	Project design document form (Version 11.0)
BASIC INFORMATION	
Title of the project activity	Wind Power Project at Tadas, Karnataka
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	11
Completion date of the PDD	30/04/2020
Project participants	M/s ReNew Wind Energy (Karnataka) Private Limited
Host Party	India
Applied methodologies and standardized baselines	ACM0002: Grid-connected electricity generation from renewable sources- Version 20.0[1] (EB 105)
Sectoral scopes	Sectoral Scope : 1 Energy industries (renewable / non-renewable sources)
Estimated amount of annual average GHG emission reductions	89,075 tCO_{2e}

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

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

Introduction:

The project activity involves setting up of 63 numbers of Enercon make E-53, 800 kW Wind Turbine Generators (WTGs) by ReNew Wind Energy (Karnataka) Private Limited (RNWEKPL) at Tadas in Haveri & Darwada district of Karnataka, India. The total installed capacity of the project activity is 50.4 MW and Enercon (India) Limited is the supplier of WTGs for this project activity. The project activity is expected to generate 94,570 MWh of electricity per year. The net electricity generated from this project activity will be supplied to individual customers in the Southern grid (Now Indian Grid) through open access sale for first 10 years of operation to improve the financial viability of project. The model of power sale is group captive model. From 11 years onwards it is assumed that power will be sold to grid under preferential tariff till entire lifetime of project activity.

The Enercon make E-53, 800 kW WTGs are direct drive horizontal axis wind turbine with variable rotor speed. The hub heights of WTGs are 60 m/73 m and the rotor diameter is 52.9 meters. The project is environmentally safe as it uses renewable sources for electricity generation and also technologically sound as it uses latest advanced technology[2] with 3 independent pitch control systems with emergency power supply, rotor brake, and rotor lock.

The project activity is a grid connected renewable energy project that supplies electricity to the Southern grid, thus it comes under the sectoral scope Sectoral Scope[3]: 1 Energy industries (renewable / non-renewable sources)

Purpose of the Project activity:

The purpose of the project activity is to generate electricity using wind energy and to supply the net electricity generated to the individual customers in the Southern grid through open access sale. This would reduce the dependency on fossil fuels for electricity generation and reduce the Green House Gas (GHG) emissions that would have happened in a baseline scenario.

Scenario existing prior to the project activity:

The project activity involves the installation of 63 new WTGs of 800 kW each. The scenario existing prior to the implementation of the project activity is electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

Baseline scenario:

The baseline scenario for the project activity is identical to the scenario existing prior to the implementation of the project activity.

Contribution to Sustainable Development:

National CDM Authority (Indian DNA), Ministry of Environment & Forests, Government of India has stipulated the following indicators for sustainable development in the interim approval guidelines for CDM projects[4]:

Social well-being:

[2] https://www.enercon.de/home/

[3] https://cdm.unfccc.int/DOE/scopelst.pdf

[4] http://cdmindia.in/approval_process.pdp

Since, the project activity is in a rural area of Karnataka, it will help in the overall development of the region. The project activity will result in generation of direct and indirect employment opportunities for the local people residing in nearby villages of Tadas, both during construction and operation phases of the project activity.

Economic well-being:

The project will create a business opportunity for local stakeholders such as suppliers, manufacturers, contractors etc. in Tadas region of Karnataka.

Environmental well-being:

Since, the project uses wind as renewable source for power generation; it does not lead to any greenhouse gas emission. It will avoid the fossil fuel consumption in the Southern grid and in turn it will result in SOx, NOx particulate matter emission reduction.

Technological well-being:

The technology that is being used in the project activity is environmentally safe and sound. The project demonstrates harnessing wind power potential in Karnataka and encourages setting up such projects in near future.

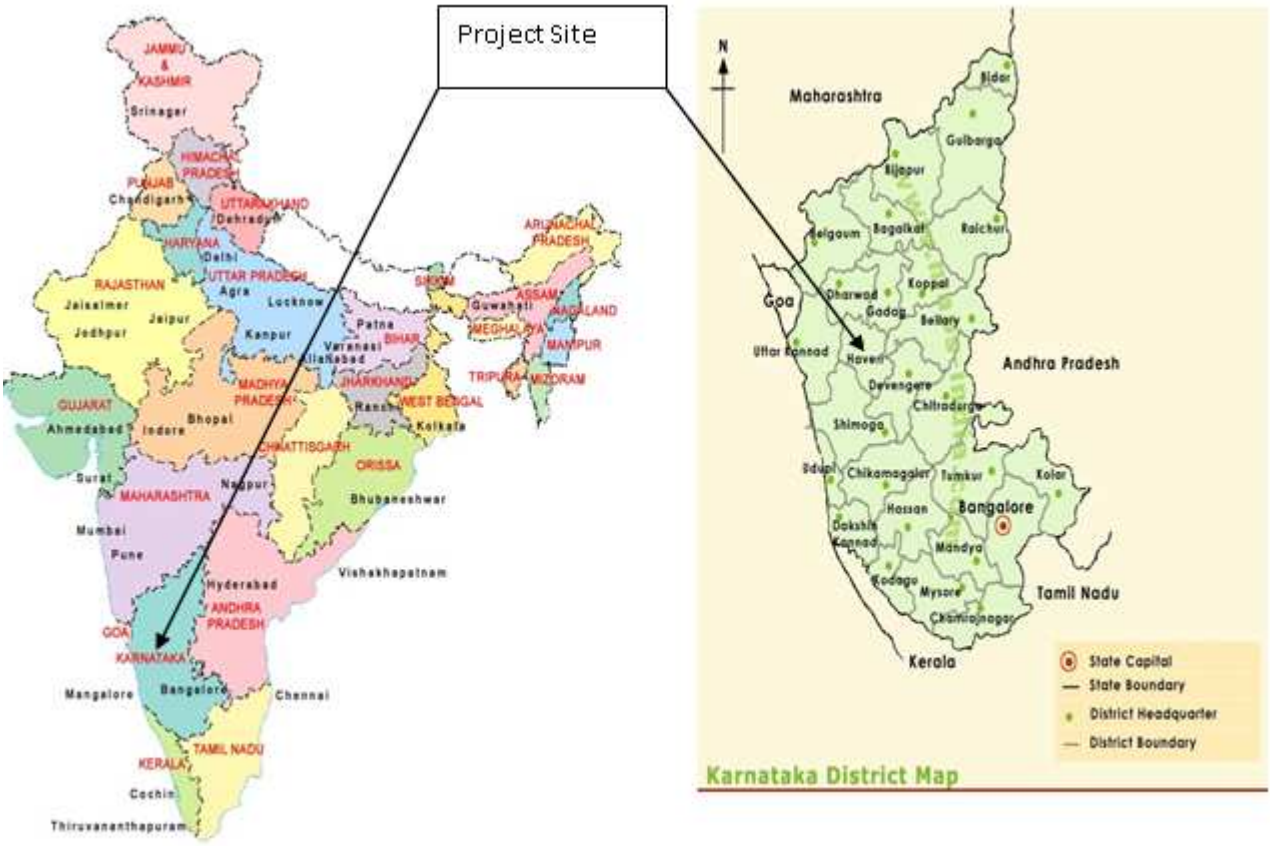
Proposed action plan for Action Plan for Sustainable Development:

RNWEKPL plans to use 2% of the net revenues accrued from the sale of Certified Emission Reductions (CERs) of this Project activity post its accrual in areas related to sustainable development. Detailed Credible Monitorable action plan is described in Annex I of this CDM PDD.

