Project design document form

(Version 11.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the project activity	3.7 MW Bundle Wind Power Project in Maharashtra
Scale of the project activity	☐ Large-scale ☒ Small-scale
Version number of the PDD	09
Completion date of the PDD	27/04/2021
Project participants	M/s Arvind Cotsyn (India) Ltd
Host Party	India
Applied methodologies and standardized baselines	Methodology: AMS-I.D "Grid connected renewable electricity generation" (EB 81, Version 18) Standardized baselines: N/A
Sectoral scopes	Sectoral Scope: 1 - Energy industries (renewable / non renewable sources)
Estimated amount of annual average GHG emission reductions	6,002 tCO_2

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 3.7 MW, which comprises 4 no. of Wind Turbine Generator (WTG), 2 no. of machines of 600 kW (make Suzlon Energy Limited, hereinafter referred as SEL), 2 no. of machines of 1250 kW (make SEL).

The wind power produced being GHG neutral reduces the emissions associated with power generation through fossil fuels based power plant in the Unified Indian Grid. The project activity can generate electricity using Wind energy which displaces approximately 6,002 tonnes of CO_2 equivalent per annum at the Unified Indian Grid as all WTGs sells the power generated to the Unified Indian Grid.

The owners of the WTGs are:-

Project Proponents' Name	Capacity in MW
Arvind Cotsyn (India) Ltd.	0.600 X 1
	1.250 X 1
Arvind Dyeing & Bleaching Mills Pvt. Ltd.	0.600 X 1
	1.250 X 1

However the project activity is the bundled project activity, Arvind Cotsyn (India) Ltd. acts as a focal point and the CER sharing among the participants will be done through internal agreement between the partners.

Purpose of the project activity

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 grid and to contribute to climate change mitigation efforts.

Scenario existing prior to the implementation of project activity:

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 of project activity to sustainable development:

The project activity contributes to sustainable development of the region and satisfies the four pillars of sustainable development in the following ways:

i) Social well being

The identified project activity has contributed towards poverty alleviation as it has employed local manpower during erection and operation of the wind power plant. The project has also resulted in an improvement in the infrastructure surrounding the region as well as the electricity availability to the otherwise deficit grid.

ii) Economic well being

- The project brings additional investment in the area to contribute in meeting increasing power demand of the people.
- Use of wind energy for electricity generation instead continuing the conventional practice reduces stress on the economy of the country.
- The project contributes to diversification of the national energy supply, which is dominated by conventional fuel based generating units.

iii) Environmental well being

The identified project leads to the following environmental benefits due to the project activity:

- As the wind power replaces equivalent power generation from fossil fuel dominated Unified Indian Grid, there is a reduction in the GHG emissions due to the project activity.
- Project also eliminates emissions of other air pollutants viz. SOx, NOx, particulate matters etc which would otherwise be emitted by thermal power plants of the electricity grid for generating equivalent power
- Project enables conservation of fossil fuel resources for better applications.

The identified project being a renewable energy power generation activity, it significantly contributes towards reducing the dependence on import of fossil fuel like coal for power generation.

iv)Technological well being

The project activity has also led to the promotion of WTGs of various capacities at their respective parts because it demonstrates an example for the other WTG investors.

