	Project design document form (Version 11.0)
BASIC INFORMATION	
Title of the project activity	21 MW Wind energy farm at Palladam, TamilNadu by HZL[1]
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	05
Completion date of the PDD	14/12/2020
Project participants	M/s Hindustan Zinc Limited (India) EKI Energy Services Limited (Australia)
Host Party	India
Applied methodologies and standardized baselines	**Methodology:** ACM0002 (Version 20.0[2]) Consolidated baseline methodology for grid-connected electricity generation from renewable sources **Standardized Baseline:** Not Applicable
Sectoral scopes	1 : Energy industries (renewable - / non-renewable sources)
Estimated amount of annual average GHG emission reductions	43,317 tCO_2e

[1] https://cdm.unfccc.int/Projects/DB/DNV-CUK1352807242.64/view

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

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

Hindustan Zinc Ltd. (HZL), a vertically integrated natural resources enterprise, headquartered at Udaipur, Rajasthan having broad operations ranging from exploration, mining, ore processing to smelting of nonferrous metals is the owner and project proponent of the proposed project activity.

Purpose of the 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 45,990 MWh annually) will displace equivalent electricity generation in grid connected power plants. The project activity will reduce the anthropogenic GHG emissions (approximately 43,317 tCO2 annually) associated with the equivalent amount of electricity generation from the fossil fuel based grid connected power plants

Measures Implemented within the Proposed Project Activity

The project activity involves installation and operation of fourteen Suzlon make 1.5 MW Wind Turbine Generators (WTGs) by Hindustan Zinc Limited (HZL) in the state of Tamilnadu. Out of these 14 WTGs, 03 are commissioned on 20/10/2011, 01 commissioned on 26/12/2011 and 10 are commissioned on 10/02/2012. The cumulative capacity of the project activity is 21.0 MW. The electricity generated from the project activity is exported to regional Grid.

Baseline Scenario:

The project activity is a Greenfield wind power project, supplying electricity to the fossil fuel dominated Indian Grid. In the absence of the project activity equivalent amount of electricity would have been generated in the Southern Grid (now 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[3]:

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 generates employment in the region during construction as well as operation of the project activity.
- It leads to generation of employment and development of the region.
- It augments power generation in the region that aids the local population.

Economic well-being

[3] http://www.envfor.nic.in/cc/cdm/criteria.htm

The CDM project activity should bring in additional investment consistent with the needs of the people.

- The project activity leads to additional business for equipment suppliers, O&M contractors, civil work contractors etc.
- It also leads to additional investment for the development of infrastructure in the region including roads, power infrastructure, transmission lines, 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 registered project activity reduces 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 registered project activity demonstrates the use of wind based electricity generation, which would serve as an example for other industries to replicate.

Further, the project proponent utilizes 2% of revenues from sale of CERs for sustainable development initiatives.

A.2. Location of project activity

Host Party: India

Region/State/Province etc.: Tamil Nadu

Villages: Suriyanallur, Kurukkapalayam, Nelali, Kozhumankuli, Kundadam, Uthiyur and Nandanvanapalayam,

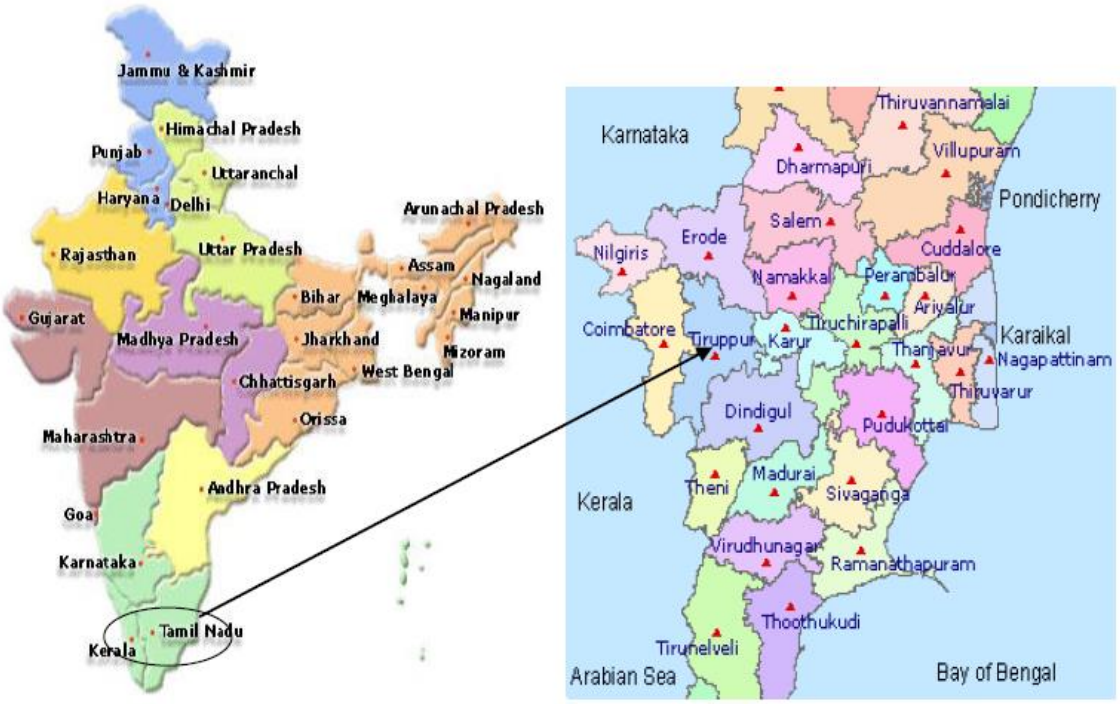
District: Thiruppur, State: Tamil Nadu

The project activity consists of fourteen 1.5 MW wind turbines in the district of Thiruppur in the state of Tamil Nadu, India. The specific geographical coordinates of the individual WTGs are as given below

Sr.No.	Village	WTG. No.	Latitude	Longitude
1	Suriyanallur	KD176	N10^{0}52’2.9”	E77^{0}27’31.8”

