Project design document form

(Version 10.1)

BASIC INFORMATION	
Title of the project activity	Bundled Wind Power Project by Peethambra Granites Pvt Ltd (EKIESL-CDM. November -11-01)
Scale of the project activity	☐ Large-scale ☒ Small-scale
Version number of the PDD	04
Completion date of the PDD	16/05/2018
Project participants	Peethambra Granites Pvt. Ltd.
Host Party	India
Applied methodologies and standardized baselines	AMS-I.D: Grid connected renewable electricity generation (version 17)
Sectoral scopes linked to the applied methodologies	Sectoral scope I: Energy industries (renewable / non-renewable sources)
Estimated amount of annual average GHG emission reductions	7,833 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The project activity uses renewable energy (wind) as a clean fuel to generate electrical energy. The total installed capacity of the project is 4 MW, which comprises 5 no. Wind Turbine Generator (WTG), of 800 kW each of make Enercon India Limited.

The wind power produced being GHG neutral will reduce the emissions associated with power generation through fossil fuels based power plant in the regional grids of India. The project activity is a green field project activity & can generate electricity using Wind energy thus reducing approximately 7,833 tonnes of CO_2 equivalent at the regional Southern grid of India, as respective WTGs will sell the power generated to the Southern grid.

The further information of the project WTGs are:-

Sr. No.	Project Participants' Name	Capacity (kW)	Date of Commissioning	Connected Grid	Generated Power use
WEG1	Peethambra Granites Pvt Ltd	1 X 800kW	31/03/2012	Southern	Sale toTNEB
WEG2	Neha Sharma	2 X 800kW	27/03/2012	Southern	Sale toTNEB
WEG3			31/03/2012		
WEG4	Atul Sharma	2 X 800kW	30/09/2011	Southern	Sale toTNEB
WEG5			31/03/2012		

Purpose of the project activity:

The project activity involves supply, erection, commissioning and operation of 5 Wind Electric Generators (WTGs) of 800 kW each, 3 at District Tuticorin and 2 at District Tirunelveli in Tamil Nadu; all WTGs are supplied and manufactured by Enercon India Ltd.

The main purpose of the project activity is to generate electrical energy through sustainable means using wind power resources, to utilize the generated output for selling it to the State Electricity Board and to contribute to climate change mitigation efforts.

The WTGs convert wind energy into electrical energy and do not use any other fuel for generating the electricity, therefore, the project emissions are taken as zero.

Pre-project Scenario:

The Project participant was not involved in generation of wind based power and supplying to grid at the same site under the pre-project scenario therefore, in the absence of the project activity, the equivalent amount of electricity would have been generated from the connected / new power plants in the Southern grid. The installed capacity is predominantly coal based and therefore is a major source of carbon dioxide emissions in India[1]. The main emission source in the pre-project scenario is the power plants connected to the Southern grid and main GHG involved is CO_2.

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

Baseline scenario:

As the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following as per applied methodology:

"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."

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

Contribution of project activity to sustainable development:

The project investors believes that the project activity has contributed to the sustainable development as discussed below according to the indicators stipulated by Ministry of Environment and Forests, Govt. of India for sustainable development in its interim approval guidelines for host country approval eligibility criteria for Clean Development Mechanism (CDM) projects[2]:

I. Social well being:

- The project activity provided job opportunities to some of the local people during erection and operation of the wind farms contributing up to some extent in poverty alleviation of the local community. The company has developed both the sites and approach roads.
- The project activity will also contribute in infrastructure development by improving the availability of the electricity to the Southern grid, hence contributing towards meeting the electricity deficit in Tamilnadu.

II. Economic well being:

- The project activity leads to investment to a developing region which otherwise would not have happened in the absence of project activity. The generated electricity is fed into the regional grid through local grid, thereby improving the grid frequency and availability of electricity to the local consumers (villagers & sub-urban habitants) which will provide new opportunities for industries and economic activities to be setup in the area thereby resulting in greater local employment, ultimately leading to overall development.
- The proposed CDM project activity requires temporary and permanent, skilled and semi-skilled manpower at the wind park; this will create additional employment opportunities.

III. Environmental well being:

- The project utilizes wind energy for generating electricity which otherwise would have been generated through the operation of power plants in the Southern grid mix, contributing to reduction in specific emissions (tons of emissions /MWh of energy generated) including GHG emissions.
- As wind power projects produce no end products in the form of waste (e.g. Particulate Matter, Fly ash, Water effluent etc.).
- Being a renewable resource, using wind energy to generate electricity contributes to natural scare resource (eg. Fossil fuel used for electricity generation) conservation.
- Thus, the project causes no negative impact on the surrounding environment contributing to environmental well being.

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

IV. Technological well being:

- The project activity leads to the promotion of 800 kW of EIL WTGs into the region, demonstrating the success of this type of wind turbines, which fed the generated power into sub- station in Tamilnadu, thus strengthening the grid supply and improving quality of power under the service area of the substation.
- Hence the project leads to technological well being. The project technology manufactured, operated & maintained indigenously and doesn't involve any technology transfer from foreign countries.

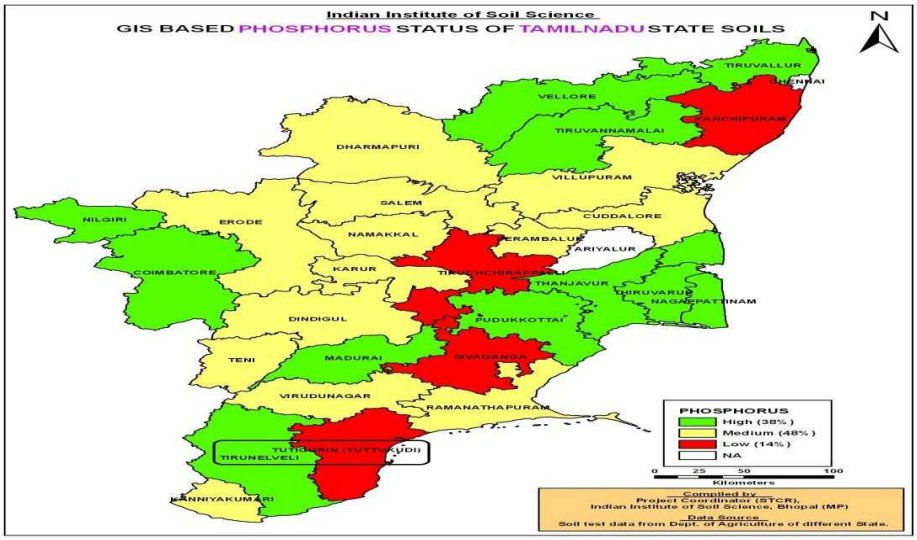
A.2. Location of project activity

India
This is bundled project activity and the machines are installed in the Tamil Nadu state of India.

Sr. No.	Investor Name	Capacity (MW)	Village	District	State	Country
WEG1	Peethambra Granites Pvt Ltd	1 X 0.8	Subramaniyapuram	Tuticorin	Tamil Nadu	India
WEG2	Neha Sharma	1 X 0.8	Pallankottai	Tirunelveli	Tamil Nadu	India
WEG3		1 X 0.8	Pallankottai	Tirunelveli	Tamil Nadu	India
WEG4	Atul Sharma	1 X 0.8	Karadikulam	Tuticorin	Tamil Nadu	India
WEG5		1 X 0.8	Karadikulam	Tuticorin	Tamil Nadu	India

Sr. No.	Village	State	Nearest Railway Station	Nearest Airport
WEG1	Subramaniyapuram	Tamil Nadu	Sankarankovil(21.2 KM apart)	Tuticorin
WEG2	Pallankottai	Tamil Nadu	Sankarankovil(21.2 KM apart)	Tuticorin
WEG3	Pallankottai	Tamil Nadu	Sankarankovil(21.2 KM apart)	Tuticorin
WEG4	Karadikulam	Tamil Nadu	Sankarankovil(21.2 KM apart)	Tuticorin
WEG5	Karadikulam	Tamil Nadu	Sankarankovil(21.2 KM apart)	Tuticorin

