuclear	0	0	0
Solar	0	0	0
Biomass	25	13	13

[15] Reference: http://www.cercind.gov.in/08022007/Act-with-amendment.pdf

[16] Detailed spreadsheet with data collated for common practice analysis has been provided to DOE for validation.

Tidal-Mechanical &Thermal	0	0	0
Geothermal	0	0	0
Total	**67**	**37**	**37**

The list of wind power projects in the applicable capacity range in the geographical boundary is tabulated below:

Name of owner	Location (District)	Capacity (MW)	Reasons for exclusion
Aryan Coal beneficiation Private limited	Sangli	15	CDM project under validation[17]
Bharat Forge Limited	Satara	15.93	Bharat forge has commissioned 4 projects in Satara district. All the projects were commissioned prior to Electricity Act. Commissioning dates: 2.07: September 1998 6.9: March 2000 4.2: March 2002 2.76: March 2001
Bharati Shipyard Limited	Dhule	15	CDM project under validation[18]
DJ Malpani	Dhule and Nandurbar	15	CDM registered project[19]
Ellora Times Limited	Satara	21.65	CDM registered project[20]
Enercon wind farms sai limited	Ahemadnagar	20	CDM registered project[21]
Gangadhar Narsingdas Agrawal	Dhule, Satara and Beed	16.5	CDM registered project[22]
GI windfarms Limited	Satara	21	Project consists of two projects with a combined capacity of 21 MW. Both the projects were commissioned in March 2002, prior to introduction of the Electricity Act

[17] http://cdm.unfccc.int/Projects/Validation/DB/SB3OIAHMLZK0Z0KZ1J4ZLHHC8O8541/view.html

[18] http://cdm.unfccc.int/Projects/Validation/DB/KPIKXNELV2Y0NE3YMAD0P58HPDVF43/view.html

[19] http://cdm.unfccc.int/Projects/DB/BVQI1207584460.66/view

[20] http://cdm.unfccc.int/Projects/DB/BVQI1159875467.29/view

[21] http://cdm.unfccc.int/Projects/DB/DNV-CUK1279516994.31/view

[22] http://cdm.unfccc.int/Projects/DB/RWTUV1173341097.6/view

Gujarat Fluorochemical limited	Sangli	23.1	CDM registered project[23]
Jindal steel and power limited	Satara	18	CDM project under validation[24]
MSPL Limited	Satara and Dhule	21	MSPL has commissioned two project of capacities of 1 and 20 MW respectively. 1 MW was commissioned in March 2002 prior to introduction of electricity act. 20 MW was submitted to UNFCCC as a CDM project.[25]
Nishkalp investment and trading	Satara, Ahemadnagar	20.95	Nishkalp has installed 4 projects with a combined capacity of 20.95 MW. All four projects were commissioned prior to 2003.
Patnaik minerals private limited	Dhule	15	CDM project under validation[26]
REI agro limited	Dhule	22.4	REI agro has commissioned 3 projects with a combined capacity of 22.4 MW. All three projects are developed as CDM projects. Two projects (12.5+3.3) [27] are combined as a single CDM project and third project (6.6) [28] is developed as a separate CDM project.
Roaring 40s wind farm private limited	Ahmadnagar	37.6	Roaring has commissioned three projects. All three projects are registered as CDM projects. 2 projects (1.6+8)[29] were developed as a single CDM project and third project (28 MW) [30] was developed separately.

[23] http://cdm.unfccc.int/Projects/DB/RWTUV1202913883.06/view

[24] http://cdm.unfccc.int/Projects/Validation/DB/IUYE8HZCM27FA0V3YWZTQCS97MBZNI/view.html

[25] http://cdm.unfccc.int/Projects/DB/BVQI1204612226.17/view

[26] http://cdm.unfccc.int/Projects/Validation/DB/6BLYO2WUMBJR43922LAW79OC5AWQUQ/view.html

[27] http://cdm.unfccc.int/Projects/Validation/DB/CF0MSEL2TA1QOO3X6D9691XW7UO3KX/view.html

[28] http://cdm.unfccc.int/Projects/Validation/DB/LFTIDSON660NHIT5389DOU44QT1ZI2/view.html