2	Suriyanallur	KDE80	N10^{0}54'7.8"	E77^{0}29'11.2"
3	Kurukkapalayam	TAY52	N10^{0}56'12.0"	E77^{0}29'7.2"
4	Nelali	TAY54	N10^{0}55'34.0"	E77^{0}28'46.5"
5	Nelali	KDE84	N10^{0}54'35.0"	E77^{0}29'27.6"
6	Kozhumankuli	TAY29	N10^{0}52'26.0"	E77^{0}29'30.2"
7	Kundadam	Q165	N10^{0}51'43.3"	E77^{0}25'52.6"
8	Kundadam	Q132	N10^{0}52'57.4"	E77^{0}24'51.9"
9	Kundadam	Q133	N10^{0}52'58.2"	E77^{0}25'11.3"
10	Uthiyur	KDE92	N10^{0}54'21.7"	E77^{0}30'22.5"
11	Nelali	TAY46	N10^{0}55'38.7"	E77^{0}29'38.1"
12	Nelali	TAY48	N10^{0}55'38.5"	E77^{0}29'59.3"
13	Nelali	TAY47	N10^{0}51'9.5"	E77^{0}23'57.6"
14	Nandanvanapalayam	KD112	N10^{0}55'18.7"	E77^{0}30'2.1"

The location of the project activity is delineated in the maps below:



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:

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
Swept 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

Technology Transfer:

No technology transfer from other countries is involved in the project.

Plant Load Factor:

The expected plant load factors for the project activity as determined by independent third party assessments are as follows:

The expected plant load factor for the project activity as determined by Power & Energy Consultants, a third party engineering and consultancy firm, is 25%. The plant load factor is applied in accordance with paragraph 3(b) of the "Guidelines for the reporting and validation of plant load factors" for ex-ante estimation of emission reductions.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of India (Host Country)	M/s. Hindustan Zinc Limited (Private Entity)	No
Australia	EKI Energy Services Limited	No

A.5. Public funding of project activity

No public funding from parties included in Annex – I is involved in the project activity. The project proponent hereby confirms that there is no divergence of Official Development Assistance (ODA) to the project activity.

A.6. History of project activity

The project activity involves installation and operation of fourteen Suzlon make 1.5 MW Wind Electric Turbine (WTGs) by Hindustan Zinc Limited (HZL) in the state of Tamil Nadu. Out of these 14 WTGs 03 are commissioned in October 2011, 01 is commissioned in December 2011 and 10

are commissioned in February 2012. The cumulative capacity of the project activity is 21.0 MW. The electricity generated from the project activity will be exported to regional Grid.

Currently the Project Activity has applied for the renewal of the 1st Crediting Period.

PP confirms that "The proposed CDM project activity is not a project activity that has been deregistered"

Also, the project participants declare that

a) This CDM project activity was not a CPA that has been excluded from a registered CDM PoA;

b) There is no any registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired exists in the same geographical location as the current CDM project activity. This current CDM project activity has a valid crediting period.

A.7. Debundling

Not applicable

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

Title of the approved baseline and monitoring methodology: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

Reference: ACM0002, Version 20.0, Sectoral Scope: 01

https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG

The following tools and guidance's have been followed (References):

1. Tool to calculate the emission factor for an electricity system (Version 07.0)
2. Tool for the demonstration and assessment of additionality (Version 06.0.0)

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 capacity of 21.0 MW which qualifies 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,	The project activity is an installation of a new grid connected renewable energy wind power plant and hence

	geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit	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 operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity	The project activity does not involve any capacity additions, retrofits or replacements and therefore this condition is not applicable.
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.
Q q5	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.

In addition, the applicability conditions included in the tools referred to below apply[4]: -

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.
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.

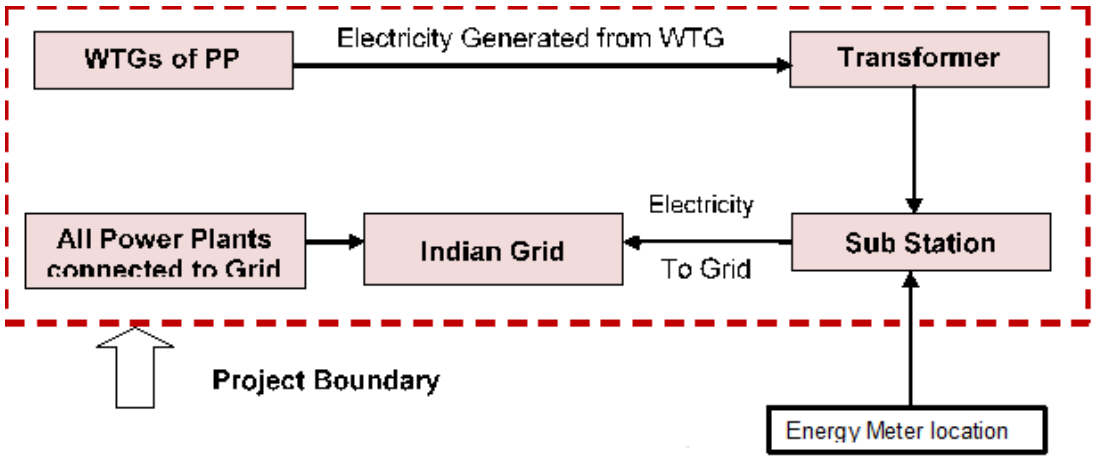
[4] The condition in "TOOL02: Combined tool to identify the baseline scenario and demonstrate additionality" that all potential alternative scenarios to the proposed project activity must be available options to project participants; does not apply to this methodology, as this methodology only refers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

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.

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

According to the applicable methodology, spatial extent of this project activity includes the project site and all the power plants connected physically to the electricity system that the CDM power project is connected to. The project activity is connected to the network of state transmission utility which falls in Indian grid. Thus, the project boundary includes all the power plants physically connected to the Indian grid.