Sr. No.	UID/Location No.	Latitude (in decimals)	Longitude (in decimals)	Latitude		Longitude	
WEG1	HT SC No. 206/K38	9.102361°	77.691667°	N	9° 06' 8.5"	E	77° 41'30.0 "
WEG2	HT SC No. 4061/K14	9.143361°	77.680500°	N	9° 08' 36.1"	E	77° 40' 49.8"
WEG3	HT SC No. 4120/K18	9.132111°	77.673083°	N	9° 07' 55.6"	E	77° 40' 23.1"
WEG4	HT SC No. 174/K19	9.130528°	77.686278°	N	9° 07'49.9 "	E	77°41' 10.6"
WEG5	HT SC No. 205/K22	9.122056°	77.679333°	N	9° 07' 19.4"	E	77° 40' 45.6"



A.3. Technologies/measures

Type & Category

Since, the capacity of the proposed project is 4 MW, which is less than the maximum qualifying capacity of 15 MW, the project activity has been considered as a small scale CDM project activity and UNFCCC indicative simplified modalities and procedures are applied. The project activity utilizes the wind potential for power generation and exports the generated electricity to the grid. According to small scale CDM modalities the project activity falls under the following category:

Sectoral Scope: 1 Energy industries (renewable / non renewable sources)
Type: I Renewable Energy Projects
Category: D Version 17, Grid connected renewable electricity generation

Technology

It is to be noted that the project activity is a greenfield project for generation of renewable electrical energy by harnessing wind power. Thus, this project actually displaces the electricity in the grid which is essentially fossil-fuel based.

In wind energy generation, kinetic energy of the wind is converted into mechanical energy and subsequently into electrical energy. Wind turbines capture the wind's energy with three propeller-like blades, which are mounted on a rotor, to generate electricity. The turbines sit high atop towers, taking advantage of the stronger and less turbulent wind. As the wind blows through the blades of the windmill, a pocket of low-pressure air forms on the downwind side of the blade. The low-pressure air pocket then pulls the blade towards it, causing the rotor to spin. The rotor turns the shaft that further spins the connected generator. The spinning of this generator produces the required electricity. Since power is generated from wind energy, no emissions are attributed to the project emissions and due to that equivalent amount of electricity from fossil-fuel dominated grid can be displaced due to the project activity. Detailed information of gases & emission sources in baseline & project activity have been discussed in Section B.3 of this document. The project activity is the installation of an environmentally safe and sound technology since there are no GHG emissions associated with the electricity generation.

Being a renewable resource, using wind energy to generate electricity contributes to natural scare resource (eg. Fossil fuel used for electricity generation) conservation. Also the project leads to promotion of 800 kW WTGs which proves the success of this type of technology.
There do not stand any risk factors which influence the emission reductions.

Emission reductions will be claimed on the net electrical energy that is supplied to grid which will be metered using electricity meters (Main & Check meters) located at the electrical yard of the respective WTGs. These electrical energy meters are essentially electronic tri-vector meters of appropriate accuracy class. Since these meters are not designed to measure high voltages and currents as generated in the WTG, the WTG output is connected to these meters via transformers (CT/PT) for stepping down the generated voltage and current to ranges which the meters can record. As such, these meters have a multiplying factor which when multiplied to the meter reading provides the actual amount of electricity generated. The technology providers for the project have additionally installed an LCS meter at the WTG controller. Details of monitoring of emission reductions and their calculation have been provided in Section B.6.1 & Section B.7.2 of this document.

For the project activity, the project proponent has procured the WTGs from Enercon India Limited for supply of 5 units in total of E-53 800 kW capacity each. The salient features of the technology employed are:

Turbine model	Enercon E-53
Rated power	800 kW
Rated diameter	52.9 m
Hub height	75 m (concrete)
Turbine type	Direct driven, horizontal axis wind turbine with variable rotor speed
power regulation	independent pitch system for each blade
Cut in wind speed	3.0 m/s
Rated wind speed	12 m/s
cut out wind speed	28-34 m/s
extreme wind speed	59.5 m/s
Rated rotational speed	29 rpm
operating range rot. Speed	12-29 rpm
oreintation	Upwind
No. of blades	3
Blade material	Fibre glass Epoxy reinforced
Gear box type	Gearless
Generator type	Synchronous generator
Braking	Aerodynamic
Output voltage	400 v
Yaw system	Active yawing with 4 electric yaw drives with brake motor
Tower	74 m (concrete)

Generation of power through wind turbine has no sources of emission as discussed in detail in Section B.3 of this document. The electricity generated is monitored using electrical meters (Main & Check meters) which provide a measure of the actual electrical energy that would have been sourced from a fossil-fuel based power plants in the absence of the project activity. Hence, the fossil-fuel power based grid shall form the baseline to the project activity which has been developed in Section B.4 of this document. Further to this, a detailed monitoring procedure is provided in Section B.7 of this document.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host Country)	Peethambra Granites Pvt. Ltd. (Private Entity)	No

A.5. Public funding of project activity

No Public funding is flowing into the project activity.

A.6. History of project activity

The proposed CDM project activity is registered as a CDM project activity with UN reference number as UN 8890[3]. This project activity is not included as a component project activity (CPA) in a registered CDM programme of activities (PoA).

The proposed CDM project activity was not a CPA that has not been excluded from a registered CDM PoA. This is a registered CDM project activity whose first crediting period is ongoing and project exists in the same geographical location as the proposed CDM project activity.

A.7. Debundling

As per 'Guidelines on assessment of de-bundling for SSC project activities' Annex 13 to EB 54, para 2, 'A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

(a) With the same project participants;
(b) In the same project category and technology/measure;
(c) Registered within the previous 2 years; and
(d) Whose project boundary is within 1 km of the project boundary of the proposed small- scale activity at the closest point.

The project participant hereby confirms that they have not registered any small scale CDM activity or applied to register another small scale CDM project activity within 1 km of the project boundary, in the same project category and technology/measure in previous 2 years.

SECTION B. Application of selected methodologies and standardized baselines

B.1. Reference to methodologies and standardized baselines

Title: Grid Connected Renewable Electricity Generation[4], Version 17, EB 61, sectoral scope 01

Reference: Appendix B of the simplified modalities & procedures for small scale CDM project activities

The methodology also refers to latest approved versions of "**Tool to calculate the emission factor for an electricity system, version 02.2.1"**

B.2. Applicability of methodologies and standardized baselines

Choice of project category 'D- Grid connected renewable electricity generation' is as per the Appendix B of the simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. Justification for the choice has been provided in table as per requirements set in para 1-8 in the methodology AMS I.D. Version-17.

Applicability Criterion (with Para number reference)	Project Case

[3] http://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1355888511.27/view

[4] http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

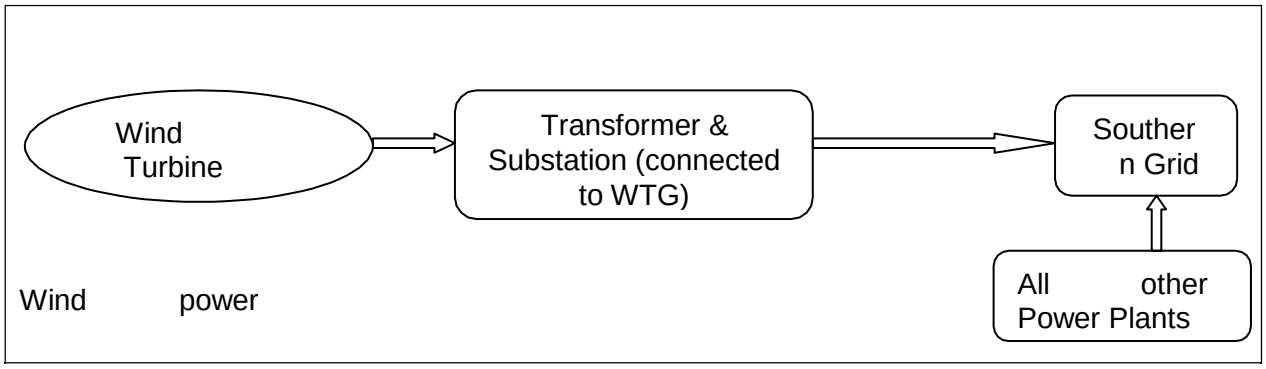
1. This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a) Supplying electricity to a national or a regional grid. (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The Project is wind based renewable energy source, zero emission power project connected to the Southern grid. The Project will displace equivalent amount of fossil fuel based electricity generation that would have otherwise been provided by the operation and expansion of the fossil fuel based power plants in Southern regional electricity grid
2. Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A2) applies is included in Table 2[4]	The 1st option of Table 2 of AMS I.D. Version 17, EB 61 is applicable (please refer footnote).
3. This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project is installation of a new wind based electricity generation plant at a site where no renewable energy power plant was in operation (Greenfield plant) by the PP.
4. Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology[5]: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater	The Project activity is power generation from wind energy source, not from hydro, hence criteria is not applicable to the project activity.