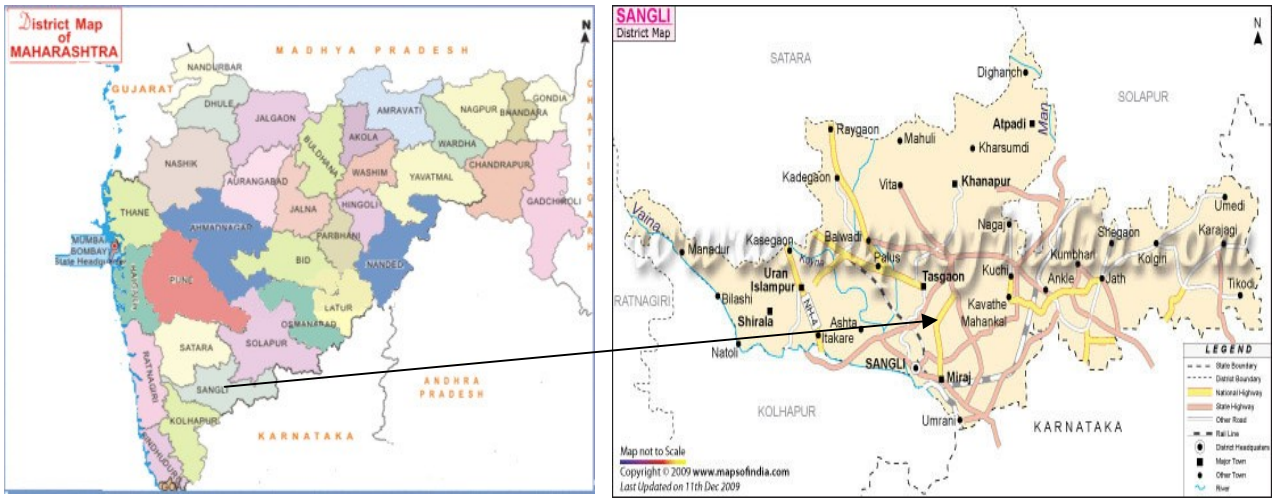
A.2. Location of project activity

Host Party(ies) India
Region/State/Province etc Maharashtra
City/Town/Community etc.

Project WTG Titled	Capacity (MW)	Village	District	State	Country
Arvind Cotsyn (India) Ltd.	0.600 X 1	Tisangi	Sangli	Maharashtra	India
	1.250 X 1	Dhondewadi	Sangli	Maharashtra	India
Arvind Dyeing & Bleaching Mills Pvt. Ltd.	0.600 X 1	Nagaj	Sangli	Maharashtra	India
	1.250 X 1	Tisangi	Sangli	Maharashtra	India
Total Capacity	**3.7 MW**				

Physical/ Geographical location

Project WTG Titled	Capacity (MW)	UID	Latitude			Longitude		
			Deg	Min	Sec	Deg	Min	Sec
Arvind Cotsyn (India) Ltd.	0.600 X 1	Loc. No. W-66	N 17	08	38.0	E 74	51	55.8
	1.250 X 1	Loc. No. G-377	N 17	11	56.6	E 74	43	15.4
Arvind Dyeing & Bleaching Mills Pvt. Ltd.	0.600 X 1	Loc. No. W-11	N 17	07	53.6	E 74	54	19.1
	1.250 X 1	Loc. No. G-335	N 17	08	55.9	E 74	50	17.7
Total Capacity	**3.7 MW**							



A.3. Technologies/measures

Project Type : I – Renewable Energy Projects

Project Category : I.D. – Grid connected renewable electricity generation (Version 18, EB 81[1])

Wind power technology details – The technology employed, converts wind energy to electrical energy. In wind power generation, energy of wind is converted into mechanical energy and subsequently into electrical energy. The technology is an environment friendly technology since there are no GHG emissions associated with the electricity generation.
The technical specifications of the WTGs have been provided as below. There is no transfer of technology involved in the project activity.

The project activity consists of WTGs of Following Machines:-

Capacity of machine Installed	Machine Manufacturer
600 kW	Suzlon Energy Limited
1250 kW	Suzlon Energy Limited

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Technical details for S-52, 600 kW Machine manufactured by Suzlon Energy Ltd.

SR. NO.	PARTICULARS	DETAILS
1	Rotor Diameter	52 m
2	Rated Rotational Speed	24.2 rpm
3	Rated Power	600 kW
4	Hub Height	75 m
5	Cut-in Wind Speed	4 m/s
6	Rated Wind Speed	12 m/s
7	Cut-off wind Speed	25 m/s
8	Design Life Time	20 years

[1] https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK

Technical details for S-66, 1250 kW Machine manufactured by Suzlon Energy Ltd.

SR. NO.	PARTICULARS	DETAILS
1	Rotor Diameter	66 m
2	Rated Rotational Speed	20.6 rpm
3	Rated Power	1250 kW
4	Hub Height	74 m
5	Cut-in wind speed	4 m/s
6	Rated wind speed	12 m/s
7	Cut off wind speed	20 m/s
8	Design Life Time	20 years

For monitoring equipment and location refer Section B.7.3 Metering Arrangement. For Plant Load Factor for all WTGs refer Section B.6.3.

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	M/s Arvind Cotsyn (India) Ltd.	No

A.5. Public funding of project activity

No funding from Annex I countries as a result of ODA, is involved in the identified project activity.

A.6. History of project activity

The start date of project activity is 13/09/2005. The date of registration in CDM programme is 05/02/2014. The first crediting period of this project activity was from 20/02/2014 to 19/02/2021.
The proposed CDM project activity is registered as a CDM project activity and not included as a component project activity (CPA) in a registered CDM programme of activities (PoA);

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

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

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

A.7. Debundling

According to Appendix C to the Simplified Modalities and Procedures for Small-Scale CDM project activities, “De-bunding” is defined as fragmentation of large scale project activity in to smaller parts. A small scale project activity that is a part of large scale project activity is not eligible to use the simplified modalities and procedure for small scale project activity. A small project activity shall be deemed to be a de-bundled component of large scale project activity, if there is a registered small scale CDM project activity or an application to register another small scale CDM project activity.