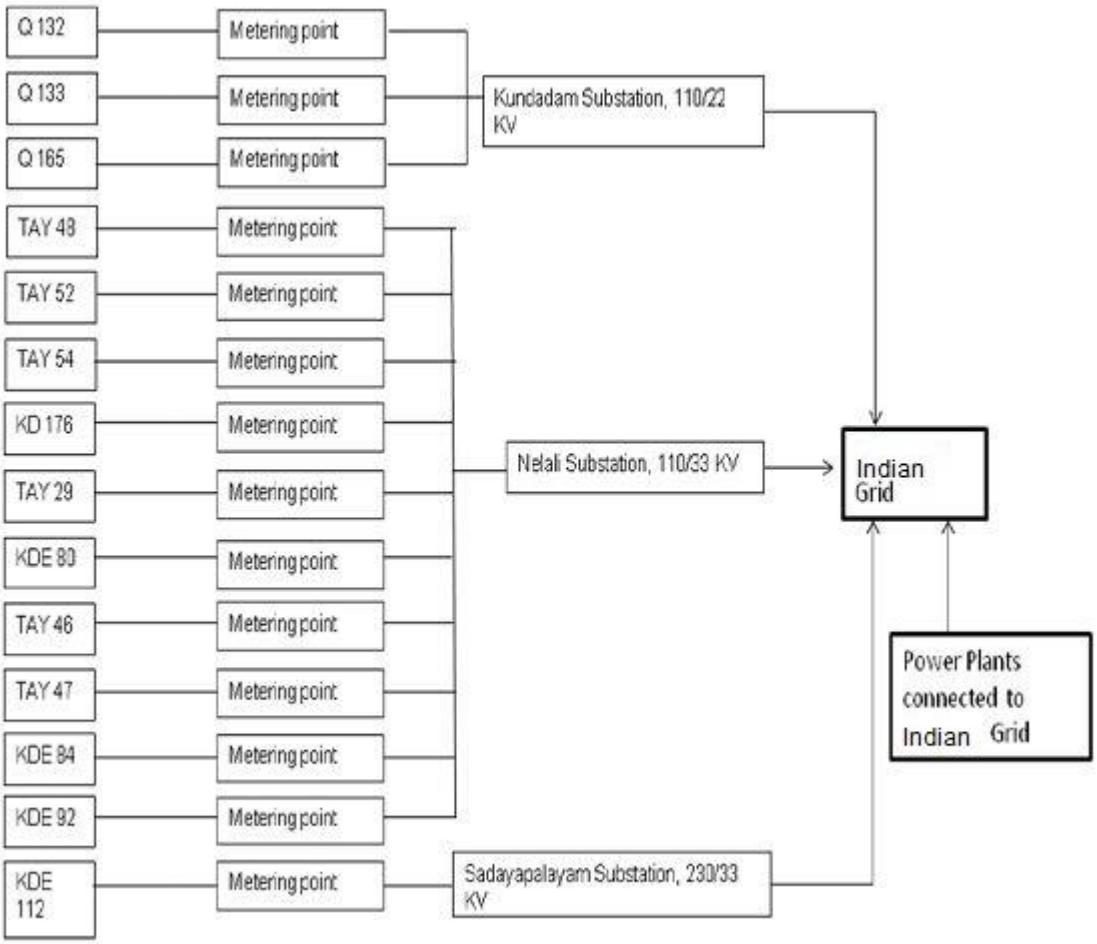
Flow diagram of the project boundary:



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 Indian grid which in turn would be Indian Grid 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.



The details like metering points and metering locations are under state electricity board and PP do not have any control on it. Thus meters, meter details and their location may change in future.

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 31.03.2019, consisting of 226,279.34 MW Thermal, 77,641.63 MW Renew,45,399.22 MW Hydro and 6,780 MW Nuclear. Sector-wise details of installed capacity are shown in Table 1. However, it is evident from Table 1[5] 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

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

[5] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

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[6] 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.

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 Indian Grid has not

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

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 Indian 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.

As per the CEA database version 15, 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 ($EF_{grid,y}$ or $EF_{grid,CM,y}$) 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
$EF_{grid,y}$ or $EF_{grid,CM,y}$	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	Build margin for year 2018-19 sourced from Baseline CO_2 Emission Database, Version 15.0, Dec 2019 published by Central Electricity Authority (CEA), Government of India