5

	Project type	AMS-I.A	AMS-I.D	AMS-I.F
1	Project supplies electricity to a national/regional grid		√	
2	Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			√
3	Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)		√	
4	Project supplies electricity to a mini grid[4] system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			√
5	Project supplies electricity to household users (included in the project boundary) located in off grid areas	√		

than 4 W/m^2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	
5. If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project activity is a 5X0.8 MW wind electricity generation. Unit does not co-fire fossil fuels since wind is the only source of power.
6. Combined heat and power (co-generation) systems are not eligible under this category.	Project activity is not a combined heat and power system.
7. In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	Project involves installation of five wind mills of capacity 0.8 MW each at project site. It does not involve capacity addition.
8. In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	Not applicable, the entire wind project is a Green field project activity and this project is not the enhancement or up gradation project.

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



Project boundary has been ascertained using para 9 of AMS I.D. – "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 GHG emission sources considered for the project boundary and their explanations are as follows:

Source	Gas	Included	Justification / explanation
(BASELINE) Electricity Generation of NEWNE grid	CO_2	Yes	Major emission sources
	CH_4	No	Excluded for simplification. This is conservative
	N_2O	No	Excluded for simplification. This is

			conservative
(PROJECT ACTIVITY) Wind Electricity Generation	CO_2	No	As renewable wind power project, hence not applicable
	CH_4	No	The proposed project is wind power project, hence not applicable
	N_2O	No	The proposed project is wind power project hence not applicable

B.4. Establishment and description of baseline scenario

The project activity is the installation of a new wind power plant. This project is not a modification/ retrofit of any existing electricity generation facility. Hence, in accordance to para 10 of the approved methodology AMS I.D, Version 17, the baseline scenario for new installation facility is described as: "the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid".

The baseline methodology followed is the one specified under Project category I.D in Appendix B of the Simplified M&P for small scale CDM project activities. As per the applied methodology, AMS ID, (Version 17), para 11, the baseline emissions are the product of electrical energy baseline expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor. For the estimation of the emission factor the project proponent has chosen to calculate the combined margin, consisting of the combination of the operating margin (OM) and the build margin (BM) according to the procedures laid out in the "Tool to calculate the Emission Factor for an electricity system". The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, has estimated the Combined Margin for the South grid, the details of which are available on the following website.

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

The latest version of the said tool, Version 02.2.1, has been used by the CEA for the calculation. The procedures followed, the assumptions made and the formulae applied by the CEA for the calculation of the OM and the BM is detailed in Section B.6.1 of this PDD.

Parameter	**Baseline Emissions, BE_y**
Description of Baseline	As per para 10 of the methodology AMS I D Version 17, "The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid." The proposed project activity will evacuate power to the Southern grid & completely comply with the para 10 of AMS I D Ver17. As per para 12 of the methodology AMS I D Version 17, The Emission Factor can be calculated in a transparent and conservative manner as follows: (a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the Emission Factor for an electricity system'. OR (b) The weighted average emissions (in t CO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

	Thus the Option (A) mentioned above is selected for baseline calculation The baseline emissions are the product of electrical energy baseline EG_{BL}, y expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.
Rationale	The project is a renewable energy project with maximum output capacity of 4.0 MW which is well below the specified limits of 15 MW of maximum output capacity. Also the project activity sells electricity to regional grid,Southern grid. Hence Type I – Renewable energy projects and Category D – Electricity Generation for a System are applicable to the project as per Appendix B of the simplified modalities and procedures for small-scale project activities. Also applicability of SCC CDM methodology AMS-I.D has been clearly demonstrated in Footnote 5, in Section B.2 above. Thus the PP has chosen to determine Baseline scenario and Baseline calculations in accordance with AMS-I.D.
Variables	1) Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh), $EG_{BL,y}$ (2) CO_2 emission factor of the grid in year y (t CO_2/MWh), $EFCO_{2,grid,y}$
Mathematical Relations	$BEy = EG_{BL,y} * EFCO_{2,grid,y}$ $ER_y = BE_y – PE_y – LE_y$ $ER_y = BE_y – 0 – 0$ (as, $PE_y = LE_y = 0$) $ER_y = BE_y$
Datasources	Published Database Version 07 of Central Electricity Authority
Weblink	http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver7.pdf

B.5. Demonstration of additionality

As per of EB 22, Annex 3, baseline scenario should be established taking into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector.

Para 7(a) of same states that, only those national and/or sectoral policies or regulations under paragraph 6(a) i.e. type E+ policy that increase GHG emissions, that have been implemented before adoption of the Kyoto Protocol by the COP (decision 1/CP.3, 11 December 1997), shall be taken into account when developing a baseline scenario. For more emitting power sector, there was no policy with comparative advantage existed before 11 December 1997. Hence it is not applicable for baseline determination.

Para 7(b) of the same state that those National and/or sectoral policies or regulations under paragraph 6(b), i.e. type E- policy that decrease GHG emissions, that have been implemented since the adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001) need not be taken into account in developing a baseline scenario. As per Electricity Act 2003, Section 86(1), SERC shall “Promote cogeneration and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person”. The Ministry of Power has published the implementation plan[6] of various sections (of Electricity Act 2003) including the provision of incentivising renewable energy projects through State Electricity Regulatory Commissions. Hence, it can be concluded that the provincial and sectoral policies are E-, policies that decrease GHG emissions. Also,

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

these policies have been implemented since the adoption by the COP of the CDM M & P (decision 17/CP.7, 11 November 2001).

Hence the PP has not considered them in developing the baseline scenario for the project activity. Instead the baseline scenario is based on hypothetical situation without the provincial and sectoral polices being in place. Hence the selection of baseline scenario confirms to Annex 3 of EB 22.

Moreover, The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid, and is in line with para 10 of the methodology AMS ID version 17.

The implementation of the project activity was a voluntary step undertaken by the project developers with no direct or indirect mandate by law. The project activity is in line with the policies of the Government of India – Ministry of New and Renewable Energy (MNRE). Wind Power Project is one of the thrust areas of power generation from renewable in the Ministry of New and Renewable Energy. It has been recognized that wind power projects can play a critical role in improving the overall energy scenario of the country and in particular for remote and inaccessible areas like deserts, sea soars etc.

In accordance with paragraph 28 of the Simplified Modalities and procedures for Small Scale CDM project activities, a Simplified Baseline and Monitoring methodology listed in Appendix B may be used for a Small Scale CDM project activity if project participants are able to demonstrate that the project activity would otherwise not be implemented due to the existence of one or more barriers listed in "Guidelines on the demonstration of additionality of small-scale project activities" version 09, annex27 EB 68 .These barriers are:

A. Investment Barrier
B. Technology Barrier
C. Barriers due to Prevailing Practice
D. Other Barriers.

Demonstration of additionality for the CDM project activity:

In accordance with simplified modalities and procedures for small-scale project activities, simplified baseline and monitoring methodology listed in Appendix B may be used if project participant can demonstrate that the project activity would otherwise not be implemented due to the existence of one or more barrier(s) listed in Guidelines on the demonstration of additionality of small-scale project activities. Similarly, for the indentified CDM project, following barriers have been overcome during project planning & execution.

The project follows the Annex 34 of EB 35 "Non-binding best practice examples to demonstrate additionality for SSC project activities." and, paragraph 1 of Annex 27 of EB 68, "Guidelines on the demonstration of additionality of small-scale project activities" option (a) i.e. Investment Barrier to demonstrate additionality.

Though the detail methods are not mentioned in above tool, the PP has taken reference for investment analysis by using UNFCCC "Tool for the demonstration and assessment of additionality", (Version- 06.1.0, Annex 20, EB- 69).