- With the same project participants
- In the same project category and technology
- Registered within the previous two years; and

- Whose project boundary is within 1 km of the project boundary of the proposed small scale activity

In this case the project proponents have not applied for CDM registration, as a part of any other project. This means that the project activity does not fall under the de-bundled category and qualifies for small scale CDM Project.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

The methodology applicable to this project activity is "Grid connected Renewable Electricity Generation – AMS-I.D.", Version 18[2], Sectoral Scope: 01.
Title: Grid connected renewable electricity generation
Reference: AMS-I.D. (Version 18, EB 81)
Type I: Renewable Energy Projects (Small Scale)
Category: "I.D", Grid connected Renewable Electricity Generation

AMS-I.D. draws upon the following tool which has been used in the PDD:

- Tool to calculate the emission factor for an electricity system , Version 07.0 EB 100 annex 4[3]

B.2. Applicability of methodologies and standardized baselines

The total output of project activity is 3.7 MW which is less than 15 MW (electrical) threshold capacities, thus it qualify to apply the SSC methodology.

As per Meth. AMS-I.D., **Version 18**

Applicability Criterion (with para number reference)	**Project Status**
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 activity is the Renewable Energy Project i.e. Wind Power Project that supply electrical power to the electricity grids i.e. Unified Indian Grid.
2. Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS- I.A) applies is included in Appendix of methodology	The 1st option of Table 2 of AMS- I.D. Version 18, EB 81 is applicable.
3. This methodology is applicable to project activities that (a) Install a Greenfield plant; (b) Involve a capacity addition in (an) existing plant(s); (c) Involve a retrofit of (an) existing plant(s); (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or	The project activity is the Renewable Energy Project i.e. Wind Power Project that supplies electrical power to the electricity grids i.e. unified Indian grid. It's an Greenfield project thus Option A is applicable i.e. (a) install a new power plant at a site where there was no renewable energy

[2] https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK

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

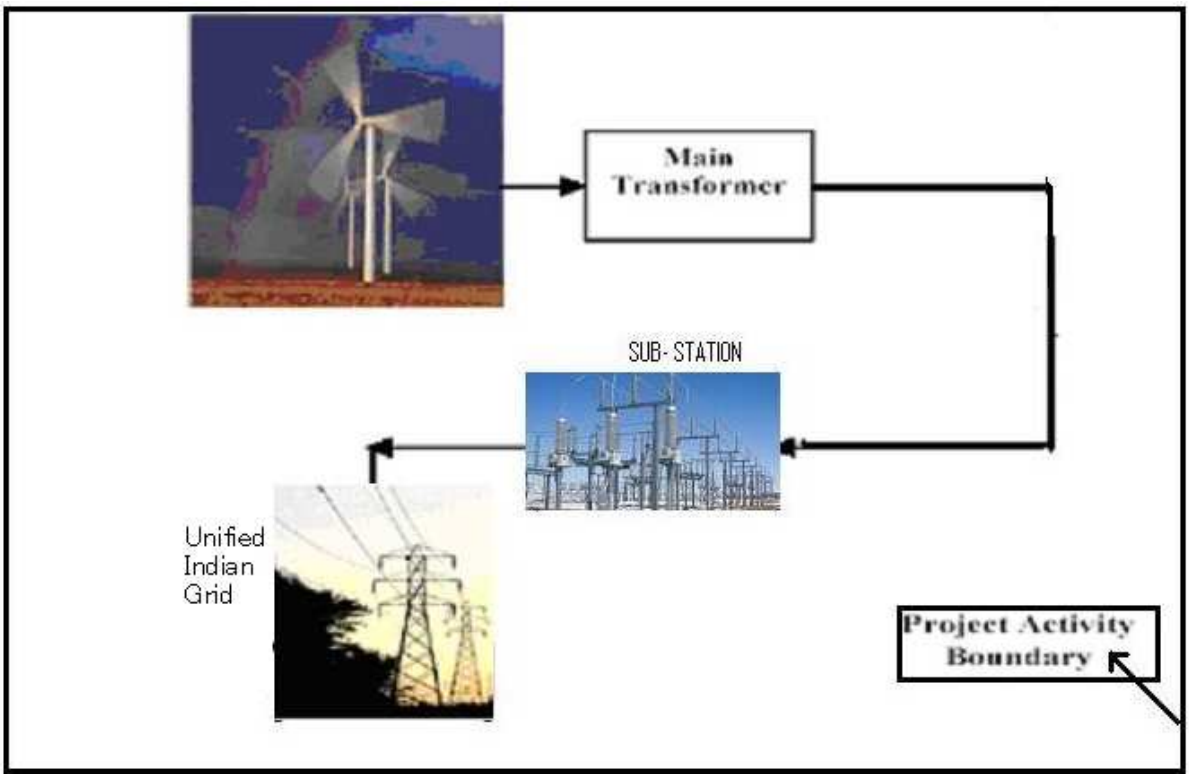
(e) Involve a replacement of (an) existing plant(s).	power plant operating prior to the implementation of the project activity(Greenfield plant).
4. Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity 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 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.	Not applicable, the project activity is the Renewable Energy Project i.e. Wind Power Project.
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.	Not applicable, the project activity is the Renewable Energy Project i.e. Wind Power Project and no non-renewable components are involved.
6. Combined heat and power (co-generation) systems are not eligible under this category.	Not applicable, the project activity is the Renewable Energy Project i.e. Wind Power Project
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.	The project activity is the green field project & thus there is no capacity addition involved in the project activity.
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 project activity is the Renewable Energy Project i.e. Wind Power Project and does not involve any retrofit or replacement.
9. In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If there covered methane is used for electricity generation for supply to a grid then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as "AMS-I.C.: Thermal energy production with or without electricity" shall be explored.	Not relevant as the project activity is only renewable energy generation activity.
10. In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	Not applicable as the project activity is power generation by wind.