B.5. Demonstration of additionality

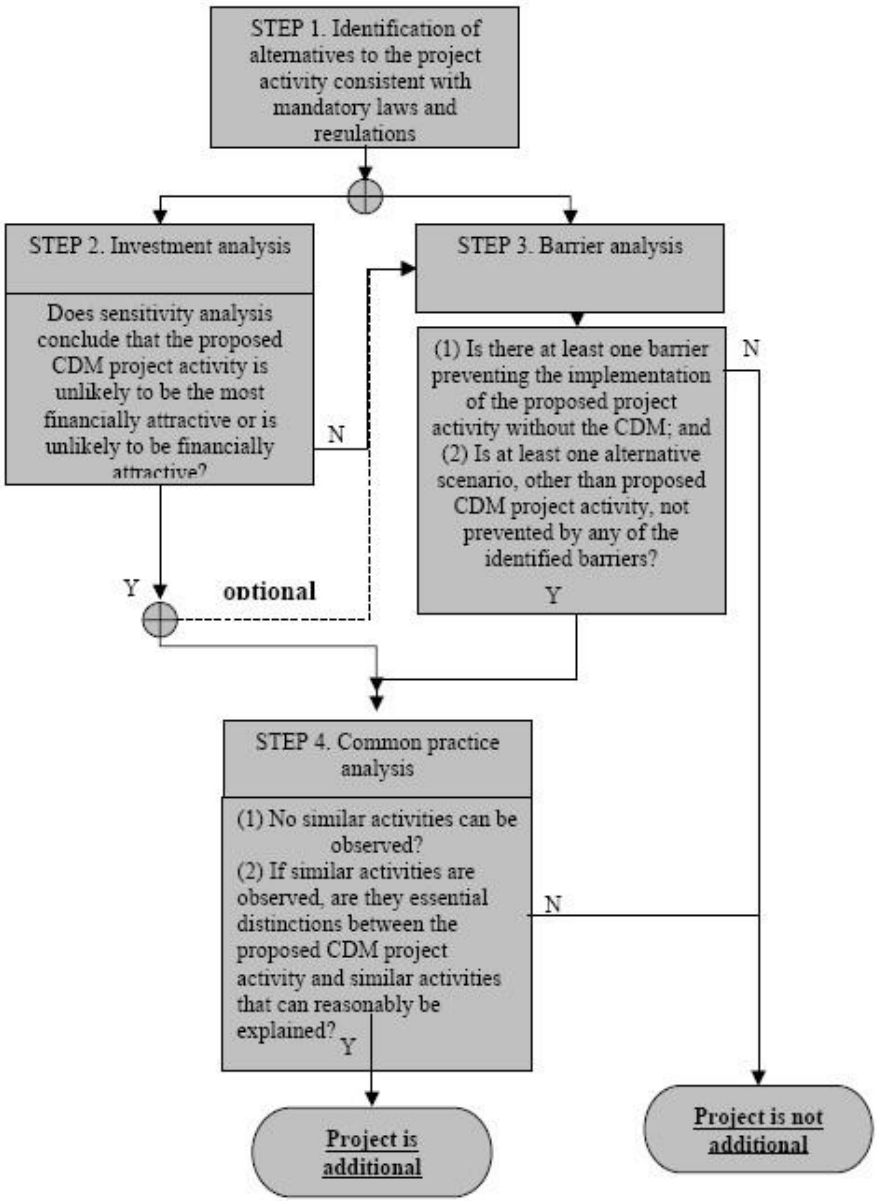
In accordance with "Guidance on the demonstration and assessment of prior consideration of the CDM" Version 3, since the start date of the project activity falls after 02 August 2008, the project participant is required to inform the host party DNA and UNFCCC Secretariat in writing of the commencement 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 02/09/2011 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.

Further, the chronology of events furnished below evidences continuing and real action was taken to secure CDM status for the project in parallel with its implementation:

Techno-commercial offer for supply of equipment for proposed HZL wind power projects, terms of O&M Services along with details of specifications of S-82 model of 1500 kW capacity	04/12/2010
Purchase order for WTGs (start date of the project)	28/03/2011
Agreement between HZL and Suzlon Infrastructure Services Limited (SISL) for construction works related to project	28/03/2011
Agreement between HZL and SISL for O&M services	28/03/2011
Prior consideration of CDM Form submitted to UNFCCC & MoEF (Indian DNA)	02/09/2011
Local Stakeholder Consultation Meeting notice in English and Tamil newspapers dated	02/09/2011
Stakeholder Consultant process	12/09/2011
Power Purchase Agreement (PPA) 4 nos.	30/09/2011
Site specific Wind resource assessment report issued by Power & Energy Consultants	20/10/2011
Commissioning of 03 WTGs	20/10/2011
Commissioning of 01 WTGs	26/12/2011
Power Purchase Agreement (PPA) 10 nos.	10/02/2012
Commissioning of 01 WTGs	10/02/2012
Host Country Approval	14/09/2012

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 06.0.0.



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 Indian 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, no further analysis is required. The baseline alternative identified is continuation of the current situation (no project activity or other alternatives undertaken), in which case electricity delivered to the grid by the project activity would have been generated by the operation of grid-connected power plants and by the addition of new generation sources.

Sub-step (1b): Enforcement of applicable 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.
- 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 06.0.0) 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 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:

$Ke = Rf + \beta \times (Rm - Rf)$

where:

Ke = Rate of return on equity capital;

Rf = Risk-free rate of return;

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

Rm – Rf = Market risk premium;

Risk free rate:

The risk free rate is understood as the rate of return on an asset that is theoretically free of any risks. Therefore the weighted average yield of Government of India Securities are considered as risk free rate determined at the time of project start. This data is published by Reserve Bank of India. The latest risk free rate available at the time of decision making was for the year 2009-10 (20 years maturity period has been taken to be conservative) published on 12th November 2010 by RBI.

The applicable risk free rate is 8.30%.

(Reference: http://www.rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=11731)

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[7] 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, Rm = 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% – 8.30% = 7.57%.

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

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

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.

The Beta value taken for this analysis is based on the beta values of the listed power producing companies engaged in similar business as the project activity at the time of investment decision estimated by regressing monthly returns on stock against local index, using 5 years[8] of data. The equity beta values have been taken from BSE. 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. 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 15.27% 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	CAPM
BSE 100	0.9304	15.81%
BSE 200	0.9201	15.27%
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 15.27% on a conservative basis.

[8] 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',

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

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

Furthermore, in accordance with the Guidelines on the Assessment of Investment Analysis', EB 51, Annex 58, para and Guidance 16, which 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." And therefore, benchmark analysis is applied to the project activity.

The project proponents have hence identified post tax Post Tax Equity IRR as the most appropriate financial indicator for the project as the actual interest payable is taken into account in the calculation of income tax in the estimation of the IRR and carried out an investment analysis of the project activity in accordance with the Guidance on the Assessment of Investment Analysis Version 03.

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

Capacity			
Project Size	21.0	MW	Techno-commercial offer from Suzlon dated 04/12/2010
Total Project Cost	1251.89	INR (x10 Million)	Techno-commercial offer from Suzlon dated 04/12/2010
Means of Finance			
Debt (0%)	0	INR (x10 Million)	Investment decision
Equity (100%)	1251.89	INR (x10 Million)	Investment decision
Total Project Cost	1251.89	INR (x10 Million)	Techno-commercial offer from Suzlon dated 04/12/2010
Operating Parameters			
Plant Load Factor	25.00	%	Wind Resource Assessment Report by Power and Energy consultants received 20/10/2011 (Conservative in comparison to PLF based on Techno-commercial offer from Suzlon dated 04/12/2010)
Life of the WTG	**20**	**Years**	WTG technical specifications
Operation & Maintenance Cost			
O & M Cost Exemption	2.00	Years	Techno-commercial offer from Suzlon dated 04/12/2010
O & M Cost	1.425	INR Million/WTG	Techno-commercial offer from Suzlon dated 04/12/2010
O & M escalation	5.0	%	Techno-commercial offer from Suzlon dated 04/12/2010