Investment Analysis:

As per *Tool for the demonstration and assessment of additionality*, it is to be determined that the project activity is not:

a) The most economically or financially attractive; or
b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

Determine appropriate analysis method

As per Sub-step 2a, Paragraph (1), as the project activity is selling the generated electricity to state electricity utility & getting financial benefits other than CDM benefits hence, Option- I is not applicable under this situation. Also as per EB-62, Annex 05, clause no.19 "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. Hence Option-II is also not applicable under this situation. So the project promoter has chosen Option- III or benchmark analysis as an appropriate analysis method to demonstrate the investment barrier.

Apply benchmark analysis

Additionality Tool (Version 06.1.0) requires the PP to identify the financial indicator, such as IRR, most suitable for the project type and decision context. The PP has selected Equity IRR as a suitable financial indicator for a comparison with the selected benchmark. Additionality Tool (Ver. 06.1.0) permits the use of Equity IRR, for demonstrating the additionality using benchmark analysis.

Benchmark:

Annex 05 of EB 62 para 12 states that where the Equity IRR has used to demonstrate the additionality of the project, required/expected returns on equity are appropriate benchmarks for an Equity IRR.

PPs have selected post tax Equity IRR as financial indicator of the project and used Capital Asset Pricing Model (CAPM) for deciding benchmark for this project. CAPM is a model of linear general equilibrium return. In the CAPM theory, investors are assumed to have homogeneous expectations during the decision-making period. Investors make their decision only on the basis of the expected returns, standard deviations and covariance of all pairs of security. According to CAPM, all investors hold only the market portfolio and riskless securities. The market portfolio is a portfolio comprised of all stocks in the market. The required rate of return is given by the following formula -

$$\text{Required rate of return} = R_F + \beta \times (R_M - R_F)$$

Where-
R_F = Risk free rate
β = Beta which shows risk
R_M = Market return

Risk free rate:

The risk free rate is the return on a security (or a portfolio of securities) that is free from default risk. Typically, the rate of long term government bonds is used to determine the risk free rate. In the context of the present project activity, YTM (Yield to Maturity) at primary issues over a period of 10 years has been considered to represent the risk free rate. (Reference has been taken from Guidance 16 of Annex 05 of EB 62)

Expected market rate of return = *Returns of BSE-Sensex is considered as Market index.* Return on well-diversified market portfolio.

{From the available market indices BSE-Sensex[7] acts as a better financial/economic indicator when compared to other indices based *on:*

- *It is the major index of India that is being monitored at the international market.*
- *It had tracked the Indian stock market for a long time period. Thus large number of data points are available which provide a better estimate of expected market return.*
- *It includes various phases of the economy and various types of investors who have been active in the market at different points in time.*

Moreover, it comprises of 30 large companies, based on their market capitalization. The index can therefore be considered as relatively stable with low random fluctuations and thus is in line with the assumptions of the CAPM model and it is reasonable to refer to BSE-SENSEX for determining the average market return.

Market Risk Premium

The market risk premium is the difference between the expected market rate of return and the average risk free rate and is usually measured by looking at the average of the historical returns on a market portfolio. In the context of the present project activity, the period selected to calculate the expected market return has been calculated from the inception of BSE Sensex uptill the decision making date.

Thus the market risk premium estimated is

Market risk premium = $R_M - R_F$

However, the market risk premium should not be viewed on a standalone basis. The overall risk premium depends on market risk premium as well as on a parameter called Beta, which has been explained below:

Beta = Covariance (R, R_M) / Variance (R_M)

Beta is the measure of the expected volatility of a particular stock relative to a well-diversified market portfolio. It measures the systematic risk of a stock, i.e. the risk that cannot be eliminated in a well- balanced, diversified portfolio. The beta is calculated as the covariance between its return and the return on a well-diversified market portfolio, divided by the variance of the return on a well-diversified market portfolio.

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, since there was only no exclusive wind energy companies listed on any stock exchange in India, in the absence of adequate data on companies which are exclusively into the same type of business (i.e wind power projects), the next best option for assessing the risk of these projects is to consider the data available on companies which are involved in similar businesses.

Therefore, PP has considered beta values of the power companies in India. The group of companies considered includes renewable as well as conventional power generating companies. It is understood that risky businesses are likely to have higher cost of equity than safer businesses; projects in riskier businesses will have to cover these higher costs. Hence, 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 (e.g. wind), and a lower

[7] http://www.bseindia.com/sensex/index.htm

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.

Nevertheless, being more conservative, in this case, to arrive at Beta value of Proposed Project Activity, PP has taken average of unlevered beta of the Companies which are included in Power - Generation/Distribution sector categorized by money control & have trading data of 3 years at the time of investment decision date. Project Proponent has taken the average of Unlevered Beta value arrived for six power companies (TATA Power, Neyveli Lignite, Reliance Infra, CESC, GIPCL, BF Utilises) listed on Bombay Stock Exchange (BSE) available at the time of investment decision.

β_a = Unlevered Beta or Asset Beta = β_e / {1+(1-T)*(D/E)}

where - β_a = Asset Beta or Unlevered Beta of the stock
β_e = Equity Beta or Levered Beta of individual stock
T = Marginal Tax Rate
D/E = Debt/Equity

Thus the benchmark for each project case in the bundle is as follows:-

Sr. No.	WTG Owner	Benchmark (Equity IRR)
1	Peethambra Granites Pvt.Ltd – WTG1	17.06%
2	Neha Sharma – WTG2 & WTG3	17.00%
3	Atul Sharma – WTG4	17.00%
4	Atul Sharma – WTG5	17.00%

Benchmark determination input values is based on publicly available data sources which can be clearly validated by the DOE, thus it complies with guidance 13 of EB 62, Annex 5.

The key assumptions supporting financial projections:

Assumption and financial of the project							
		Peethambra Granites Pvt.Ltd -	Neha Sharma	**Atul Sharma**	Atul Sharma		
		WTG1	WTG 2 & 3	WTG 4	WTG 5		
Details of the project						Source	Link
State where the project is situated		Tamilnadu	Tamilnadu	Tamilnadu	Tamilnadu	As Per Offer Letter	
No. of machine		1	2	1	1	As Per Offer Letter	
Capacity /machine	MW	0.8	0.8	0.8	0.8	As Per Offer Letter	
Total Capacity	MW	0.8	1.6	0.8	0.8		
Date of Commissioning (Expected)		31-Mar-12	31-Mar-12	31-Mar-12	31-Mar-12	As Per Offer Letter	
Life of the plant	Years	20	20	20	20	As per TNERC order dated 20.03.2009, Pg 54	http://tnerc.gov.in/orders/draft%20order%2020-3-2009%20complete%20final. pdf

Generation and sale of electricity							
PLF	Percent	25.02%	24.82%	25.12%	24.82%	As per Third Party Report in accordance to EB 48 Annex 11	
Issuance dates of PLF report		25-Aug-11	10-Jun-11	10-Jun-11	10-Jun-11	As per Third Party Report	
Annual generation	kWh	1,753,000	3,479,000	1,760,000	1,739,000		
Tariff Rate at the decision making	INR/kWh	3.39	3.39	3.39	3.39	As per TNERC order dated 20.03.2009, Pg 54	http://tnerc.gov.in/orders/draft%20order%2020-3-2009%20complete%20final. pdf
Deration after 10th year, every year	Percent	1.00%	1.00%	1.00%	1.00%	As per TNERC order dated 20.03.2009, Pg 54	http://tnerc.gov.in/orders/draft%20order%2020-3-2009%20complete%20final. pdf
Operation and maintenance cost and Insurance							
O & M Expenses	INR Million	0.72	1.43	0.72	0.72	As per offer letter	
Escalation in the O & M Expenses	Percent	6%	6%	6%	6%	As per offer letter	
O & M Expenses (TNEB)	INR Million	0.14	0.28	0.14	0.14	As per e-mail communication from technology provider	
Escalation in the O & M Expenses (TNEB)	Percent	5%	5%	5%	5%	As per e-mail communication from technology provider	
Financial parameters							
TOTAL COST	INR Million	46	92	46	46	As Per Offer Letter	
Loan Amount	INR Million	32.2	64.4	32.2	32.2		
Equity Investment	INR Million	13.8	27.6	13.8	13.8		
Term loan							
Loan Amount	INR Million	32.2	64.4	32.2	32.2	As per TNERC order dated 20.03.2009, Pg 54	http://tnerc.gov.in/orders/draft%20order%2020-3-2009%20complete%20final. pdf
Interest rate	Percent	12.00%	12.00%	12.00%	12.00%	As per TNERC order dated 20.03.2009, Pg 54	http://tnerc.gov.in/orders/draft%20order%2020-3-2009%20complete%20final. pdf