[29] http://cdm.unfccc.int/Projects/DB/DNV-CUK1270220130.38/view

[30] http://cdm.unfccc.int/Projects/DB/DNV-CUK1263981578.63/view

<table>
<tr>
<td>Savita Chemicals limited</td>
<td>Ahmadnagar, Satara and Manehere</td>
<td>17.2</td>
<td>Savita Chemicals has commissioned the following WTGs[31]:
<table>
<tr><th>Project Number</th><th>Capacity</th><th>Commissioning Date</th></tr>
<tr><td>1</td><td>0.8</td><td>Sep-08</td></tr>
<tr><td>2</td><td>1.6</td><td>Mar-08</td></tr>
<tr><td>3</td><td>1.05</td><td>Mar-09</td></tr>
<tr><td>4</td><td>2.25</td><td>Mar-00</td></tr>
<tr><td>5</td><td>0.75</td><td>Sep-01</td></tr>
<tr><td>6</td><td>2.5</td><td>Sep-05</td></tr>
<tr><td>7</td><td>2.5</td><td>Sep-06</td></tr>
<tr><td>8</td><td>3.3</td><td>Mar-07</td></tr>
<tr><td>9</td><td>1.65</td><td>Sep-07</td></tr>
</table>
Project number 4 and 5 were commissioned prior to Electricity Act and hence are excluded from the analysis.

Project number 6, 7, 8 and 9 are developed as a single CDM project and are under validation stage[32].
Total combined capacity of remaining projects (1, 2, 3 and 10) is only 4.25 M W and hence is not of similar scale of project activity. Thus, they are excluded from the analysis.</td>
</tr>
<tr>
<td>Shah promoters and Developers</td>
<td>Dhule, Sangli and Ahmadnagar</td>
<td>15.6</td>
<td>CDM registered project[33]</td>
</tr>
<tr>
<td>Shraddha Construction and Power generation private limited</td>
<td>Dhule and Satara</td>
<td>24.4</td>
<td>CDM project under validation[34]</td>
</tr>
<tr>
<td>Shree Naman Developers Limited</td>
<td>Sangli, Nasik and Satara</td>
<td>29.25</td>
<td>CDM registered project[35]</td>
</tr>
<tr>
<td>Suma Shilp Limited</td>
<td>Dhule</td>
<td>15</td>
<td>CDM project under validation[33]</td>
</tr>
</table>

[31] Indian Wind power directory

[32] http://cdm.unfccc.int/Projects/Validation/DB/KPIKXNELV2Y0NE3YMAD0P58HPDVF43/view.html

[33] http://cdm.unfccc.int/Projects/DB/RWTUV1229007791.61/view

[34] http://cdm.unfccc.int/Projects/DB/RWTUV1229007791.61/view

[35] http://cdm.unfccc.int/Projects/DB/RWTUV1229007791.61/view

S36un and sand Hotel private limited	Sangli, Ahmadnagar and Satara	17.6	CDM registered project[37]
Tata finance limited	Satara and Ahmadnagar	21.95	Tata finance have commissioned 5 projects in Maharashtra and all five were commissioned prior to 2002.[38] Hence, the project was commissioned prior to the Electricity Act 2003 under a different investment climate.

Therefore, N_{all} = Thermal projects[39]+ Hydro Projects[40]+ Wind Projects[41]+Biomass projects [42] +Nuclear projects [43] + Solar projects+ Geothermal & Tidal projects[44]

= 3+17+4+13+0+0+0+0

=37

Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.

From the projects identified above, those projects which employ "different technologies", have been excluded and the number of such projects has been identified as N_{diff}.

Thermal power projects, biomass projects, and hydropower projects are different from the project activity (a wind based project) as they use different *Energy source/fuel* (paragraph 9a of the Additionality Tool). Further, four wind power projects exist in the applicable capacity range which has not considered CDM Benefits. However, these projects are different from the project activity as they were commissioned prior to the Electricity Act, 2003 under a different investment climate. Accordingly, all four wind projects are considered as projects applying different technologies (in accordance with paragraph 9d of Additionality Tool) Therefore, all 37 projects identified in the determination of N_{all}, apply technologies different from the proposed project activity.

Therefore, N_{diff} = 37

[36] http://cdm.unfccc.int/UserManagement/FileStorage/IUJ83S21V4W0GORLPHMFN95XT7ADQE

[37] http://cdm.unfccc.int/Projects/DB/RWTUV1200565962.09/view

[38] Indian Windpower directory

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

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

[41] Source, Directory Indian Wind Power, dated August,2010 & MEDA Website – Investor list for Wind Projects http://www.mahaurja.com/PG_WE_Overview.html

[42] http://mnre.gov.in/schemes/grid-connected/biomass-powercogen/

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

[44] http://www.eai.in/ref/ae/oce/oce.html

Step 4: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity

F= 1 – 37/37 = 0
As per the Additionality Tool, 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.