Tax on OMS	10.30	%	Techno-commercial offer from Suzlon dated 04/12/2010
Insurance cost			
Insurance Cost	0.11	INR Million/WTG	Insurance costs incurred in previously commissioned wind power projects
Depreciation Rate			
Yearly book depreciation	5.28%	%	As per Companies Act[9]
Yearly tax depreciation	7.69%	%	As per IT Act[10]
Tax			
Income tax rate	33.22%	%	As per IT Act[11]
Minimum Alternate Tax	19.93%	%	As per IT Act
Tariff			
Tariff	3.39	INR	Tamil Nadu tariff order dated 20/03/2009
GBI	0.5	INR / kWH	http://mnre.gov.in/file-manager/UserFiles/faq_wind.pdf

Using the assumptions in the table above, the post-tax equity IRR for the project activity works out to be 7.88%, calculated in accordance with the "Guidance on the Assessment of Investment Analysis" Version 03, which clearly depicts the fact that the project activity is not very attractive as an investment option since the returns are much below the selected benchmark.

Sub-step 2d: Sensitivity analysis:

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:

S. No.	Parameter	Variation	IRR without CDM
1.	PLF	+ 10 %	9.45%
		- 10 %	6.27%
2.	Tariff rate	+10 %	9.43%
		-10 %	6.28 %
3.	O&M Cost	+10%	7.62%

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

[10] http://law.incometaxindia.gov.in/DIT/File_opener.aspx?page=ITRU&schT=rul&csId=2f13c0bd-dec4-4df6-a273-431e3b91a01b&rNo=&sch=&title=Taxmann%20-%20Direct%20Tax%20Laws

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

		-10 %	8.13%
4.	Project Cost	+10%	6.40%
		-10 %	9.65%

Further, the variations in critical parameters required for the equity IRR to attain the benchmark rate of returns are tabulated below.

S. No.	Parameters	Variation for IRR with out CDM revenue to attain benchmark
1.	PLF	49%
2.	Tariff rate	50%
3.	O&M Cost	-375%
4.	Project Cost	-32%

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

- The actual average PLF for the project activity since the time of commissioning has remained below the PLF considered for the investment analysis (based on third party report). An increase of 49% is highly unlikely.
- The project proponent has entered into a power purchase agreement valid for 20 years. The tariff would not be varying further as the PPA has been signed.
- The equity IRR remains below the benchmark at no O&M costs (-100% of O&M costs considered) 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. Therefore any decrease in the investment cost is not possible.

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 21.0 MW capacity, the applicable output range for the identification of projects is 10.5 MW to 31.5 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, 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 Tamil Nadu.

Further, all types of power plants have been considered for the common practice analysis. The number of projects in the applicable output range of 10.5 MW to 31.5 MW has been identified, covering thermal, hydro, biomass & wind and other types of power plants. The Thermal & Hydro projects in the applicable range have been taken from CEA database version 6.0[12]. Registered CDM projects are also excluded from the analysis, for determination of N_{all}. There are 28 wind power projects in Tamil Nadu in the capacity range of 10.5 to 31.5 MW. Out of these 28, 27 projects are under the CDM Process as tabulated below.

Following is the result of this analysis[13]:

Technology Area	Projects in applicable capacity range	Projects excluding CDM projects in applicable capacity range, N(all)	N(diff)
Thermal	5	5	5
Hydro	25	25	25
Wind*	28	1	0
Nuclear	0	0	0
Solar	0	0	
Biomass	18	11	11
Tidal-Mechanical &Thermal	0	0	0
Geothermal	0	0	0
Total	76	42	41

Therefore, N_{all} = Thermal projects [14] + Hydro Projects [15] + Wind Projects [16] +Biomass projects[17]+Nuclear projects[18]+ Solar projects+ Geothermal & Tidal projects[19]

[12] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf

[13] Details of data collated and analysis done are provided to DOE for validation

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

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

[16] Source, Directory Indian Wind Power, dated August,2010

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

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

= 5+25+1+11+0+0+0+0

= 42

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 project and hydropower projects are different from the project activity (a wind based project) as they use different Energy source/fuel (para 9a of the Additionality Tool). Therefore, the five projects identified in the determination of N_{all}, apply technologies different from the proposed project activity.

Therefore, N_{diff} = 41

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 – 41/42 = 0.02

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 0.02 (less than 0.2), and $N_{all} – N_{diff}$ = 1, the proposed project activity is not in common practice.

Wind projects by individual investors in Tamil Nadu where the installed capacity is between 10.5 MW to 31.5 MW are presented in the table below:

Name of Owner	Total Capacity in Tamil Nadu (MW)	CDM	Weblinks and Explanation
Ambika cotton mills	15.4	Yes	PDD titled" Bundled Wind power project in Tamilnadu, India co-ordinated by the TamilNadu Spinning Mills Association (TASMA)" http://cdm.unfccc.int/Projects/DB/TUEV-SUED1173364563.43/view
Arvind A traders	19.35	Yes	PDD titled" 37.6 MW bundled wind power project in Nagercoil, Tamilnadu" http://cdm.unfccc.int/Projects/DB/DNV-CUK1174976416.26/view PDD titled" 16.45 MW bundled grid connected renewable energy project in Tamil Nadu, India" http://cdm.unfccc.int/Projects/Validation/DB/ABFMBRFUS8RHP90TSOL3MQ2K4PLTM5/view.html PDD titled" Bundled Grid Connected Wind Power Project from Tamilnadu, India" http://cdm.unfccc.int/Projects/Validation/DB/6YL2AXZ5ITKXD4XTHBG2B3TW9XW0DC/view.html
Bannari Amman Spinning Mills	23.4	Yes	1) PDD titled" STL Wind Power Project, India Version 02 September 2005" http://www.dnv.com/focus/climate_change/upload/version%202%