Loan Tenure	Quarter	40	40	40	40	As per TNERC order dated 20.03.2009, Pg 54	http://tnerc.gov.in/orders/draft%20order%2020-3-2009%20complete%20final. pdf
Moratorium Period	Quarter	4	4	4	4	As per TNERC order dated 20.03.2009, Pg 54	http://tnerc.gov.in/orders/draft%20order%2020-3-2009%20complete%20final. pdf
Repayment Period	Quarter	36	36	36	36		
Repayment installments value	INR Million	0.894	1.789	0.894	0.894		
1st installment from	Quarter end	Jun-13	Jun-13	Jun-13	Jun-13	Considered , as from next quarter from the date of commissioning	
Book Depreciation							
Transportation Charges	INR Million	1.50	3.00	1.50	1.50		
Transfer of Development rights	INR Million	1.60	3.20	1.60	1.60		
Gross Depreciable Value[8]	INR Million	40.60	81.20	40.60	40.60		
Salvage value	%	10.00%	10.00%	10.00%	10.00%	As per TNERC order dated 20.03.2009, Pg 54	http://tnerc.gov.in/orders/draft%20order%2020-3-2009%20complete%20final. pdf
Salvage value	INR Million	4.06	8.12	4.06	4.06		
Net Depreciable Value	INR Million	36.54	73.08	36.54	36.54		
Book Depreciation	INR Million	1.83	3.65	1.83	1.83		
Residual value	INR Million	6.36	12.72	6.36	6.36		
IT Depreciation on (WDV)	Percent	40.00%	40.00%	40.00%	40.00%	As Per Income Tax Act	http://www.incometaxindia pr.gov.in/incometaxindiacr/ contents/ITRules2010/appe ndix264.htm
Income Tax							
Financial Year		FY 2011-2012	FY 2011-2012	FY 2011-2012	FY 2011-2012		
Income tax rate	Percent	30.00%	30.00%	30.00%	30.00%	As Per Income tax rule Pg 35 Para E(l)	http://indiabudget.nic.in/ub 2011-12/fb/bill91.pdf
MAT	Percent	18.50%	0.00%	0.00%	0.00%	As Per Income tax rule Pg 25	http://indiabudget.nic.in/ub 2011-12/bs/bs.pdf

Surcharge	Percent	5.00%	5.00%	5.00%	5.00%	As Per Income tax rule Pg 31	http://indiabudget.nic.in/ub 2011-12/bs/bs.pdf
Education cess	Percent	3.00%	3.00%	3.00%	3.00%	As Per Income tax rule Pg 35 Para E(l)	http://indiabudget.nic.in/ub 2011-12/fb/bill91.pdf
Service Tax	Percent	10.00%	10.00%	10.00%	10.00%	As Per Income tax rule Pg 3 & 4, Points 2.(11) and 2.(12)	http://indiabudget.nic.in/ub 2011-12/fb/bill2.pdf
Final Tax rates							
Income tax rate	Percent	32.45%	32.45%	32.45%	32.45%		
MAT	Percent	20.01%	0.00%	0.00%	0.00%		
Service Tax	Percent	10.30%	10.30%	10.30%	10.30%		

The result of the analysis is as follows–

Sr. No.	WTG Owner	Equity IRR without CDM	Benchmark (Equity IRR)
1	Peethambra Granites Pvt.Ltd – WTG1	7.65%	17.06%
2	Neha Sharma – WTG2 & WTG3	7.45%	17.00%
3	Atul Sharma – WTG4	7.98%	17.00%
4	Atul Sharma – WTG5	7.45%	17.00%

Tax Shield

PP has considered 40% accelerated depreciation due to which he is enjoying benefit of tax shield for the first two years, the details of which are presented in the IRR Sheet.

Calculation and comparison of financial indicators

PP has calculated the IRR for the project for a period of twenty years (i.e. complete life time of the WTG). Values that have been considered for calculation of IRR, has been incorporated above.

This substantiates that the investment is not financially attractive (equity IRR for the project activity is less than the Benchmark) for any of the investor. Thus it can be easily concluded that project activity is additional & is not business as usual scenario. Thus, successful CDM registration of this project activity is important to make it financially viable.

Sensitivity Analysis

As per Guidance 20 of Annex 5 of EB 62, only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets. Guidance also states, “All parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude”. The Annex also states, as a general point of departure, variations in the sensitivity analysis should at least cover a range of +10% and –10%, unless this is not deemed appropriate in the context of the specific project circumstances.

Since the project cost is already firmed up, the cost is not variable. The tariff is determined by PPA which is fixed for years mentioned as per the respective State Electricity Board’s tariff order and hence it need not be subjected to variation. All other expenses are much less than 20% of the total cost. Hence, only PLF needs to be subjected to reasonable variation. Nevertheless, following factors have been subjected to sensitivity analysis:

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

The results of sensitivity analysis are as follows:

Equity IRR	Peethambra Granites Pvt.Ltd – WTG1			
Variation %	-10%	Normal	10%	Breaching Value
PLF	3.95%	7.65%	11.87%	21.70%
O&M	8.40%	7.65%	6.97%	-144.59%
Project Cost	11.29%	7.65%	4.97%	-21.59%
Tariff Rate	3.95%	7.65%	11.87%	21.70%

Equity IRR	Neha Sharma – WTG2 & WTG3			
Variation %	-10%	Normal	10%	Breaching Value
PLF	3.72%	7.45%	12.03%	19.64%
O&M	8.20%	7.45%	6.69%	-134.46%
Project Cost	11.43%	7.45%	4.74%	-19.82%
Tariff Rate	3.72%	7.45%	12.03%	19.64%

Equity IRR	Atul Sharma – WTG4			
Variation %	-10%	Normal	10%	Breaching Value
PLF	4.07%	7.98%	12.68%	18.21%
O&M	8.74%	7.98%	7.22%	-126.19%
Project Cost	12.08%	7.98%	5.09%	-18.60%
Tariff Rate	4.07%	7.98%	12.68%	18.21%

Equity IRR	Atul Sharma – WTG5			
Variation %	-10%	Normal	10%	Breaching Value
PLF	3.72%	7.45%	12.03%	19.63%
O&M	8.20%	7.45%	6.69%	-134.46%
Project Cost	11.43%	7.45%	4.74%	-19.82%
Tariff Rate	1.03%	7.45%	12.03%	19.63%

The results of sensitivity analysis show that even with a variation of +10% & -10% in project cost, O&M cost, PLF and Tariff Rate Equity IRR is significantly lower than the benchmark. And it is evident from the results given above; the project remains additional even under the most favourable conditions.

	Probability to breach the benchmark
PLF	Not possible as the PLF has been reported as per the Third Party Report based on long term data and hence a PLF fluctuation of more than 10% is unlikely to happen.
O&M	With the country experiencing 5% inflation on an average, the question of O&M coming down is ruled out. Moreover, CERC[8] Draft orders specifies 5.72% escalation in O&M Cost & in recent time offer letter for most of the project proponents provides for a 6% escalation in the cost every year for the first 5 years.

[8] CERC order Pg.25

http://www.cercind.gov.in/2011/Whats-New/cer2012_17.pdf

Project Cost	The Purchase Order cost for all project proponents is less than 10% of the Offer letter cost which was considered during decision making. However, we have conducted sensitivity analysis for all project proponents for project cost being 10% less than that considered during decision making. Still, the IRR does not breach the Benchmark for any of the project proponents. Hence, there is no any probability of the Benchmark being breached.
Tariff Rate	The tariff is determined by PPA which is fixed for years mentioned as per the respective State Electricity Board's tariff order. Hence, there is no probability to get variation for the same.

Demonstration of Parallel and continuing actions as per the 'guidelines on the demonstration and assessment of prior consideration of the CDM' annex 13 para 2 to EB 62[9].

Project Investors' Name	Board Resolution date	Purchase Order date	F-CDM sent to UNFCCC & NCDMA
Peethambra Granites Pvt Ltd	30/08/2011	20/10/2011	01/12/2011
Atul Sharma	15/06/2011	16/06/2011	
Neha Sharma	15/06/2011	16/06/2011	

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

Method of calculation of combined margin emission factor: "Tool to calculate the Emission Factor for an electricity system", Version 02.2.1, EB 63 (Annex 9: Methodological Tool).