A.2. Location of project activity

Host Party: India
Region: Southern India / Sate: Karnataka / District: Haveri, Darwada
Mandal: Haveri / Site Name: Tadas, Villages-Hirebendigeri, Kabunoor, Basavanal, Hulagur, Nelagudda, Kamaddli, Bu Koppa, etc.

Project activity is located in Tadas of Haveri & Darwada districts in the state of Karnataka, India. The project site is well connected with major cities in Karnataka. Haveri & Darwada the district head quarter and a prominent town, is at 50 Km distance. This is also the nearest railway and Air connectivity point.



Wind turbine-wise detailed co-ordinates are tabulated below. The 63 turbines of the project will be selected from the below mentioned 88 turbine locations, and will be finalized during implementation.

WTG Location					
Sr. No.	**Turbine ID**	**Coordinates**	**Sr. No.**	**Turbine ID**	**Coordinates**
1	96 A	E 52.1705; N 16.67327	45	439	E 52.8963; N 16.74504
2	305	E 52.6028; N 16.65302	46	440	E 52.8837; N 16.74767
3	373	E 52.9340; N 16.68784	47	441 A	E 52.9068; N 16.73991
4	377	E 52.9135; N 16.70042	48	442	E 52.8935; N 16.73796
5	378	E 52.8794; N 16.70240	49	443	E 52.9067; N 16.73493
6	379	E 52.8811; N 16.70536	50	444	E 52.8052; N 16.73125
7	380	E 52.9042; N 16.70959	51	445	E 52.7940; N 1673398
8	381	E 52.9193; N 16.71320	52	446	E 52.7903; N 16.72854
9	382	E 52.9548; N 16.71623	53	447	E 52.8059; N 16.72503
10	383	E 53.0023; N 16.71231	54	448	E 52.8032; N 1672215
11	384 A	E 52.9876; N 16.70452	55	449	E 52.8430; N 16.71984
12	385 B	E 53.0114; N 16.70072	56	450 A	E 52.9290; N 16.71896
13	386	E 53.0218; N 16.69699	57	451	E 52.9531; N 1672353
14	389 A	E 53.1343; N 16.71175	58	452	E 52.9679; N 16.72661
15	390 B	E 53.1248; N 16.71635	59	453 A	E 52.8005; N 16.69007
16	391 A	E 53.1065; N 16.72071	60	454	E 52.7488; N 16.69260
17	392 A	E 53.1104; N 16.72416	61	455	E 52.7025; N 16.69552
18	393	E 53.0656; N 16.72762	62	456	E 52.7329; N 16.69962
19	394	E 53.0748; N 16.73067	63	457 A	E 52.6695; N 16.69940

20	395	E 53.0832; N 16.73380	64	458	E 52.6942; N 16.70351
21	396	E 53.1354; N 16.73499	65	459	E 52.6937; N 16.70675
22	397	E 53.1443; N 16.73221	66	460	E 52.6369; N 16.70739
23	398	E 53.1257; N 16.72921	67	461	E 52.6450; N 16.71050
24	399	E 53.1549; N 16.72611	68	462	E 52.6561; N 16.71347
25	400 A	E 53.2366; N 16.72274	69	463	E 52.6460; N 1671615
26	401	E 53.2017; N 16.73364	70	464	E 52.6137; N 16.71876
27	421	E 52.6975; N 16.77312	71	465	E 52.6239; N 16.72186
28	422	E 52.7058; N 16.77664	72	466 A	E 52.6240; N 16.72484
29	423	E 52.5799; N 16.77633	73	467	E 51.7299; N 16.70852
30	424	E 52.5707; N 16.77359	74	468	E 51.7242; N 16.71120
31	425	E 52.5736; N 16.77071	75	469	E 52.1495; N 16.69466
32	426	E 52.5651; N 16.76809	76	470	E 52.1993; N 16.66590
33	427	E 52.5999; N 16.76583	77	471 B	E 51.9195; N 16.66232
34	428	E 52.5980; N 16.76252	78	484 A	E 52.8235; N 16.67867
35	429	E 52.6651; N 16.76222	79	485	E 52.8048; N 16.67453
36	430	E 52.6541; N 16.75949	80	486	E 52.9393; N 16.74372
37	431	E 52.6477; N 16.75663	81	487 A	E 52.8699; N 16.73050
38	432	E 52.6904; N 16.75071	82	506	E 51.9188; N 16.66061
39	433	E 52.6874; N 16.74602	83	520	E 53.1173; N 16.57886
40	434	E 52.7355; N 16.74220	84	523	E 51.6741; N 16.71841
41	435	E 52.7779; N 16.74344	85	544	E 52.0391; N 16.73694
42	436	E 52.7927; N 16.73963	86	548 A	E 52.0766; N 16.72975
43	437	E 52.7543; N 16.73770	87	554 A	E 52.0591; N 16.75330
44	438	E 52.8002; N 16.73698	88	557	E 52.2073; N 16.73962

A.3. Technologies/measures

The project activity involves installation of 63 numbers of Enercon make E-53, 800 KW WTGs. The total installed capacity of the project activity is 50.4 MW. The net electricity generated by the project activity will be supplied to Indian (Southern) grid. The technology is clean as there are no GHG emissions associated with the generation of electricity from renewable source such as wind.