As the factor F has been calculated to be 0(less than 0.2), and Nall – Ndiff = 0, the proposed project activity is not in common practice.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

As per the approved consolidated Methodology ACM0002 (Version 20.0) para 39:

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 (tCO_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" (tCO_2/MWh)

As per methodology, combined grid emission factor as per the "Tool to calculate the emission factor for an electricity system" version 07 is calculated as below.

CO_2 Baseline Database for the Indian Power Sector, Version 15, Dec 2019[45] 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;

[45] https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver15.pdf

(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 August 2006, 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	Tamil Nadu
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Telangana
Punjab	Andaman & Nicobar	Maharashtra	Nagaland	Puducherry
Rajasthan		Goa	Tripura	Lakshadweep
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)

	2014-15	2015-16	2016-17	2017-18	2018-19
India	**16.8%**	**15.1%**	**14.6%**	**14.3%**	**14.5%**

Data Source: Central Electricity Authority (CEA) database Version 15, Dec'2019[46]

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 (tCO_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 PD 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) (incl. Imports)			
	2016-17	**2017-18**	**2018-19**
INDIAN Grid	916,278	960,693	995,957

Simple Operating Margin (tCO_2/MWh) (incl. Imports)			
	2016-17	**2017-18**	**2018-19**

[46] https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver15.pdf

INDIAN Grid	0.9636	0.9543	0.9685

Weighted Generation Operating Margin	
INDIAN Grid	**0.9622**[47]

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 PD 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 PD and is fixed for the entire crediting period.

Build Margin (tCO_2/MWh) (not adjusted for imports)	
	2018-19
INDIAN Grid	**0.8811**[48]

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 ($EFgrid_{,CM,}y$) is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

[47] https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver15.pdf

[48] https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver15.pdf

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. Since project activity is of wind power generation, the above weightage has been considered for OM and BM.

Therefore, $EF_{grid,CM,y}$ = 0.9622 * 0.75 + 0.8811 * 0.25
= 0.9419 t CO_2/MWh

Note: The Quantity of net electricity generation that is produced and fed into the grid is represented as $EG_{PJ,y}$. However in the registered PDD the same had been represented as $EG_{facility,y}$. So in order to maintain the consistency $EG_{facility,y}$ has been used in the PDD Version 07.

B.6.2. Data and parameters fixed ex ante

Data/Parameter	**$EF_{grid,BM,y}$**
Data unit	tCO_2/MWh
Description	Build Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 15, Dec 2019[49]
Value(s) applied	0.8811
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07" as per the latest data available for the most recent year 2017-18. The data is obtained from "CO_2 Baseline Database for Indian Power Sector" version 15, 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.

[49] https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver15.pdf

Data/Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 15, Dec 2019[50]
Value(s) applied	0.9622
Choice of data or measurement methods and procedures	Calculated as the last 3 year (2016-17, 2017-18, 2018-19) generation-weighted average, sourced from Baseline CO_2 Emission Database, Version 15.0, Dec 2019 published by Central Electricity Authority (CEA), 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	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 15, Dec 2019[51]
Value(s) applied	0.9419
Choice of data or measurement methods and procedures	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* (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 (%) = 75% 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

Ex-ante calculation of emission reductions is equal to ex-ante calculation of baseline emissions as project emissions and leakage are nil.

Baseline emission factor (Combined Margin) ($EF_{grid,CM,y}$)
= 0.9419 tCO_2e/MWh

Annual electricity supplied to the grid by the Project ($EG_{PJ,y}$)
= 25.5 MW (capacity) * is 20.16 %(PLF) * 8760(hours)
=45033 (MWh)

Annual Baseline Emissions Reduction:

$ER_y = EF_{grid,CM,y} * EG_{PJ,y}$
= 0.9419 tCO_2e/MWh * 45,033 MWh
= 42,416tCO_2e/year

Leakage emissions

[50] https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver15.pdf
[51] https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver15.pdf

Not applicable as per ACM 0002 version 20

Project activity emissions

The Project activity does not envisage any fossil fuel consumption. Therefore, the parameter $PE_{FF,y}$ = 0 tCO_2e/ annum. Also, as the proposed CDM Project activity is not a geothermal project activity or a hydro project activity, hence, the Project emissions as per parameters $PE_{GP,y}$ and $PE_{HP,y}$ are also zero.