The combined margin calculations estimate the baseline emission factor for grid. It consists of a combination of operation margin (OM) and build margin (BM) factors obtained from publication issued by Central Electricity Authority (CEA) of India- CO_2 Baseline Database for the Indian Power Sector, Version 07, January, 2012[10].

The methodology provides following approaches for emission factor calculations:

(a) Combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology "Tool to calculate the emission factor for an electricity system".

OR

(b) The weighted average emissions (in t CO2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.
Option (a) has been considered to calculate the grid emission factor as per the 'Tool to calculate the emission factor for an electricity system' since data is available from an official source.

As per the "Tool to calculate the emission factor for an electricity system" version 02.2.1, the following steps have been followed.

STEP 1. Identify the relevant electricity systems;
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional);

9 http://cdm.unfccc.int/filestorage/P/U/2/PU2ARNBM3KFXS9HZ6OELGTICJ81VYD/eb62_repan13.pdf?t=YjZ8bH Q5ZjZufDAy2Fsdxw5idTexx-QEth3F

10 http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

STEP 3. Select a method to determine the operating margin (OM);
STEP 4. Calculate the operating margin emission factor according to the selected method;
STEP 5. Calculate the build margin (BM) emission factor;
STEP 6. Calculate the combined margin (CM) emission factor.

STEP 1. Identify the relevant electricity power systems.

The tool defines that "for determining the electricity emission factors, identify the relevant 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 2007-08 as the four regional grids except the Southern grid has been synchronized, they are now being considered as one and named as NEWNE grid. Since the project supplies electricity to the Southern grid, emissions generated due to the electricity generated by the Southern grid as per CM calculations will serve as the baseline for this project.

STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional).

Project participants have the option of choosing 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) method.

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 or Dispatch data analysis is not possible due to lack of availability of this activity data to the project developers. The choice of other two options for calculating the operating margin emission factor depend on the 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)

2006-07	2007-08	2008-09	2009-10	2010-11

NEWNE	18.5%	19.0%	17.4%	15.9%	17.6%
South	28.3%	27.1%	22.8%	20.6%	21.0%
India	20.9%	21.0%	18.7%	17.1%	18.4%

Data Source: Central Electricity Authority (CEA) database Version 7,January'2012

The above data clearly shows that the percentage of total grid generation by low cost/must run plants (on the basis of average of three most recent years) for the NEWNE and southern grids are less than 50 % of the total generation. Thus the average emission rate method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation.

The "Simple operating margin" has been calculated as per the weighted average emissions (in tCO_2/MWh) of all generating sources serving the system, excluding hydro, geo-thermal, wind, low-cost biomass, nuclear and solar generation;
In the project activity, (*ex-ante*) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission has been considered. The data is published annually by the Central Electricity Authority. The CEA database is based on the methodology ACM0002 version 12.2.0.

It is confirmed that ex-ante vintage is considered in the project activity and cannot be changed during the crediting period.

STEP 4. Calculate the operating margin emission factor 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)

Year	GWh (Southern)
2008-2009	127,797
2009-2010	135,773
2010-2011	145,076

Simple Operating Margin (t CO_2/MWh) (incl. Imports)

Year	t CO_2/MWh (Southern)
2008-2009	0.9729
2009-2010	0.9415
2010-2011	0.9419

Simple Operating Margin = Generation weighted average of the simple operating Margin

= 0.9515 (t CO_2/MWh)

STEP 5. Calculate the build margin emission factor ($EF_{BM, y}$)

Option 1 as described above is chosen in the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PDD.

The $EF_{BM, y}$ is estimated as 0.7339 tCO_2/MWh (With sample group constituting most recent capacity additions to the grid comprising 20% of the system generation)

STEP 6. Calculate the combined margin (CM) emissions factor

Combined Margin – The combined margin is the weighted average of the simple operating Margin and the build margin. In particular, for intermittent and non-dispatchable generation types such as wind and solar photovoltaic, the Tool to calculate the emission factor for an electricity system, version 02.2.1, allows to weigh the operating margin and Build margin at 75% and 25%, respectively.

The baseline emission factor is calculated using the combined margin approach as described in the following steps:

Calculation of Baseline Emission Factor EF_y

The baseline emission factor EF_y is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM, y}$) and the Build Margin emission factor ($EF_{BM, y}$):

$$EF_y = w_{OM} * EF_{OM, y} + w_{BM} * EF_{BM, y}$$

Where the weights w_{OM} and w_{BM}, are 75% and 25% respectively for wind energy projects, and $EF_{OM, y}$ and $EF_{BM, y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2/MWh.

Baseline Emission factor (Southern) = 0.75*0.9515 + 0.25*0.7339
= 0.8971 tCO_2/MWh

As per Paragraph 11 of methodology I.D. the baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor (in tCO_2 /MWh).

Baseline emissions:

The baseline emission calculation for the project activity is attributable to the CO_2 Emission that could have been produced at grid from fossil fuel based power plants in absence of the proposed project activity with Wind mill. Therefore the amount electricity supplied to the baseline grid will be multiplied by the Grid emission factor to calculate the baseline emission reduced by the Project.

As per para 11of AMS ID

$$\mathbf{BE_y = EG_{BL,y} X EF_{CO2,grid,.y}}$$

Where,

BE_y = Baseline Emissions in year y (t CO_2)

$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{CO2, grid, y}$ = CO_2 emission factor of the grid in year y (t CO_2/MWh)

Project Emissions:

As per para 20 to AMS I.D, version 17 for renewable project activities Project Emission (PE_y) in tCO_2/year = 0 except geothermal and hydro power plants.

Since project activity is a wind power plant.

Therefore,

$PE_y = 0$ ..... (1)

Leakage Emissions:

Since project does not involve transfer of an energy generating equipment from another activity, as per para 22 of AMS I.D, Version 17:

$LE_y = 0$ ..... (2)

Emission Reduction:

As per para 23 of AMS I.D, version 17,

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

Where,
ER_y = Emission reductions in year y (t CO_2/y)
BE_y = Baseline Emissions in year y (t CO_2/y)
PE_y = Project emissions in year y (t CO_2/y)
LE_y = Leakage emissions in year y (t CO_2/y)

Using equation 1 & 2 we get,

$$\mathbf{ER_y = BE_y - 0 - 0}$$
or
$$\mathbf{ER_y = BE_y}$$

B.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin Grid Emission factor
Source of data	Calculated from operating and built margin, using 75%-25% weights used
Value(s) applied	0.8971
Choice of data or measurement methods and procedures	The value applied is taken from the CEA reviews of three years. The detailed calculation is shown in the baseline section above.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This value is fixed *ex-ante*

Data/Parameter	$EF_{OM,y}$
Data unit	tCO_2/MWh
Description	Operating Margin Grid Emission factor
Source of data	Calculated from CEA database, Version 07, January 2012
Value(s) applied	0.9515
Choice of data or measurement methods and procedures	The value applied is taken from the CEA reviews of three years. The detailed calculation is shown in the baseline section above.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This value is fixed *ex-ante*

Data/Parameter	$EF_{BM,y}$
Data unit	tCO_2/MWh
Description	Build Margin Grid Emission factor
Source of data	CEA database, Version 07, January 2012
Value(s) applied	0.7339
Choice of data or measurement methods and procedures	The value applied is taken from the CEA reviews of three years. The detailed calculation is shown in the baseline section above.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This value is fixed *ex-ante*

B.6.3. Ex ante calculation of emission reductions

The relevant equation & calculations had been mentioned at Section B.6.1 of this PDD, thus kindly refer the same.