The technical specification[5] of WTGs installed in the project activity are shown below-

General	
Rated power	800 kW
Rotor diameter	52.9 m
Hub height	60 m / 73 m
Wind class (IEC)	IEC/NVN Class S, (vav = 7.5 m/s, vext = 57 m/s)
Turbine concept	Gearless, variable speed, single blade adjustment
Rotor	
Type:	Upwind rotor with active pitch control
Rotational direction	Clockwise
No. of blades	3
Swept area	2,198 m²
Blade material	GRP (epoxy resin); integrated lightning protection
Rotational speed	Variable, 12 - 28.3 rpm

[5] https://www.enercon.de/home/

Pitch control	ENERCON single blade pitch system, one independent pitch system per rotor blade with allocated emergency supply
Drive train with generator	
Hub	Rigid
Main bearing	Tapered roller bearing pair
Generator	ENERCON direct-drive annular generator
Grid feeding	ENERCON inverter
Brake systems	3 independent pitch control systems with emergency power supply, rotor brake, rotor lock
Yaw control	Active via adjustment gears, load-dependent damping
Cut-out wind speed	28 - 34 m/s (with ENERCON storm control)
Remote monitoring	ENERCON SCADA

Apart from the WTGs, the project activity also involves the installation of transformers, transmission lines/ cables and other equipment required for the generation and transfer of electricity to the grid.

Scenario existing prior to the project activity –

The project activity involves the installation of 63 new WTGs of 800 kW each. The scenario existing prior to the implementation of the project activity is electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

Baseline scenario -

The baseline scenario for the project activity is identical to the scenario existing prior to the implementation of the project activity.

The proposed project activity does not involve any transfer of equipment and uses technology readily available in the host country.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	M/s ReNew Wind Energy (Karnataka) Private Limited	No

A.5. Public funding of project activity

The project is not utilizing any Official Development Assistance (ODA) and does not involve any public funding from Annex I countries to undertake the project activity.

A.6. History of project activity

The project activity has already commissioned. The Commissioning details are as follows:

Sr. No.	Date of Commissioned	No. of WTG's Commissioned
1	07.12.2012	3
2	24.12.2012	5
3	04.01.2013	7
4	28.01.2013	6
5	08.02.2013	4
6	13.03.2013	2
7	30.03.2013	11
8	30.03.2013	5
9	16.04.2013	17
10	03.05.2013	3
	Total	**63**

The registration date of the project activity under CDM mechanism was 31/12/2012. Currently, the project is applying for Renewal of Crediting Period. The project also underwent post registration changes vide PRC-9376-002[6]

A.7. Debundling

Not Applicable, as this is not a de-bundled project activity.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

Title : Grid-connected electricity generation from renewable sources[7]
Reference : The project activity meets the eligibility criteria of large scale project as it is more than 15MW
Methodology : ACM0002: Grid-connected electricity generation from renewable sources --- Version 20.0[8]
Type I : Energy industries (renewable / non-renewable sources)
Category : Approved Consolidated Methodology (ACM0002)

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

- Tool to calculate the emission factor for an electricity system[9] - Version 07.0 (EB 100, Annex 04).
- Tool for the demonstration and assessment of additionality[10]- Version 06.1.0, EB 65

B.2. Applicability of methodologies and standardized baselines

The project activity involves generation of grid connected electricity from renewable wind energy. The project activity has a proposed capacity of 50.4 MW which will qualify for a large scale CDM

[6] https://cdm.unfccc.int/PRCContainer/DB/prcp636261799/view

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

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

[9] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.pdf

[10] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

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.

Applicability Criterion	Project Case
1. This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s)	The project activity is a Renewable Energy Project i.e. wind Power Project which falls under applicability criteria option 1 (a) i.e., "Install a Greenfield power plant". Hence the project activity meets the given applicability criterion.
2. The methodology is applicable under the following conditions: (a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; (b) 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 option (a) of applicability criteria 2 is applicable as project is renewable energy wind power plant/unit.
3. In case of hydro power plants, one of the following conditions shall apply[11]: (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	The project is installation of new wind based electricity generation plants (not a hydro power plant). Hence this criterion is not applicable.

[11] Project participants wishing to undertake a hydroelectric project activity that result in a new reservoir or an increase in the volume of an existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology.

than 4 W/m2; 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/m2; or (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/m2, 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/m2; (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/m2 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.	
4. In the case of integrated hydro power projects, project proponent shall:	The project is wind power project and thus the criterion is not applicable to this project activity.
5. 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	The project is wind power project and thus the criterion is not applicable to this project activity.
6. Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	The project is wind power project and thus the criterion is not applicable to this project activity.

7. The methodology is not applicable to: (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.	(a) The project activity is Greenfield and there is no switching of fossil fuel to renewable energy. Hence the criteria is not applicable to the project activity (b) The project is not a biomass fired power plant. Hence the criteria is not applicable 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".	Not applicable, the wind project is a Green field project activity and this project is not the enhancement or up gradation project.
9. In addition, the applicability conditions included in the tools referred to below apply.[12]	Please refer tables below.

Tool to calculate the emission factor for an electricity system[13] - Version 07.0 (EB 100, Annex 04)

Applicability Criterion	Project Case
This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	The project is a grid connected Greenfield wind power project and thus the tool is applicable.
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified in "Appendix 2: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh)	Steps involved in calculation of Emission Factor is included in section B.6.3 of the PDD as per the requirement of the tool

[12] The condition in the "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.

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

Applicability Criterion	Project Case
should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	
In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	Project is located in non-Annex I country and hence the tool is applicable
Under this tool, the value applied to the CO_2 emission factor of biofuels is zero.	The project is a wind project and there is no involvement of biofuels.

Methodological Tool- Tool for the demonstration and assessment of additionality- Version 06.1.0 EB [14]65

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

The spatial extent of the Project boundary includes the project power plant and all the power plants physically connected in the Indian Grid. The greenhouse gases and the emission sources included in or excluded from the project boundary are shown in table below:

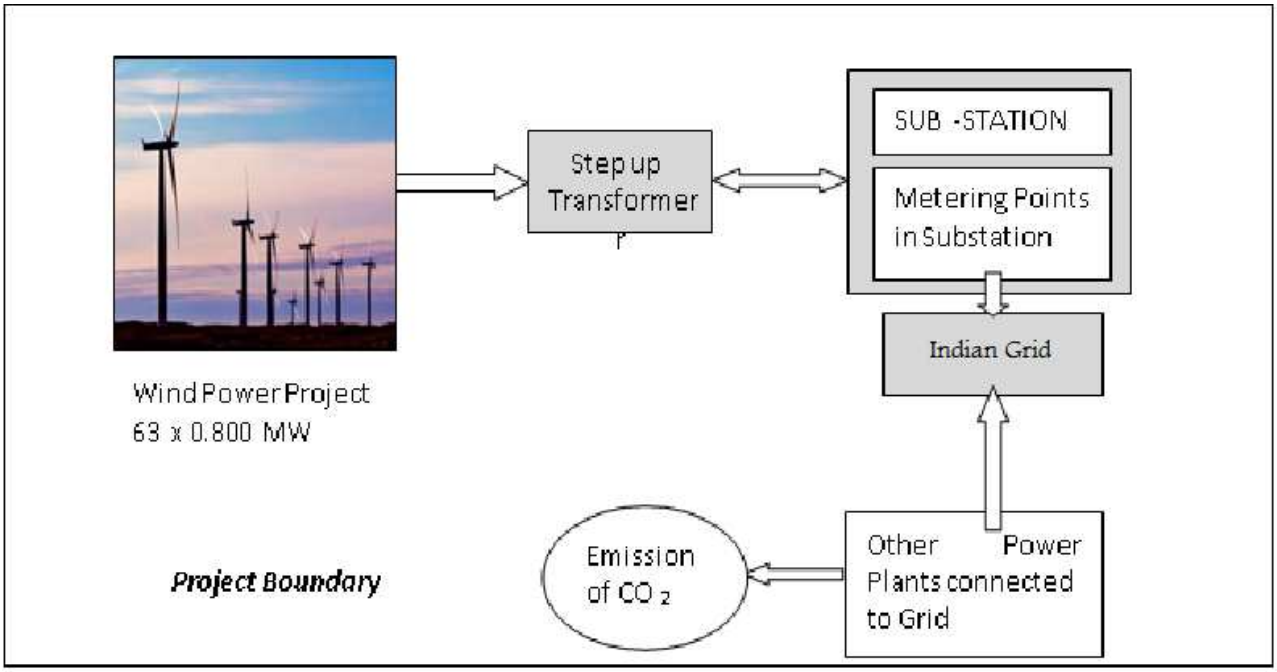
Source		GHGs	Included?	Justification/Explanation
Baseline	Grid connected electricity generation	CO_2	Yes	In the baseline scenario, electricity would be sourced from the Southern Grid which in turn would have been connected to fossil fuel fired power plants which emit CO_2.
		CH_4	No	No methane emission is expected.
		N_2O	No	No nitrous oxide emission is expected.
Project Activity	Electricity generation by WTGs	CO_2	No	The project activity does not emit carbon dioxide.
		CH_4	No	No methane emission is expected.
		N_2O	No	No nitrous oxide emission is expected.

As per the applied methodology ACM0002, Version 20.0, the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

The project boundary of this project activity consists of 63 wind turbines of 0.800 MW capacity each, step up transformer, substation and the Southern grid. The project boundary also includes all power plants connected to this Southern Grid. The project activity does not include any sources of emission and also does not involve any GHGs.

The monitoring of net electricity supplied (monitoring parameter) by the project activity will take place at the substation via installed energy meters. The detailed project boundary is depicted below-

[14] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf



B.4. Establishment and description of baseline scenario

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 "TOOL07:Tool to calculate the emission factor for an electricity system".

The relevant National Acts and regulations pertaining to generation of energy in India are:

- Electricity Act[15] 2003
- National Electricity Policy[16] 2005
- Tariff Policy[17] 2006

The above mentioned National Acts and regulations pertaining to generation of energy in India does not influence the choice of fuel used for power generation. There is no legal requirement on the choice of a particular technology for power generation

The project activity involves setting up of wind project to harness the power of wind 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 is the result of weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM).

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

[16] http://www.powermin.nic.in/whats_new/national_electricity_policy.htm

[17] http://www.powermin.nic.in/whats_new/pdf/Tariff_Policy.pdf

Calculations for this combined margin must be based on data from an official source (where available) and made publically available. The CEA database version 15.0 is the latest available data at the time of PDD submission to DOE for validation, hence same is considered for emission factor calculations.

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

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

B.5. Demonstration of additionality

The demonstration of additionality for the proposed Project activity is being carried out in accordance with "Tool for demonstration and assessment of Additionality" Version 06.1.0, EB 65. The tool provides a stepwise approach to demonstrate additionality which is displayed below:

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

Sub-step 1a: Define alternatives to the project activity:

If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario for the project activity as per the applied methodology ACM 0002, Version 20.0 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".

Accordingly, the realistic and credible alternatives to the project activity are:

b) The Project is undertaken without registering it as a CDM activity.
c) Equivalent amount of electricity being generated through operation of grid-connected power plants and by addition of new generation sources.

Outcome of Sub-step 1a: All the realistic alternatives for the project activity have been enlisted above.

Sub-step 1b: Consistency with mandatory laws and regulations:
The relevant National Acts and regulations pertaining to generation of energy in India are:

- Electricity Act[18] 2003
- National Electricity Policy[19] 2005
- Tariff Policy[20] 2006

The above mentioned National Acts and regulations pertaining to generation of energy in India does not influence the choice of fuel used for power generation. There is no legal requirement on the choice of a particular technology for power generation. There are no legal and regulatory requirements that prevent Alternatives (a) and (b) from occurring.

Outcome of Sub-step 1b: The identified realistic and credible alternative scenarios to the project activity are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations.

Step 2: Investment analysis

Sub-step 2a: Determine appropriate analysis method

The Project activity envisages exporting the electricity to Southern grid and the revenues from the sale of electricity at the preferential tariff which is revenue other than CDM related income. Thus, the "Option I-Apply simple cost analysis" cannot be used as for this project activity as per "Tool for demonstration and assessment of additionality[21]", Version 6.1.0

"Option II- Investment Comparison Analysis" is applicable when 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. This option is also not applicable as the proposed baseline scenario does not require the project participant to make an investment.

As the alternative to the project activity is supply of electricity from grid, hence as per the "Guidelines on the assessment of investment analysis[22]" version 5.0, the Benchmark analysis method is considered to be appropriate for investment analysis of the project activity.

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

Choice of Financial Indicator:
As allowed by the Guidelines on the Assessment of Investment Analysis (Version 5.0)[23], Equity Internal Rate of Return (IRR) was selected as the financial indicator to assess the attractiveness of the project.

Choice of Benchmark:
As per guidance 12 of Guidelines on the assessment of the investment analysis (Version 05, EB 62), In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated

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

[19] http://www.powermin.nic.in/whats_new/national_electricity_policy.htm

[20] http://www.powermin.nic.in/whats_new/pdf/Tariff_Policy.pdf

[21] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

[22] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

[23] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

The value for cost of equity is selected from Appendix. The value of Return on Equity for Group-1 projects in India is 11.75%.

The investment analysis of the project has been carried out in nominal terms, as per paragraph 7 of Appendix of the above mentioned document,

In situations where an investment analysis is carried out in nominal terms, project participants can convert the real term values provided in the table below to nominal values by adding the inflation rate. The inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period. If this information is not available, the target inflation rate of the central bank shall be used. If this information is also not available, then the average forecasted inflation rate for the host country published by the IMF (International Monetary Fund World Economic Outlook) or the World Bank for the next five years after the start of the project activity shall be used.

Thus, the inflation forecast value has been considered as 5.90%[24] forecasted value for the crediting period chosen by the Central Bank (Reserve Bank of India) of the host country.