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

			20-%20pdd%20%20sept%2005.pdf
			2) PDD titled "Bannari Amman Spinning Mills Wind Power Project managed by Enercon (India) Ltd."
			http://cdm.unfccc.int/Projects/Validation/DB/FYPAQ52NJB35JZRDUIC0GVD36E6S33/view.html
Best & Co.	25	Yes	PDD titled" Bundled Wind power project in Tamil Nadu, India, co-ordinated by Tamil Nadu Spinning Mills Association (TASMA-II)"
			http://cdm.unfccc.int/Projects/Validation/DB/4R4NBZ8HU31NRZMNQAMH37GJN07926/view.html
CLP Windfarm Pvt. Ptd.	21.45	Yes	http://cdm.unfccc.int/Projects/Validation/DB/AHUI0REMO7Y5YXH4DKL26CAYNWPR2U/view.html
CPCL	17.6	Yes	PDD titled" 17.6 MW captive grid connected electricity generation from wind energy project by Chennai Petroleum Corporation Limited.
			http://cdm.unfccc.int/Projects/DB/BVQI1257245548.54/view
DCW limited	11.2	No	-
Grace Infrastructure (P) Ltd.	31	Yes	PDD titled" 31 MW Wind energy project in, India by Grace Infrastructure Pvt Ltd"
			http://cdm.unfccc.int/Projects/Validation/DB/FFZD3FVFDVCBV7VFLEO18LOFADFR7Z/view.html
Green Infra Wind Farms Ltd.	24	Yes	PDD titled "24 MW wind power project in Tamil Nadu, India"
			http://www.emergent-ventures.com/UploadedFiles/Catalogue/GIL_PDD.pdf
Integral Coach factory	10.5	Yes	http://cdm.unfccc.int/Projects/DB/RWTUV1289918552.25/view
Jayajyoti & Co. Ltd.	15	Yes	PDD titled" Bundled Wind power project in Tamilnadu, India co-ordinated by the TamilNadu Spinning Mills Association (TASMA)"
			http://cdm.unfccc.int/Projects/Validation/DB/0L0AS1GZWWW9I6J01GWYTQWF2TOV19/view.html
Jain Irrigation Systems Ltd.	13.2	Yes	PDD titled" 13.2 MW Wind Mill Power Project in Theni district of Tamil Nadu, by JISL-India"
			http://cdm.unfccc.int/Projects/Validation/DB/CTAB1JW6OXS0HR09NM29ZH3R43EETT/view.html
KPR Mills Pvt. Ltd.	19.27	Yes	PDD titled" 19.27 MW Grid connected wind electricity generation project by KPR Mills in Tamil Nadu. Version 02"
			http://cdm.unfccc.int/Projects/Validation/DB/KBAXDG75UAPOH4J4P20YB2AIQKM36G/view.html
			PDD titled" 19.8MW grid connected Wind farm project by K.P.R Mill Private Limited, Tamil Nadu, India at Villages: Keelaveeranam, Kuruchampatti, Vadi, Ayansurandi, Rajagopalaperi, District: Tirunelveli, Tamilnadu by M/s K. P. R. Mill Private Limited"
			http://cdm.unfccc.int/Projects/Validation/DB/AB7TO0OZGUKE6HYPB4TWCP5536AGVF/view.html
Lakshmi Machine Works Ltd.	27.95	Yes	PDD titled" 27.95 MW wind energy project in Coimbatore district in Tamilnadu, India"
			http://cdm.unfccc.int/Projects/Validation/DB/MFHV5EFC9PJIZQ16ZPUQ3ZYQ5JUBNI/view.html
Loyal textiles	20.45	Yes	PDD titled" 22.25 MW Captive Wind Power Project in Tamil Nadu"
			http://cdm.unfccc.int/Projects/Validation/DB/ED7XENPZW06ZNTMVUOXKGQXEGZMUZV/view.html
Muthoot Fincorp. Ltd.	18.75	Yes	1) PDD titled" 23.75MW grid connected electricity generation project at Tirunelveli in Tamil Nadu"
			http://cdm.unfccc.int/Projects/Validation/DB/JGFW5O1TPVDU1AANHSLX8UMW5900BF/view.html
			2) PDD titled" Wind based bundled renewable energy project, Tamilnadu, India"

			http://cdm.unfccc.int/Projects/Validation/DB/NL768PUSVEEJJWKRMJ52W0F1GGT8A2/view.html
NEG- Micon (I) Pvt. Ltd.	18.55	Yes	Bundled Project http://cdm.unfccc.int/Projects/DB/DNV-UK1174976416.26/view
Premier Mills Pvt. Ltd.	14.85	Yes	PDD titled" Grid connected renewable electricity generation project by M/s. Premier Mills Pvt Ltd in Tamilnadu, India" http://cdm.unfccc.int/Projects/Validation/DB/J0J2B6K3O92EEUAFD3OGYLE03TNZ7I/view.html
Paharpur cooling towers Ltd.	16.8	Yes	PDD titled" Wind energy based electricity generation project located at Manur and Vakaikulam, Tirunelveli district, Tamilnadu India" http://cdm.unfccc.int/Projects/Validation/DB/655DAB5QBOT3K7J584UPACWSUJVN3M/view.html
Powerica Ltd.	16.5	Yes	PDD titled" Wind power project at Tamilnadu by Powerica Limited" http://cdm.unfccc.int/Projects/Validation/DB/XIBTKKDPMONX9RG3T5ZNWM6GWRWMRL/view.html
Rasi Seeds (P) Ltd.	16.25	Yes	PDD titled" 40.68 MW grid connected electricity generation project by Indian Wind Power Association at Tirunelveli in Tamil Nadu http://cdm.unfccc.int/Projects/Validation/DB/1VD4I971NMFAB70C0LGFR01GV4RI4H/view.html
Sapthagiri Distilleries	28.5	Yes	PDD titled" 53.75 MW Bundled wind Power project in Tamil Nadu and Karnataka by KBD Group, India" http://cdm.unfccc.int/Projects/Validation/DB/ZSGOS9T3629EQQBKKJ8S3S5KQCSRP9/view.html
Shanmugaval mills	25.5	Yes	PDD titled" Bundled Wind power project in Tamilnadu, India co-ordinated by the TamilNadu Spinning Mills Association (TASMA)" http://cdm.unfccc.int/UserManagement/FileStorage/AE2042RXII12SBXNF29XDKVT2BCEWG PDD titled" Wind Energy Project in Tamilnadu, India – structured by Sri Shanmugavel Group" https://cdm.unfccc.int/UserManagement/FileStorage/PKTBRXYOZNMWGV4J9SDLIE3Q1FH75C
Shriram EPC Limited	15	Yes	http://cdm.unfccc.int/Projects/DB/RWTUV1310469708.36/view
Simran Wind Project Pvt. Ltd.	21	Yes	PDD titled" Grid connected wind energy project in Tamil Nadu by Simran Wind Project Private Ltd." http://cdm.unfccc.int/Projects/Validation/DB/IVRFOXG4PHX66FTOIH9AHHP55OHR4L/view.html
Tamil Nadu newsprint & Paper Ltd.	13.75	Yes	http://cdm.unfccc.int/Projects/DB/BVQI1323706561.41/view
TCS Textile Ltd.	19.8	Yes	PDD titled" 19.80 MW bundled wind energy project in Tirunelveli and Coimbatore districts in Tamilnadu, India." http://cdm.unfccc.int/Projects/Validation/DB/QCDOZFYAQ1NMKR2SATF56PMJNH0TIU/view.html