Emission reductions are calculated as follows:

$ER_y = BE_y – PE_y – LE_y$ (1)

Where:
ER_y Emission reductions in year y (tCO_2/y)
BE_y Baseline Emissions in year y (tCO_2/y)
PE_y Project emissions in year y (tCO_2/y)
LE_y Leakage emissions in year y (tCO_2/y)

as per Section B.6.1. - $PE_y = LE_y = 0$

Thus,
$ER_y = BE_y – PE_y – LE_y$
$ER_y = BE_y – 0 – 0$ (as, $PE_y = LE_y = 0$)

The summary of the same is as:-
$ER_y = BE_y$

Emission reductions in year y (tCO_2/y) = Baseline Emissions in year y (tCO_2/y)

EX- ANTE EMISSION REDUCTION CALCULATIONS FOR PEETHAMBRA GRANITES PVT LTD PROJECT ACTIVITY									
				Net Generation	**Baseline Emissio**	**Baselin e**	**Project emissio**	**Leakage Emissio**	**Emissio n**

Sr. No.	Capacity (MW)	Investor's Name	PLF		n factor	emissions	ns	ns	reductions
				(MWh/year)	(tCO2/MWh)	(ton of CO_2e/ year)	(ton of CO_2e/ year)	(ton of CO_2e/ year)	ton of CO_2e/year
WTG 1	0.8	Peethambra Granites Pvt.Ltd	25.02 %	1,753	0.8971	1,573	0	0	1,573
WTG 2	0.8	Neha Sharma	24.82 %	1,739	0.8971	1,560	0	0	1,560
WTG 3	0.8		24.82 %	1,739	0.8971	1,560	0	0	1,560
WTG 4	0.8	Atul Sharma	25.12 %	1,760	0.8971	1579	0	0	1,579
WTG 5	0.8	Atul Sharma	24.82 %	1,739	0.8971	1,560	0	0	1,560
Total				**8,732**		**7,833**	**0**	**0**	**7,833**

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)
2013	7,833	0	0	7,833
2014	7,833	0	0	7,833
2015	7,833	0	0	7,833
2016	7,833	0	0	7,833
2017	7,833	0	0	7,833
2018	7,833	0	0	7,833
2019	7,833	0	0	7,833
Total	54,831	0	0	54,831
Total number of crediting years	7			
Annual average over the crediting period	7,833	0	0	7,833

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	EG_y
Data unit	Quantity of net electricity supplied to the grid in Year y
Description	Joint Metering Report.
Source of data	8,732
Value(s) applied	Quantity of net electricity supplied to the grid in Year y
Measurement methods and procedures	Measurement method: The net electricity exported to grid is calculated as a difference in the electricity exported to the grid and imported from the grid.

	Monitoring: Electrical Energy Meters which are electronic tri-vector meters of accuracy class 0.2[11] (Main & Check meters) Data type: Measured & Calculated Archiving: Paper & Electronic Responsibility: The O&M site-in-charge shall be responsible for the regular recording of data. Calibration Frequency: The meters shall be calibrated once every two years.
Monitoring frequency	Recording Frequency: Continuous Monitoring, Continuous Measurement and at least monthly recording.
QA/QC procedures	The amount of electricity exported to grid is cross-checked with the invoices for sale of power. Meter calibration shall be conducted once every two years and internal audit system is in place as mentioned in Section B.7.2
Purpose of data	The Data/ Parameter is required to calculate the baseline emission
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. In the case of the crediting period start & end dates of the project activity falls in between the billing cycles, then for emission reduction calculations, the daily generation reports measured at TNEB provided by the O&M service provider, shall be considered.

B.7.2. Sampling plan

Not Applicable

B.7.3. Other elements of monitoring plan

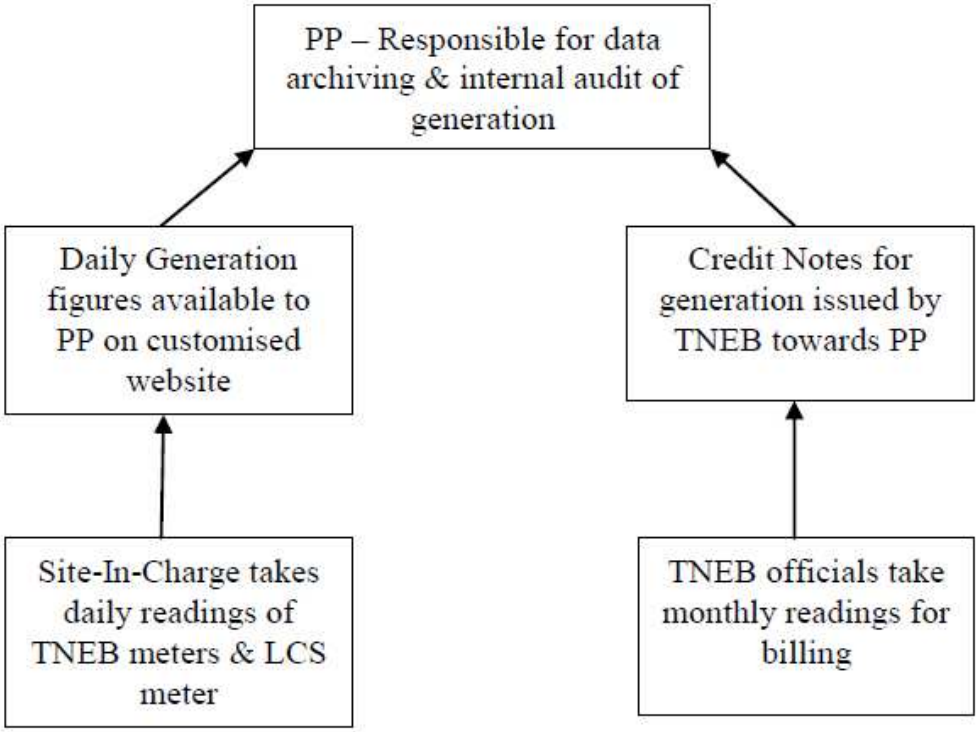
The Monitoring plan is designed to be in accordance with the modalities and procedures for small scale project activities. The monitoring plan describes the parameters to be monitored, monitoring practices, QA and QC procedures, data storage and archiving.

The project activity is in accordance with approved small scale methodology AMS I.D, and therefore, can use the monitoring methodology for type I.D of 'Appendix B of the simplified M&P for small-scale CDM project activities-Version 17, - Grid connected renewable electricity generation.

The monitoring methodology specified in the methodology requires that the project-monitoring plan to consist of monitoring of quantity of net electricity supplied to the grid in the year y. In order to monitor the mitigation of GHG due to the project activity, the total energy exported needs to be measured. The net energy supplied to grid by the project activity multiplied by emission factor for regional grid, would form the baseline for the project activity.

Since the baseline emission factor is based on an ex-ante determination, monitoring of this parameter is not required. The sole parameter for monitoring is the net electricity exported to the grid. The Project is operated and managed by Enercon India Limited (EIL). Enercon India Limited (EIL) will have a designated Site-In-Charge (O&M) on site, who will be responsible for monitoring the electricity exported from the project activity. The overall flow of information has been depicted using the following hierarchical structure:

[11] Currently project activity involves 0.2s accuracy class meters. The accuracy of meters is under control of state electricity board (as per state electricity board regulations) and PP do not have any control on it. Thus in future the accuracy class of meters may change however it will be 0.5s or more accurate.



As per the project boundary diagram provided in Section B.3 of this document, the monitoring is done at the WTG electrical yard substation using a TNEB owned electronic tri-vector meters (Main & Check Meters).

The net electricity exported to grid is calculated as a difference in the electricity exported to the grid and imported from the grid. The electricity export and import values are calculated as the product of difference of current and previous TNEB meter readings multiplied with the multiplying factor of the meter. Additionally, all the WTGs at the site are connected to a central monitoring system located at that site only. This system captures daily generation figures which are later made available to PP on the customized website of EIL.

Training

Training of staff operating and maintaining the WEGs will be carried out by the WEG manufacturer or O&M Service Provider or Investors contract agency. Special emphasis will be given to the training of the employees to enable them to develop their skills to meet changing WEG technology and to provide efficient and effective O&M services. There is an initial learning program as well as continuous learning programs for all employees.

The training program focuses mainly on the management, monitoring and maintenance, and safety & reliability aspects of wind power. The objectives include:

1. Understanding the various stages and aspects in the management of wind power systems.
2. Understanding the importance of monitoring and maintenance of wind power systems and hence the various tasks involved in this.
3. Understanding the importance of safety and reliability aspects involved with wind power and the measures taken.
4. Managing generation and other data for future reference.

All the relevant data & reports for maintaining accuracy in monitoring and reporting of GHGs emission reductions is with the O & M contractor/ investors representative , which follows Quality Management System (QMS) procedure as per ISO 9001 and is ISO certified organization (it will by default incorporate Management review meeting and the internal audits as per procedures) .