Thus, the benchmark can be computed as 11.75%+5.9%= **17.65%**.

The Project Proponent has conducted financial analysis taking the Equity IRR, on nominal basis, as the financial indicator to prove additionality. The Equity IRR has been calculated to be **13.10%.**

IRR input parameters:

Particulars	Value	Unit	Source
No. of wind turbines	63	Nos	Enercon Offer
Capacity of each wind turbine	0.8	MW	Enercon Offer
Capacity of the project	50.4	MW	Calculated
PLF	21.42%		Third party PLF study report
Net electricity supplied to the grid	94.57	Million kWh	Calculated
Wheeling and Banking Charges for 1st 10 years	7.00%		KERC Tariff Order
Wheeling and Banking Charges beyond 10 years	0.00%		No charges for sale under preferential tariff sale
Net electricity sold to third parties through grid (first 10 years)	87.95	Million kWh	Calculated
Net electricity sold to grid under preferential tariff rate (11th year onwards)	94.57	Million kWh	Calculated
Project cost	2,790.90	INR Million	Enercon Offer
Debt	70%	INR Million	KERC Tariff Order
Debt Contribution	1,953.63	INR Million	Calculated
Equity Contribution	837.27	INR Million	Calculated

[24] Annual average percentage change over next ten years' value as sourced from RBI report dated 23rd January 2012, (http://rbi.org.in/scripts/PublicationsView.aspx?id=14022)

;Free O&M	2	years	Enercon Offer
Operation and Maintenance ;Cost (from 3rd year)	0.60	INR Million per WTG	Enercon Offer
Operation and Maintenance Cost	37.80	INR Million	Calculated
Escalation in O & M (from 3rd year onwards)	5.00%	%	Enercon Offer / KERC Tariff Order

Interest Rate	11.75%	%	KERC Tariff Order
Margin Money	25.00%	%	http://www.banknetindia.com/banking/metlen d.htm
Working capital: O & M Expenses for	0	Month	KERC Tariff Order
Receivables equivalent to MAT rate	19.93%	%	Indian IT Act for FY 2011-12
1.5 Months of energy charges for sale of electricity	2.00	Month	KERC Tariff Order
Maintenance Charges	0.00%	% of O&M	KERC Tariff Order
Service Tax on O&M	12.36%	%	http://220.227.161.86/26232idtc15702.pdf
Tariff (Open Access) upto 10th Year	5.50	Rs/kWh	HT 2(a) i tariff in state 2012 for industrial consumers
Preferential Tariff applicable from 11th year onwards	3.70	Rs/kWh	Page 31, KERC RE tariff order_2009
Depreciation Rate (Companies Act) - Plant &			
Machinery	5.28%	%	Indian Companies Act
IT Accelerated Depreciation			
Rate - Plant & Machinery	7.69%	%	Appendix IA of IT Rules
Income tax rate	33.22%	%	Indian IT Act
Interest on working capital	13.25%	%	KERC Tariff Order
Moratorium	0	Year	KERC Tariff Order
Debt repayment	10	Years	KERC Tariff Order
Salvage value	10%	%	CERC Notification

Sub-step 2c: Sensitivity Analysis:

As per Guidelines on the assessment of investment analysis, version 5, EB 62, Annex 5, point 20, only variables, including the initial investment cost, that constitute more than 20% of total project costs or total project revenues have been identified and subjected to a reasonable variation and the results of this variation have been presented below. Also as per the point 21 of the above mentioned guideline, a range of +10% to -10%.

Change in net generation	**+10.00%**	**0.00%**	**-10.00%**
Equity IRR	16.41%	13.10%	9.91%

Change in Total Project Cost	**+10.00%**		**-10.00%**
Equity IRR	10.51%		16.45%
Change in O&M Cost	**+10.00%**		**-10.00%**
Equity IRR	12.77%		13.42%
Change in tariff	**+10.00%**		**-10.00%**
Equity IRR	16.41%		9.91%
Change in Debt Contribution	**+10.00%**		**-10.00%**
Equity IRR	13.48%		12.78%
Change in Debt Contribution	**+10.00%**		**-10.00%**
Equity IRR	13.48%		12.78%

The purpose of the sensitivity analysis is to demonstrate the sensitivity of the returns from the Project activity due to uncertainty in plant load factor, capital cost, preferential tariff, O&M costs and debt contribution in financing. This is an assessment of the impact of variations in above parameters from the assumed/design values, and represents magnitude of effects of these variations on the returns from the Project activity.

From the sensitivity analysis, it can be seen that the Equity IRR does not reach to the benchmark value even in favourable scenario of the variation in electricity generation, project cost, operation & maintenance (O&M) Cost, tariff and Debt ratio in project financing, which indicates that the project will remain additional in all above considered favourable scenarios. The favourable scenarios where the Equity IRR will cross the benchmark have been explained below:

Electricity Generation Variation:

The Equity IRR will touch the benchmark considering a positive variation of 13.70%. The PLF has been considered in the financial analysis sourced from 3rd party PLF study report, in line with EB48, Annex 11, and a positive variation of 13.70% is not practically feasible and reasonable scenario. However actual PLF in the site is also in the same range covered under the sensitivity analysis and never reached a level of 13.70% positive variation.

Project Cost Variation:

The Equity IRR will touch the benchmark considering a negative variation of project cost of 13.10%. The project cost has been sourced from the Term Sheet as executed between the PP and the equipment supplier. This contractual price is firm and negative variation of the same to the tune of 13.10% is not feasible.

O&M Cost Variation:

The Equity IRR will cross the benchmark considering a negative variation of O & M expenditure 156%. The O&M cost has been considered from the offer of the supplier. This is not expected to experience a negative variation due to incremental trend of inflations, material and manpower expenditures during the course of the project lifetime. So negative variation to the tune of above mentioned percentages are not reasonable.

Tariff Variation:

The Equity IRR will cross the benchmark considering a variation of 13.70%. The tariff has been considered based on retail tariff for industrial consumers for first 10 years and from 11th year it will be preferential tariff provided to wind power developers, a positive variation to the tune of 13.70% is not reasonable for the project, as increase of 13.70% in preferential tariff is not realistic.

Debt Percentage:

The Equity IRR will not cross the benchmark even with consideration of 100% debt, so there is no practical scenarios that the project will reach the bench mark in change in financing pattern.

Step 4 – Common practice Analysis

The common practice analysis of the project activity has been done as per the methodological tool "Demonstration and Assessment of Additionality", Version 6.1.0.

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

Project Capacity	Applicable Range (±50%)
50.4 MW	25.2 MW- 75.6 MW

Step 2: The host country, i.e., India has been considered as the applicable geographical area for this project as per the default option as mentioned in the Tool. In this step all plants (N_{all}) 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 has been identified and listed below.