Therefore, PE_y = 0 tCO_2e/annum

According to equation (7), overall emission reductions (ER_y) are,

$$ER_y = BE_y - PE_y - LE_y$$
$$= 42416 - 0 - 0$$
$$= 42416\ tCO_2e$$

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)
Year 1*	42,416	0	0	42,416
Year 2	42,416	0	0	42,416
Year 3	42,416	0	0	42,416
Year 4	42,416	0	0	42,416
Year 5	42,416	0	0	42,416
Year 6	42,416	0	0	42,416
Year 7	42,416	0	0	42,416
Total	**296,912**	**0**	**0**	**296,912**
Total number of crediting years	**7**			
Annual average over the crediting period	42,416	0	0	42,416

* Year 1 represents first year of second crediting period and Year 1 represents period from 27 December 2020 to 26 December 2027. Same approach is applicable for remaining periods.

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{PJ,y}$ or $EG_{facility,y}$
Data unit	MWh/year
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)
Source of data	MSEDCL reports on energy delivered at MSEDCL grid (Credit Notes)
Value(s) applied	45,033 MWh/year

Measurement methods and procedures	The net electricity supplied to the grid is the basis for estimating emission reductions from the project activity. The power generated by each WEG is stepped up via a step-up transformer and fed into the 33 kV Feeder line. Power from WEGs of other project activities is also fed in the same 33 kV feeder line. This common feeder line culminates at the 33 kV/220 kV substation, where the joint-metering is done on monthly basis. A Main Meter and Check Meter of 0.2 accuracy class are connected to individual feeders at the sub-station where all the WEGs (including that of the project activity) are connected. Electricity exported and imported from each feeder (measured by main meter and check meter) is recorded on a monthly basis by MSEDCL officials and representatives of the project promoter (O&M contractors). Based on this monthly recording, MSEDCL carries out an apportioning to calculate the net electricity supplied by the project activity WEGs to the grid. The net electricity supplied to the grid is calculated as follows: Net Electricity supplied to the grid by Project Activity **=** Total electricity exported by project activity - Total electricity imported by project activity The total electricity exported and imported by the project activity WEGs is determined based on the apportioning procedure and in the measurement methods and procedures for the parameters $EG_{y, Export}$ and $EG_{y\ Import}$ The apportioning procedure is under control of state electricity board and PP do not have any control on it. Thus values of above parameters may or may not available with PP. PP have the data of net electricity supplied to grid and same parameter is used for emission reduction calculations. Hence single parameter of net electricity supplied to grid as per Credit Note issued by the state utility MSEDCL (Maharashtra State Electricity Distribution Company Limited) is considered as monitoring parameter as per methodology requirement. Please refer section B.7.3 for apportioning procedure followed by state electricity board.
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	Calibration of the main and check meters will be carried out on an annual basis. Meters of accuracy class 0.2 would be used for main meters and check meters. Net electricity generation values recorded in reports issued by MSEDCL on energy delivered at MSEDCL grid (credit notes) will be cross-checked against payments received from MSEDCL against invoices raised by the project proponent for sale of electricity. Administrative charges would be deducted by MSEDCL from the payments against sale of electricity in accordance with the PPA.
Purpose of data	To monitor baseline emissions
Additional comment	Data will be kept for two years beyond each crediting period.