Project in-charge is deputed to look after overall project activity. The project in-charge will supervise the functioning of the wind farm in close coordination with the officials & technical personnel of O & M contractor

Internal audits & Performance review

The records are regularly audited and checked by the senior officials from project proponent on an annual basis. The officials will monitor the actual emission reduction. The personnel responsible for taking readings at site are adequately trained.

Emergency Preparedness

In the context of the project activity, the main & check meters will be kept in sealed by TNEB and all maintenance will be taken up by TNEB only. In case of failure of the main meter, generation value would be arrived at as per standard clause (8) and (9) of Article 4 of the Energy Purchase agreement as provided below:

"(8) Check meter readings shall be considered when Main Meters are found to be defective or stopped. Provided that, if difference between the readings of main and check meters vis-à-vis main meter reading exceeds twice the Percentage error applicable to the relevant class, both meters shall be tested and the one found defective shall be immediately replaced and reading of other will be considered.

(9) If during test or calibration, both the main meter and check meter are found to have errors beyond permissible limits, the bill shall be revised for the previous 3 (Three) months or the exact period if known and agreed upon by the parties, by applying correction as determined by the meter testing Wing of the STU/Distribution Licensee to the consumption registered by the meter with lesser error.

The project promoters have contracted the technology supplier for providing O&M services for the power project. The service provider would be responsible for maintenance of the necessary spare parts and consumables for the maintenance of the WTGs such as anemometers, wind vanes and sensors, oil filters, batteries, auxiliary motors and pumps, WTG controllers, slip rings, limit switches and sensors, detergents & solvents etc. The service provider would also be responsible for supply of necessary main components of the WTG such as main gearboxes, blades, generators, towers, hubs, main shafts & bearings, ground and top controller and hydraulic systems. The service provider would also ensure that occupational health and safety procedures are adhered to during the operation & maintenance activities. Additionally, spare meters would also be kept available at the site for replacement in case of failure of any of the monitoring equipment's.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

The starting date of a CDM project activity is the date at which the implementation or construction or real action of a project activity begins. Date of raising purchase order is the conclusive evidence of project activity implementation. Hence start date of project activity is 16/06/2011 (Purchase Order date placed for WTG by Neha Sharma & Atul Sharma).

C.2. Expected operational lifetime of project activity

20 Years 00 Months

C.3. Crediting period of project activity

C.3.1. Type of crediting period

The project activity will use renewable crediting period.

C.3.2. Start date of crediting period

31/12/2012 or Date of submission of complete request for registration by the DOE whichever is later.

C.3.3. Duration of crediting period

7 years 00 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

Proposed project activity is using renewable energy generation technology which is free from any kind of anthropogenic emission. Project activity is not having any negative environmental impact. Only small amounts of oily and solid wastes associated with the installation of the WTG can be ignored when compared to Emission reductions. Project activity will result into GHGs emission reduction equivalent to 7,833 tCO_2/year.

As per the Schedule 1 of Ministry of Environment and Forests (MoEF - Government of India) notification dated September 14, 2006, - 39 activities are required to undertake environmental impact assessment studies.12

There are no negative environmental effects envisaged for the project. Wind turbines are considered as zero GHG emitting projects, so there will be no pollution caused by this project. Hence the proposed project does not fall under the list of activities requiring EIA as it will not involve any negative environmental impacts. Thus no EIA study was conducted.

D.2. Environmental impact assessment

Project activity has no significant emissions. Hence environmental impact of the project activity are not considered to be significant by the project participants or the host part.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

The followings are the local stakeholders for the project activity:

- Local community (category represented by word, LC)
- Local village administration (category represented by word, LVA)
- Technology suppliers (category represented by word, TS)
- Local vendors (category represented by word, LV)

In order to address and incorporates the concern of the stakeholders, invitations have been handed over directly to the stake-holders to attend the stakeholders meeting.

In the introductory speech, the representatives of EKI Energy Services Ltd. welcomed the gathering and informed the stakeholders about the project activity; project's associated benefits with respect to CO_2 emission reductions and explained the purpose of conducting the stakeholder

meeting in order to gather the views and comments of the local stakeholders on the project activity. Subsequent to the introductory speech, comments were received from the stakeholders.

The Minutes of meeting with commenting sheet from LSH, invitation letter reception copy has been submitted to the DOE.

Invitation Date	Meeting Date	Location of the Local Stakeholder Meeting		
		Village	District	State
02/01/2012	12/01/2012	Kalagumalai, Tamilnadu	Tutikorin	Tamil Nadu

E.2. Summary of comments received

Stakeholders Involvement:

The project participants prepared necessary documentation before implementation of the project activity and approached the above stakeholders individually. The project participants have received all clearances and approvals with no negative comments for the project activity from the Governmental agencies vested with the authority to examine the proposals from all aspects and issue the same.

Stakeholders' comments:

After the brief overview of CDM and project activity given by the project proponent, stakeholder interaction session was held, wherein villagers and other stakeholders recommended that there are no adverse effects of the project on the village and have improved employment in the area. Promotion of these activities was also advocated. This is also evident from issuance of approvals/consents/licenses for setting up and commissioning of the project activity and no adverse comments for the project.

E.3. Consideration of comments received

It has been taken care of all the conditions stipulated in the relevant clearances and no adverse comment has been raised. The stakeholders have given positive feedback and thus no measures were required to be taken.

SECTION F. Approval and authorization

The project obtained Host Country Approval from MOEF vide letter no 4/16/2012-CCC dated 6th Nov, 2012.

Appendix 1. Contact information of project participants

Organization name	Peethambra Granites Pvt. Ltd.
Country	India
Address	Building No. 80, Civil Lines, Jhansi, Uttar Pradesh- 284001, India.
Telephone	+91 510 2471288
Fax	-
E-mail	prem_pgpl@rediffmail.com
Website	-
Contact person	Mr. Atul Sharma

Appendix 2. Affirmation regarding public funding

NO PUBLIC FUNDING HAS BEEN RECEIVED FOR THIS PROJECT.

Appendix 3. Applicability of methodologies and standardized baselines

BASELINE INFORMATION

CENTRAL ELECTRICITY AUTHORITY: CO2 BASELINE DATABASE	
VERSION	7
DATE	January'12
BASELINE METHODOLOGY	ACM0002 / Ver 12.2.0 and "Tool to Calculate the Emission Factor for an Electricity System", Version 2.2.1

Net Generation in Operating Margin (GWH) (incl. Imports)			
	2008-09	2009-10	2010-11
NEWNE	421,802.6329	462,327.0946	476,986.7213
South	127,797.1945	135,773.9722	145,076.4566

Simple Operating Margin (tCO2/MWh) (incl. Imports)			
	2008-09	2009-10	2010-11
NEWNE	1.0066	0.9777	0.9707
South	0.9729	0.9415	0.9419

Weighted Generation Operating Margin	
NEWNE	0.9842
South	0.9515

Build Margin (tCO2/MWh) (not adjusted for imports)			
	2008-09	2009-10	2010-11
NEWNE	0.6755	0.8123	0.8588
South	0.8179	0.7634	0.7339

Combined Margin Emission Factor

NEWNE	0.9528
Southern	0.8971

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

Please refer Section B.6.1 of the PDD.

Appendix 5. Further background information on monitoring plan

Please refer section B.7.1 and B.7.2 for information on monitoring.

Appendix 6. Summary report of comments received from local stakeholders

Please refer section E.2 of the PDD.

Appendix 7. Summary of post-registration changes

The permanent changes in monitoring plan, listed below:

- Section B.7.1: Currently project activity involves 0.2s accuracy class meters. The accuracy of meters is under control of state electricity board (as per state electricity board regulations) and PP do not have any control on it. Thus current accuracy class is mentioned and footnote mentioned that in future the accuracy class of meters may change however it will be 0.5s or more accurate.

Editorial changes or Minor Corrections due to adoption of new PDD template, listed below:

- Cover page: completion of additional fields, namely Project participant(s), Host Party, Sectoral scope and selected methodology(ies), and Estimated amount of annual average GHG emission reductions, in line with new PDD template
- Section A.6 has been updated as per the latest template
- Section B.7.1 and B.6.2: In table purpose of data is mentioned as “For Calculation of Baseline Emissions”.

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Document information

Version	*Date*	*Description*
10.1	28 June 2017	Revision to make editorial improvement.

Version	*Date*	*Description*
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.
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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Decision Class: Regulatory
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