Technology Area	All projects in applicable cap range	Projects registered as CDM project or in CDM development pipeline	Projects included in Nall
Thermal	9	0[25]	9
Hydro [26]	51	31[27]	20
Biomass[28]	18	16[29]	2
Wind	27	1	26
Nuclear[30]	0	0	0
Solar[31]	0	0	0
Tidal-Mechanical &Thermal	0	0	0
Geothermal	0	0	0
Total	**105**		**57**

From the above list N_{all} = (9+20+2+26)
= 57

Step 3: Within plants identified in Step 2, $\mathbf{N_{diff}}$ has been identified as per the definition of **Different technology** as mentioned in Methodological tool "Demonstration and assessment of additionality", Version 6.1.0.

[25] http://www.iges.or.jp/en/cdm/report_cdm.html

[26] CEA Database Version 7.0

[27] http://www.iges.or.jp/en/cdm/report_cdm.html

[28] The list of references:
a. http://www.nedcap.gov.in/Biomass_Energy.aspx?ID=31
b. http://www.credacg.org/bpg_projects_commissioned.htm

[29] http://www.iges.or.jp/en/cdm/report_cdm.html

[30] CEA Database Version 7.0

[31] http://www.renewablemarketsindia.com/attachments/4490_MNRE_List%20of%20MW-size-Grid-SolarPower-Plants-in-India.pdf

As apart from wind power projects, all other power plants included in the N_{all} uses energy resources (thermal, hydro & biomass) which are different to wind, hence all those projects are categorized as $N_{diff.}$.

Out of the 26 wind projects included in N_{all}, 22 projects are installed in different states of India other than Karnataka, and are part of N_{diff}, as each state in India provides different investment climate to projects in terms of tariff rates and other regulations as determined by respective State Electricity Regulatory Commission (SERC) from time to time.

Thus 22 wind power projects within the applicable geographical area and within the applicable output range are part of N_{diff}.

The total no of projects in N_{diff} is = (9+20+2+22)
= 53

Step 4: Step 4: Calculate factor **$F = 1-N_{diff}/N_{all}$**

F = 1-(53/57)
F = 0.07

The proposed project is not common practice as the factor **F<0.2,** thus satisfying the criteria mentioned in the methodological tool "Demonstration and assessment of additionality", Version 06.1.0.

Chronology of Events:

Sr. No.	Event	Date
1	Investment decision for the Project with serious CDM consideration; Resolution by Board of Directors	23/03/2012
2	Signing of MoU with Technology Supplier (Start Date)	06/04/2012
3	Appointment of CDM Consultant	16/04/ 2012
4	Appointment of DoE	02/05/2012
5	CDM Prior Consideration submission to UNFCCC & NCDMA, (INDIA)	16/06/2012
6	Local Stakeholder consultation	04/07/2012
7	Expected commissioning of the project	31/10/2012

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 14, Dec 2018[32] 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 CO_2 Baseline Database. As of 31 December 2013, the Southern grid has also been synchronised with the NEWNE grid, hence forming one unified Indian Grid. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the Indian grid as per CM calculations will serve as the baseline for this project.

Table: Geographical Scope of Indian Electricity Grid

Northern	Eastern	Western	North-Eastern	Southern
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Andhra Pradesh

[32] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf

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.

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

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

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

OR

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

PP has chosen ex-ante option for calculation of Simple OM emission factor using a 3-year generation-weighted average, based on the most recent data available at the time of submission of the PD to the DOE for validation.

OM determined at validation stage will be the same throughout the crediting period. There will be no requirement to monitor & recalculate the emission factor during the crediting period.

Step 4: Calculate the operating margin emission factor ($EF_{grid,OMSimple,y}$) according to the selected method

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.

Build Margin (tCO_2/MWh) (not adjusted for imports)	
INDIAN Grid	**0.8811**

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

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

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

(a) Weighted average CM; or
(b) Simplified CM.

PP has chosen option (a) i.e weighted average CM to calculate the combined margin emission factor for the project activity.

The combined margin emissions factor is calculated as follows:

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

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (t CO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (t CO_2/MWh)
W_{OM} = Weighting of operating margin emissions factor (per cent)
W_{BM} = Weighting of build margin emissions factor (per cent)

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

Wind and solar power generation project activities: W_{OM}= 0.75 and W_{BM}= 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods. Since project activity is of wind power generation, the above weightage has been considered for OM and BM.

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

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

Therefore, $EF_y = EF_{grid,CM,y}$ = 0.9419 t CO_2/MWh.
BE_y = 94,570 x 0.9419 = 89,075 tCO_2

Leakage emissions

Not applicable as per ACM 0002 version 19

Project activity emissions

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

Therefore, PE_y = 0 tCO_2e/annum

According to equation (7), overall emission reductions (ER_y) are, $ER_y = BE_y – PE_y$
= 89,075 - 0
= 89,075 tCO_2e

B.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,y}$
Data unit	tCO_2/MWh
Description	Combined Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 15, Dec 2019[33]
Value(s) applied	0.9419
Choice of data or measurement methods and procedures	The combined margin emissions factor is calculated as follows: $EF_{grid,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ 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 first 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[34]
Value(s) applied	0.9622
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07" as 3-year generation weighted average using data for the years 2016-17, 2017-18, & 2018-19. The data are 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 first crediting period.

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[35]
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 07.0.0" BM is calculated ex-ante based on the most recent information available at the time of submission of PD and is fixed for the entire crediting period. The data is obtained from "CO_2 Baseline Database for Indian Power Sector" version 15.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the first crediting period.

B.6.3. Ex ante calculation of emission reductions

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

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

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

Ex-ante calculation of emission reductions is equal to ex-ante calculation of baseline emissions as project emissions and leakage are nil.
Baseline emission factor (Combined Margin) (EF_y)
= 0.9419 tCO_2e/MWh

Annual electricity supplied to the grid by the Project (EG_y)
=50.4MW*(capacity) *21.42 %(PLF) *8760(hours)
=94,570(MWh)

Annual Baseline Emissions Reduction: $ER_y = EF_y * EG_y$
= 0.9419 tCO2e/MW*94,570
= 89,075 tCO2e/year

Leakage emissions

Not Applicable

Project activity emissions

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

Therefore, PE_y = 0 tCO_2e/annum

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

$ER_y = BE_y – PE_y$
=89,075 - 0
=89,075 tCO_2e

Note: Note: The Quantity of net electricity generation that is produced and fed into the grid is represented as $EG_{PJ,y}$. However in the registered PDD the same had been represented as $EG_{facility,y}$. So in order to maintain the consistency $EG_{facility,y}$ has been used in the PPD Version 11.