B.7.2 Sampling plan

Not Applicable

B.7.3 Other elements of monitoring plan

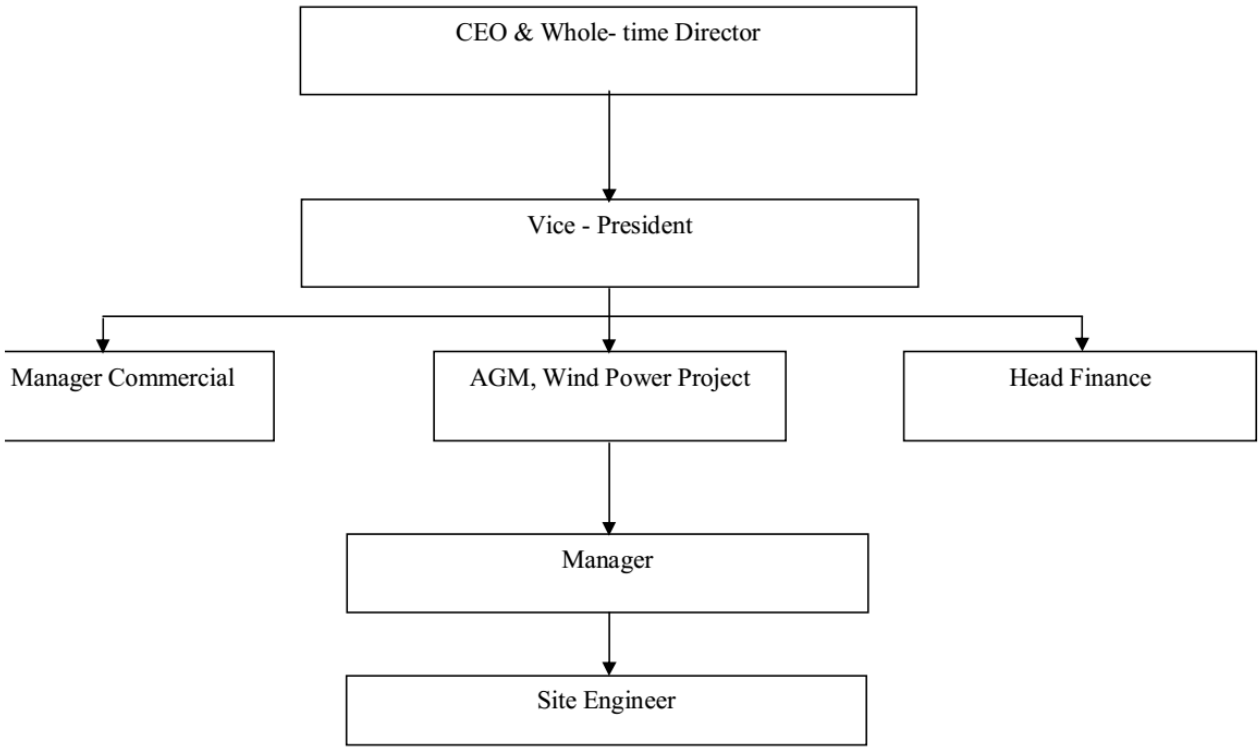
The purpose of the monitoring plan,is to define the organizational structure of the monitoring team, monitoring practices, QA and QC procedures and archiving procedures. The monitoring plan will ensure that the emission reductions from the project activity are reported accurately and transparently.

Roles and Responsibilities of the Monitoring Team

The responsibility of project management as well as monitoring, measurement and reporting lies with HZL. The project proponent has formulated a Monitoring Team to ensure proper and continuous monitoring of the emission reductions as well as performance of turbines and generation of power.

To ensure trouble free operation of all the wind turbines, HZL has entered into a comprehensive Operation and Maintenance agreement with the manufactures of the turbines. The contractor, Suzlon Infrastructure Limited, would be responsible for the operation and maintenance of the WTGs. The O&M personnel are qualified engineers and are trained at the WEG manufacturing facility of Suzlon Infrastructure Limited.

The monitoring will interact with the O&M contractors as well as the State Utility officials for executing the monitoring plan. The structure of the Monitoring Team is as follows:



The site engineer from HZL shall supervise the wind power plant operations under the guidance of the Manager. The Site Engineer of HZL will also interact with the O&M contractors and ensure that the WTG generation reports and JMR statements are forwarded to the Manger for review and electronic archiving. The O&M contractors would be responsible for forwarding monitoring data to Manager of HZL. The Manager would review the monitoring records and suggest corrective action as and when required. The Manager – Commercial will ensure that records of payments for sale of electricity to the sate utility are maintained and archived electronically. HZL management have a CDM review meeting on a bi-annual basis for review of the emission reductions and performance of the project activity

Metering Arrangements and Procedures

The general conditions set out for metering, recording, meter readings, meter inspections, Test & Checking and communication shall be as per the PPA (power purchase agreement). The electricity exported from the sub-station will be metered using electronic TOD meters. A main and check meter of 0.2 accuracy class would be installed for every feeder at the sub-station of the state electricity board. On a monthly basis, a joint meter reading will be carried out in the presence of the state electricity board officials and representatives of the project promoters.