It can be seen that, without exception, all private investors in the state of Tamil Nadu with installations between 10.5 and 31.5 MW have developed these projects as CDM projects.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

As per the approved consolidated Methodology ACM0002, version 20.0:

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

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

Where:

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

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

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

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, December 2019 published by Central Electricity Authority (CEA), Government of India has been used for the calculation of emission reduction.

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

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

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

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

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

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

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

Step 1: Identify the relevant electricity systems

As described in tool "For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity systems". It also states that "If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used". Keeping this into consideration, the Central

Electricity Authority (CEA), Government of India has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern.

However since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this CO2 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

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 ($EF_{grid,OM\ Simple,y}$) 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**
INDIAN Grid	0.9636	0.9543	0.9685

Weighted Generation Operating Margin	
INDIAN Grid	**0.9622**

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.

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**

Step 6: Calculate the combined margin (CM) emission factor (EFgrid, 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.

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 CO2 emission factor in year y (t CO2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO2 emission factor in year y (t CO2/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}:

For wind project activities: W_{OM} = 0.75 and W_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the second crediting period and for subsequent crediting periods. Since project activity is of power generation by using wind, 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 tCO2/MWh

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[20]
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.

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[21]
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

[20] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf
[21] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

Description	Combined Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 15, Dec 2019[22]
Value(s) applied	0.9419
Choice of data or measurement methods and procedures	The combined margin emissions factor is calculated as follows: $\mathbf{EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}}$ 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) ($\mathbf{EF_{grid,CM,y}}$)

= 0.9419 tCO_2e/MWh

Annual electricity supplied to the grid by the Project ($EG_{PJ,y}$)

=45,990 MWh

As per para 41 of ACM0002 Version 20, If the project activity is the installation of a Greenfield power plant, then:

$$\boldsymbol{EG_{PJ,y} = EG_{facility,y}}$$

Where:

$EG_{PJ,y}$ = 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)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

Annual Baseline Emissions Reduction

$\mathbf{ER_y} = \mathbf{EF_{grid,CM,y}} * EG_{PJ,y}$

= 0.9419 tCO_2e/MWh * 45,990 MWh

=43,317 tCO_2e/year (Rounded down)

Project emissions = 0

Leakage = 0

$\mathbf{ER_y = BE_y - PE_y - LE_y}$

= 43,317- 0 - 0

= 43,317 tCO_2e

[22] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver15.pdf

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	43317	0	0	43317
Year 2	43317	0	0	43317
Year 3	43317	0	0	43317
Year 4	43317	0	0	43317
Year 5	43317	0	0	43317
Year 6	43317	0	0	43317
Year 7	43317	0	0	43317
Total	303219	0	0	303219
Total number of crediting years	7			
Annual average over the crediting period	43317	0	0	43317

Year 1 represents first year of second crediting period which starts from 01/12/2020 to 30/11/2021 and same approach follows for remaining years

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{PJ,grid,y}$ or $EG_{PJ,facility,I,y}$
Data unit	MWh/year
Description	Quantity of electricity generated and supplied by the project power plant to the grid in year y.
Source of data	Statements issued by TANGEDCO (Tamil Nadu Generation Distribution Company Limited) to the project proponent on electricity generation
Value(s) applied	45,990 MWh
Measurement methods and procedures	Statements issued by TANGEDCO to the project proponent on electricity generation will report the net electricity export to grid. Energy meters of 0.2 accuracy class provided at each WTG continuously measure the export as well as the import from the turbine at the project site. The net electricity exported shall be calculated by subtracting import from the export values measured for each WTG. The total net electricity exported by the project activity will be calculated as the sum of the net electricity exported from each WTG. Meter readings will be taken monthly by the representative of the TANGEDCO . The detailed monitoring plan and personnel responsible is described in section B.7.2.
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	The values can be cross checked with the invoice raised by the project proponent/ supplier to TANGEDCO for the electricity supplied to the southern grid (now Unified Indian grid). However, as per latest practise of Tamil Nadu Generation and Distribution Corporation Ltd., they have considered the Distribution Line Loss for calculating Net Generation. Hence, this has been considered in calculating the Emission Reduction.
Purpose of data	To determine Baseline Emissions
Additional comment	The data will be kept for two years after the crediting period or from last issuance.