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	89,075	0	0	89,075
Year 2	89,075	0	0	89,075
Year 3	89,075	0	0	89,075
Year 4	89,075	0	0	89,075
Year 5	89,075	0	0	89,075
Year 6	89,075	0	0	89,075
Year 7	89,075	0	0	89,075
Total	623,525	**0**	**0**	623,525
Total number of crediting years	7			
Annual average over the crediting period	**89,075**	**0**	**0**	**89,075**

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	**$EG_{facility,y}$**
Data Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data	Joint meter reading OR break up sheet provided by KPTCL (referred as 'Form B')
Value(s) applied	94,570
Measurement methods and procedures	The JMR is usually taken once in month for the feeder meters. The JMR gives electricity export, import and losses till common substation. By using these data, net export by the WTGs in the Project activity will be calculated (as in some case net export is not explicitly reported in JMR). The net electricity supplied to grid is a calculated value and would be determined as the difference between the electricity exported to the grid and the electricity imported from the grid by the project activity and transmission losses mentioned in the Form B. The emission reduction would be computed on the basis of *EGfacility,y* . Net export ($EG_{facility,y}$) = $\mathbf{EG_{export,y}}$ - ($\mathbf{EG_{export,y}}$ *Transmission loss %)-115% $\mathbf{EG_{import,y}}$
Monitoring frequency	Continuous measurement and monthly recording.
QA/QC procedures	The meter(s) shall be calibrated and maintained by the state utility as per their own schedule, and this frequency of meter calibration is not within the control of the Project Proponent
Purpose of data	Baseline emissions calculation
Additional comment	The data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter	**$EG_{export,y}$**
Data Unit	MWh
Description	The quantity of electricity supplied by the project plant/unit to the grid in year *y*
Source of data	Joint meter reading OR break up sheet provided by KPTCL (referred as 'Form B')
Value(s) applied	94,570
Measurement methods and procedures	The electricity generated and fed into the grid shall be continuously monitored using energy meters. For measuring the electricity exported by the project activity, the state electricity board has installed energy meters at the common feeders of the project activity. Monthly readings are taken jointly by the representative of

	State Electricity Transmission Co. Ltd. and site in charge of Project Proponent and a statement is prepared and signed by the representatives of both parties. The meters have an accuracy class of 0.2S/ 0.5s (as per state regulation) Measurement by: electricity meters (feeder meters) Monitoring: Continuous measurement and monthly recording. Recording: Electronic/ Paper Recording Frequency: Continuous monitoring and monthly recording Responsibility: The operators/ O&M team will be responsible for measurement Archiving: Crediting Period + 2 years Calibration Frequency24: Once in 5 year. As determined by state utility, once in five years is the CEA norm of calibration[36]
Monitoring frequency	Continuous measurement and monthly recording.
QA/QC procedures	The meter(s) shall be calibrated and maintained by the state utility as per their own schedule, and this frequency of meter calibration is not within the control of the Project Proponent
Purpose of data	Baseline emissions calculation
Additional comment	The data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter	**$EG_{import,y}$**
Data Unit	MWh
Description	The quantity of electricity imported by the project plant/unit from the grid in year *y*
Source of data	Joint meter reading OR break up sheet provided by KPTCL (referred as 'Form B')
Value(s) applied	0
Measurement methods and procedures	The electricity imported shall be continuously monitored using energy meters. For measuring the electricity imported by the project activity, the state electricity board has installed energy meters at the common feeders of the project activity. Monthly readings are taken jointly by the representative of State Electricity Transmission Co. Ltd. and site in charge of Project Proponent and a statement is prepared and signed by the representatives of both parties. Measurement by: electricity meters (feeder meters) Recording: Electronic and paper Recording Frequency: Continuous monitoring and monthly recording Responsibility: The operators/ O&M team will be responsible for measurement Calibration Frequency: As determined by state utility, once in five years is the CEA norm of calibration[37] Accuracy class of meters: 0.2s/ 0.5s (as per state regulation) Archiving: Crediting Period + 2 years
Monitoring frequency	Continuous measurement and monthly recording.

[36] As per CEA publication in Gazette of India, dated, 17th March 2006; a copy of the same is submitted to the DOE

[37] As per CEA publication in Gazette of India, dated, 17th March 2006; a copy of the same is submitted to the DOE

QA/QC procedures	The meter(s) shall be calibrated and maintained by the state utility as per their own schedule, and this frequency of meter calibration is not within the control of the Project Proponent
Purpose of data	Baseline emissions calculation
Additional comment	The data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

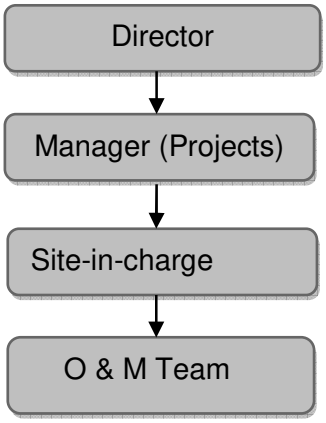
Data / Parameter	**EG_{WTG}**
Data Unit	MWh
Description	Daily electricity generation at the WTG controller
Source of data	Power Generation Reports from O&M Contractor
Value(s) applied	0
Measurement methods and procedures	The data will be monitored via project activity WTG Controllers and will be recorded daily in Power Generation Reports by the O&M Contractors. This data will be used only for determination of apportioning ratio, and will be applied only in cases where the monitoring period does not coincide with the initial/final meter reading dates in the Credit Notes. Detailed apportioning procedures are described in section Appendix 5.
Monitoring frequency	Monitoring: Continuous measurement. Recording: Electronic/ Paper Recording Frequency: Continuous monitoring and monthly recording Responsibility: The plant management shall be responsible for the regular recording of data. Archiving: Crediting Period + 2 years
QA/QC procedures	In case of any fault with the WTG Controller, the same would be immediately identified through an interlocking mechanism. In such a scenario the WTG Controller would be automatically shut down. The WTG Controller would then be replaced.
Purpose of data	The data will be used for calculation of emission reductions.
Additional comment	The data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

B.7.2. Sampling plan

Data and parameters monitored in section B.7.1, will not be determined by a sampling approach, hence not applicable.

B.7.3. Other elements of monitoring plan

Evaluation and verification procedures: This involves recording, data collection of all wind turbines, metering of electricity generated at substation, on daily basis as well as on monthly basis. The general conditions for metering, recording, meter readings, meter inspections, Test & Checking and communication shall be as per the Power Purchase Agreement with the state utility.
The project proponent proposes following arrangements in order to carry out metering and O & M activities for all wind turbines.