The WTGs will be connected to different feeders, and each feeder will have a corresponding metering point at the sub-station. Each feeder would have several WTGs connected to it, some of which may not be part of the project activity. An apportioning procedure would be carried out to calculate electricity exported from the HZL project activity. This procedure is described below.

Apportioning Procedures for calculation of Net Electricity Exported from Project Activity

The net electricity exported to the grid by project activity is recorded in JMR statements. The main billing meter at substation records total export, and total import by all the connected WTGs to the particular feeder. Additionally, the O&M contractors maintain records of the electricity generation from individual WTGs which is monitored through the SCADA system. This data is used for the apportioning of electricity export and import to individual WTGs. The electricity export and import by the WTGs of HZL is calculated by using the following formulae.

- Total Electricity exported by Project activity = (Total electricity generated by the project proponent's WTGs (Y) / Total electricity generated by all WTGs connected to the same feeder (X))*(Total electricity exported from the feeder at the sub-station (A))
- Total Electricity imported by Project activity = (Total electricity generated by the project proponent's WTGs (Y) / Total electricity generated by all WTGs connected to the same feeder(X))*(Total electricity imported by the feeder at the sub-station(B))
- Net Electricity exported by Project Activity **=** Total electricity exported by project activity (A)
  - Total electricity imported by project activity (B)

The above apportioning procedure is under control of state electricity board and PP do not have any control on it. Thus values of above parameters may or may not available with PP. PP have the data of net electricity supplied to grid and same parameter is used for emission reduction calculations. Hence single parameter of net electricity supplied to grid as per credit note is considered as monitoring parameter as per methodology requirement.

Quality control and Quality Assurance procedures:

Calibration Procedures:

Main meters and check meters are installed for monitoring the energy exported. The main and check meters shall be calibrated on an annual basis with reference to a portable standard meter. The meters shall be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2 accuracy class. The data registered by the main meter alone will be adopted for the purpose of calculation as long as the error in the main meter is within permissible limits. If during the annual accuracy tests, the main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the limits, the main meter reading shall be considered as usual. However, the check meter shall be calibrated immediately. If the main meter is found to be beyond the permissible limits of error, but corresponding check meter is within limits, then the check meter reading shall be adopted for that period. The main meter shall be calibrated immediately.

Apportioning Procedures in case the dates of monitoring period do not match with billing cycle dates

The monitoring period for the project activity may start from a date that does not coincide with the date of the initial reading of the respective JMR statement. For instance the monitoring period may start on the 20th of the month whereas the JMR Statement may report the net electricity generation data from the first of the month to the first of the next month. In such a scenario, the net electricity generation data from the start of the monitoring period to the first date of the next month (the apportioning period) would be determined as follows:

$$\text{Apportioned Net Electricity Generation} = \text{Apportioning Ratio} \times \text{Net Electricity Generation as per JMR Statement}$$

The apportioning ratio would be determined as the ratio of the electricity generation at the WTG for the apportioning period to the electricity generation at the WTG for the entire period covered under

the JMR statement. This procedure would only have to be followed for the first and last month of the monitoring period if the start and end dates do not coincide with the date of the joint meter readings of the energy meters.

Data collection and archiving

The daily data on electricity generation from WTGs at the site is collected in electronic form. Monthly JMR statements are collected and maintained in hard copy, and archived electronically. The project proponent shall keep complete and accurate records of all the data as a part of monitoring for at least a period of 2 years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

28/03/2011
This date corresponds to the earliest date of placement of purchase orders for the project activity (purchase orders with Suzlon Infrastructure Services Ltd and Suzlon Energy Ltd.)

C.2. Expected operational lifetime of project activity

20 years, 0 months from the starting date of project activity

C.3. Crediting period of project activity

C.3.1. Type of crediting period

The project proponent has selected the renewable crediting period for the project activity.
Currently, the project is requesting the Renewal of 2nd Crediting Period.

C.3.2. Start date of crediting period

The project is applying for Renewal of 2nd Crediting Period. The start date of the new Crediting Period will be from 27/12/2020.

C.3.3. Duration of crediting period

7 years, 0 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

As per the Ministry of Environment and Forests (MoEF), Government of India notification S.O. 1533[52] dated September 14, 2006 regarding Environment Impact Assessment studies as per the Environment Protection Rule, 1986 (Published in the Gazette of India, Extraordinary, Part-II, and Section 3, Subsection (ii) Ministry of Environment and Forests), the project activity is not required to conduct an Environment Impact Assessment. The required clearance was obtained from the authorities as recommended by the procedures followed by the host government. The site does not involve any sensitive archaeological monuments as per the Archaeological Survey of India. No Historical and Cultural Monuments have been affected due to project location.
There are no negative environmental impacts that are envisaged due to the project activity. The following are the positive impacts due to the project activity.