B.7.2. Sampling plan

Not applicable

B.7.3. Other elements of monitoring plan

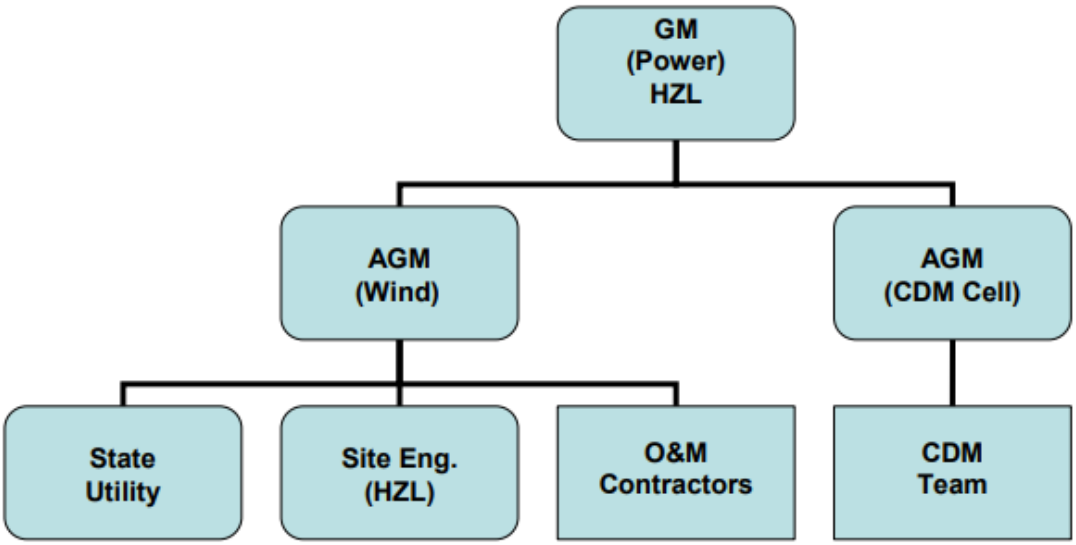
The purpose of the monitoring plan is to define the organizational structure of the monitoring team, monitoring practices, QA and QC procedures and archiving procedures. The monitoring plan will ensure that the emission reductions from the project activity are reported accurately and transparently.

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 WTG manufacturing facility of Suzlon Infrastructure Limited.

The monitoring team 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:



Monitoring Team	Roles & Responsibilities
General Manager (Power), HZL	• Communication with CDM EB • Communication with state utility
AGM (CDM Cell), HZL	• Overall coordination with monitoring team and DOE for verification activities • Maintaining data records, documentation and archiving

CDM Team	• Assisting the General Manager (Wind) with overall coordination and with maintaining data records, documentation, archiving etc.
AGM (Wind) HZL	• Coordinating with Site Engineer, O&M operators, and State Utility
Site Engineer, HZL	• Overseeing monitoring, operation and maintenance activities at site • Interacting with State Utility and O&M contractors for JMRs and calibration
O&M contractors	• Carrying out operation & maintenance of WEGs • Carrying out joint meter readings with state utility
State Utility	• Carrying out joint meter readings with representative of project proponent (O&M contractors) • Calibration of energy meters

Quality control and Quality Assurance procedures:

Calibration Procedures:

Energy meters are installed at each WTG for monitoring the energy exported and imported. The energy meters shall be tested for accuracy at least once in three years 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 energy meter will be adopted for the purpose of emission reduction calculation as long as the error in the main meter is within permissible limits. If the energy meter is found to be beyond the permissible limits of error, TANGEDCO officials shall be notified for rectification or replacement of the meter. The rectified / replaced energy meter would be calibrated.

Data collection and archiving

The daily data on electricity generation from WEGs 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 date of purchase orders for the project activity. .

C.2. Expected operational lifetime of project activity

20 years 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 for 2nd Crediting Period.

C.3.2. Start date of crediting period

01/12/2020

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 (Government of India) notification the project activity does not fall under the purview of the Environmental impact Assessment thus the project activity is exempted from the environmental clearances. It should be noted here that though EIA is not a regulatory requirement in India for wind energy projects.

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.

- *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 which 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[23] 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.

[23] As per the Environment Protection Rule, 1986 (Published in the Gazette of India, Extraordinary, Part-II, and Section 3, Sub-section (ii) MINISTRY OF ENVIRONMENT AND FORESTS)

http://envfor.nic.in/legis/eia/so1533.pdf

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 12/09/2011 at Palladam, 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 newspaper advertisement and a public notice.

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
Are coastal areas like Kanyakumari, Chennai at risk from global warming? Can something be done to mitigate the risk at the government level?	Yes, coastal areas are under risk from sea level rise. This is why it is imperative to mitigate greenhouse gas emissions through activities such as installation of renewable energy. Various initiatives have been taken including implementation of the Kyoto Protocol by the UNFCCC and by individual governments around the world.
What is the Kyoto Protocol?	The Kyoto Protocol is a legally binding agreement that arose out of the UNFCCC to tackle climate change through reduction of greenhouse gas emissions.
Do these projects affect rainfall?	No, such projects do not affect rainfall. The WTG is not higher than 80 meters and rainfall bearing clouds are at a much higher altitude.
Can the wind turbines affect groundwater in any manner?	No, the wind turbines do not have any effect on groundwater. The wind turbines capture the power of wind and convert it into electricity without any usage of water.

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

E.3. Consideration of comments received

There were no concerns raised by the local stakeholders. The potential benefits of the project activity for the local stakeholders were acknowledged.

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
Telephone	91-9928140302, +91-1472-2564801
Fax	+91-1472-256593
E-mail	V.Jayaraman@vedanta.co.in
Website	-
Contact person	Mr. Jayaraman V.

Organization name	EKI Energy Services Limited
Country	India
Address	Enking Embassy, Office no. 201, Plot 48 Scheme 78 part 2, Vijay Nagar, Indore, Madhya Pradesh 452010
Telephone	0731 428 9086
Fax	-
E-mail	naveen@enkingint.org
Website	https://www.enkingint.org/
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 section B.6.1 of the PDD for the same.

Appendix 5. Further background information on monitoring plan

The monitoring plan has been already explained in section B.7

Appendix 6. Summary report of comments received from local stakeholders

Not applicable

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.
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.

Version	*Date*	*Description*
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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