Meter readings will be taken jointly at the appointed date by PP's representative, O&M contractors and Discom officials. The same will be reported to the site-in-charge and the compiled reports will be sent to the Manager (Projects) and Director. The Manager will monitor overall activity of the project and report to the Director. As per O & M schedule, the operation and maintenance activities will be carried out by trained and qualified technical staff of O&M contractor.

Each party shall maintain complete and accurate records and all other data required by each of them for the purposes of proper administration and the operation of the project.
Here 16 MW (20 WTG's) are connected in one feeder, 16 MW (20 WTG's) in second feeder and 18.4 MW (23 WTG's) are connected in third feeder. All three are connected in KPTCL substation, transmission losses are calculated between substation and feeders (procedure is in form B) and net energy export is calculated by:

$$(EG_{facility,y}) = EG_{export}t, y - (EG_{export},y * \text{Transmission loss \%}) - 115\% \, EG_{import,y}$$

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

The start date of the project activity is 06/04/2012. This is the date of signing of Supply Agreement with Technology Supplier.

C.2. Expected operational lifetime of project activity

25 years, 00 months[38]

C.3. Crediting period of project activity

C.3.1. Type of crediting period

Renewable crediting period chosen for the project activity, it is the second crediting period

C.3.2. Start date of crediting period

31/12/2019 (start date of second crediting period)

C.3.3. Duration of crediting period

7 years, 00 months

[38] Supply agreement for WTGs

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

As per the Schedule 1 of the EIA notification dated 1/12/2009[39], given by the Ministry of Environment and Forests under the Environment (Protection) Act 1986, the proposed Project activity does not fall under the list of activities requiring EIA as the environmental impacts for such project are not considered as significant by the host Party or Project Proponent.

D.2. Environmental impact assessment

The project being harnessing environmentally biennial wind power through well establish technological option which has no adverse impacts on the local as well as global environment and help in mitigating anthropogenic climate change, environmental impacts for such project are not considered as significant by the Host Party or Project Proponent.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

RNWEKPL had identified stakeholders for their wind power project in Tadas, Hubli, District Darwada, Karnataka. The identified stakeholders have been invited through prior written personal invitations for the schedule consultation as taken place on 04/07/2012 at specified venue.

Following stakeholders were invited via personal invitation letters.

1. Representatives from Enercon (India) Pvt. Ltd.
2. Employees of RNWEKPL
3. Panchayats representatives.
4. Local Villagers from nearby area
5. Site workers/operators

E.2. Summary of comments received

Meeting started with opening speech by representative from Technology Supplier, Enercon (India) Limited. He introduced all guest on dais. The representative of project proponent explained Technical aspects of Project to stakeholders. He also explained about social, environmental & economic benefits of the Project. He also elaborated about CDM & its requirement for the current project. After the presentation, the session was open for questions/feedback from stakeholders.

The villagers raised various queries as summarised below:[40]

1. Number of turbines going to be commissioned
2. Any possible impacts of the turbines foundation / erection on ground water

All the above queries have been suitable and satisfactorily replied / clarified by Enercon (India) Limited and project proponent's representatives. Local stakeholders welcome the project and express their support to the project. The meeting was concluded by vote of thanks to all the participants.

E.3. Consideration of comments received

There was no negative feedback from any of the stakeholders. Hence, there is no need to take due account of the comments.

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

[40] Stakeholder Consultation Meeting - Minutes of the Meeting; has been submitted to the DoE

SECTION F. Approval and authorization

Letter of approval from the DNA, India (NCDMA, Ministry of Environment & forest Government of India) are provided to DOE.

Appendix 1. Contact information of project participants

Organization name	ReNew Wind Energy (Karnataka) Private Limited
Country	India
Address	MG Road, 601-604, 6th Floor, DLF Corporate Park, Gurgaon, Haryana, 122001, India
Telephone	+91- 124 – 4896670/80
Fax	-
E-mail	parag@renewpower.in
Website	www.renewpower.in
Contact person	Mr. Parag Sharma

Appendix 2. Affirmation regarding public funding

The project is not utilizing any public funding from the Annex I countries and does not create any diversion of the Official Development Assistance (ODA).

Appendix 3. Applicability of methodologies and standardized baselines

Please refer PDD Section B.2.

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

Please refer PDD Section B.6.3.

Appendix 5. Further background information on monitoring plan

Please refer PDD Section B.7.

Appendix 6. Summary report of comments received from local stakeholders

Please refer PDD Section E.

Appendix 7. Summary of post-registration changes

The project underwent post registration changes at UNFCCC vide PRC-9376-002[41]

In registered PDD the sale of power from the project activity is considered to grid at preferential tariff of INR 3.70/Kwh, while in actual implementation the project is designed as Group Captive project for 1st 10 years of operation, in which power is sold to individual customers in the southern grid through open access sale. Hence tariff is different from the preferential tariff. In the group

[41] https://cdm.unfccc.int/PRCContainer/DB/prcp636261799/view

captive model (open access sale) 7% Wheeling and Banking charges are also applicable.
PLF in the registered PDD is considered from KERC tariff order which is 26.50% while in the third party PLF study report the PLF is 21.42% at P75 level. Hence the PLF is also revised according to the third party PLF study report. The actual PLF achieved during two consecutive and complete years of operation are 19.32% and 18.95% for the period June 2013- May 2014 and June 2014-May 2015 respectively, which is lower than the estimated PLF value. The spreadsheet for actual PLF calculation is attached as Annexure A.
The primary reason of the change is to improve the financial returns of the project on account of lower site specific PLF value reported by third party agency, the PLF in the third party report was much lower than estimated during project decision as per the KERC order. Besides this declining carbon market and lower CER revenues were also factors of these changes in order to improve the financial returns from the project.

The equity IRR is revised based on these changed input parameters and is 13.10% while in registered PDD it was 11.33%.

Changes in the Monitoring Plan:

1. In the registered PDD the net electricity supplied to grid is mentioned as measured parameter but in actual it is a calculated parameter.

The net energy export is calculated by:
(EGfacility,y) = EGexport,y - (EGexport,y *Transmission loss %)-115% EGimport,y

2. The calibration frequency in the registered PDD is mentioned as once in five year but in actual the meters are under the jurisdiction of KPTCL and their calibration is determined by KPTCL, however once in 5 year calibration of meters is the CEA norm of calibration.

3. The metering structure is defined in the revised PDD as:

Here 16 MW (20 WTG's) are connected in one feeder, 16 MW (20 WTG's) in second feeder and 18.4 MW (23 WTG's) are connected in third feeder. All three are connected in KPTCL substation.

4. Metering, metering equipment, meter readings, inspection of energy meters, meter test checking details are provided in Appendix 5 of the revised PDD, However some unnecessary apportioning information is removed from the Appendix 5 of revised PDD

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Document information

Version	*Date*	*Description*
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.

Version	*Date*	*Description*
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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