[52] Reference : http://envfor.nic.in/legis/eia/so1533.pdf

- *Impact on air and water*: Wind energy is a form of renewable electricity generation; hence there would be no release of GHG into the atmosphere. Also as there is no fuel used for electricity generation no effluents or solid waste (such as ash) are generated.
- *Socio economic impact:* The project activity helps create demand for skilled and unskilled manpower in the region. The project will be providing employment opportunity to not only during the construction phase, but also during its operational life time. The project activity improves employment rate and livelihood of local populace in the vicinity of the project.

Moreover, the project generates eco-friendly, GHG free power, which contributes to sustainable development of the region.

D.2. Environmental impact assessment

The project activity i.e. electricity generation from wind, clean and green source of power will result in no negative impact on environment. Further as per the applicable regulation, the implementation of the wind park does not require an environmental impact assessment. The Ministry of Environment and Forests (MoEF), Government of India notification dated 1 December 2009 regarding the requirement of Environment Impact Assessment (EIA) studies states that any project developer in India needs to file an application to the Ministry of Environment and Forests (including a public hearing and an EIA) in case the proposed industry or project is listed in a predefined list. Wind parks are not included in this list and thus an EIA is not necessary.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

The project activity being undertaken envisages the installation of a wind farm for supply to grid. The stakeholders for a project activity are defined as the public, including individuals, groups or communities, affected, or likely to be affected, by the proposed CDM project activity.

A meeting was organized by Suzlon Infrastructure Services Ltd. on 20/10/2011 at Shanimandal village, Nandurbar district, Maharshtra to inform the local stakeholders about the project activity and discuss their concerns, if any, regarding the project activity. Local stakeholders including Sarpanchs and residents of the neighbouring villages were invited to the meeting through a public notice and personal invitations.

The agenda of the meeting was as follows:

- Welcome Speech
- Introduction to Climate Change and Clean Development Mechanism
- Views expressed by the villagers
- Interactive session with the stakeholders
- Vote of Thanks

The representatives of Suzlon Infrastructure Services Ltd. and the project proponent presented the salient features of the project activity to the stakeholders. The opinions expressed by the local stakeholders and the respective responses were recorded.

E.2. Summary of comments received

A summary of the comments and queries from the stakeholders are presented below along with the responses from the representatives of the project participants

Comment / Query from Stakeholder	Response from Representative of the Project Participant
We feel that more projects can be brought here. Can the number of projects be increased? (By Jitender Panwar)	With support given by villagers, state electricity board, and government officials, the number of wind turbines in the region can be

	increased.
Can electricity be supplied to the villagers and neighbourhood areas? (By Subhash Sawant)	The power generated will be transmitted to the state electricity grid. The state electricity board distributes the power to according to the amount of power at its disposal and the power demand.

E.3. Consideration of comments received

The stakeholders also acknowledged the socio-economic benefits of the project activity including improved infrastructure in the region, and employment opportunities for local residents.

Appendix 1. Contact information of project participants

Organization name	Hindustan Zinc Limited
Country	India
Address	CPP-CLZS, Chanderiya lead zinc smelter,Putholi, Chittorgarh-312021, Rajasthan
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E-mail	V.Jayaraman@vedanta.co.in
Website	-
Contact person	Mr. V. Jayaraman

Organization name	EKI Energy Services Limited
Country	Australia
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Telephone	91-9584461638
Fax	-
E-mail	naveen@enkingint.org
Website	-
Contact person	Mr. Naveen Sharma

Appendix 2. Affirmation regarding public funding

There is no public funding from parties included in annex I in the said project activity

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 to section B.6.1 of the PDD.

Appendix 5. Further background information on monitoring plan

Please refer section B.7.3 for information on monitoring plan.

Appendix 6. Summary report of comments received from local stakeholders

Please refer section E.1 & E.2 of the PDD.

Appendix 7. Summary of post-registration changes

Not Applicable

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Document information

Version	*Date*	*Description*
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 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: • 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; • Make editorial improvement.

Version	*Date*	*Description*
05.0	25 June 2014	Revision to: • 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)); • 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 Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
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 Initial adoption.

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