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

As per AMS I. D Version 18, EB 81 –"The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to".

The project boundary includes the wind turbine generator, sub-stations, grid and all power plants connected to grid. The project activity evacuates power to the Unified Indian Grid. Therefore the entire Unified Indian grid was considered under project boundary.

Project Boundary



Following Gases and Sources are considered in the project activity

	Source	GHG	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are replaced due to the project activity.	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project activity	CO_2 emissions from electricity imported from the grid and produced in fossil fuel fired power plants	CO_2	No	No emission source.
		CH_4	No	No emission source.
		N_2O	No	No emission source.

B.4. Establishment and description of baseline scenario

Updated baseline for the second crediting period in line with the "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period." Version 03.0.1.

This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 283 to 286 of Project Standard version 02.0.

The tool stipulates the following steps to be carried out.

Step 1: Assess the validity of the current baseline for the next crediting period
Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies
The baseline scenario remains unchanged and is in compliance with all the relevant mandatory national and/or sectoral policies.

Step 1.2: Assess the impact of circumstances

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

Nevertheless, there is an impressive growth attained by the Indian Power Sector within the recent years, the installed capacity has grown from mere 1,713 MW in 1950 to 356,100.20 MW as on 31.03.2019, consisting of 226,279.34 MW Thermal, 77,641.63 MW Renewable and 6,780 MW Nuclear. Sector-wise details of installed capacity are shown in Table 1. However, it is evident from Table 1 that the installed capacity is predominantly coal based and therefore, is a major source of carbon dioxide emissions in India. Hence, there exists scope for reducing the CO_2 emissions in the country by increased use of renewable energy sources.

Furthermore, project participant has considered the latest available CO_2 Baseline Database (CEA database, version 15)[4] at the time of requesting renewal of the crediting period for establishing the baseline emission factor, which itself considered all the new circumstances. Hence, the new circumstances do not have an impact on the baseline emission. As per below table, the fossil fuel based thermal power generation is dominant over the renewable based power generation, thus baseline scenario remains same as original.

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

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

Note: In the above table, the last column “Total” includes the total summation of installed capacity of thermal, Nuclear, Hydro and Renewable Energy.
Thus, current baseline remain same and there is no impact if circumstances, existing at the time of requesting renewal of crediting period.

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

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

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

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

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

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

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

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

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

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

The Government of India enacted the Electricity Act in the year 2003 to harmonize and rationalize the provisions in the existing laws. The Act consolidated the laws relating to generation, transmission, distribution, trading and use of electricity. With the Enactment of the act, the then existing laws viz, The Indian Electricity Act 1910, The Electricity Supply Act, 1948 and The Electricity Regulatory Commissions Act, 1998 were repealed. The Electricity Act 2003[5] was in force at the time of the completion of the baseline study for the registered PDD.

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

The state electricity regulatory commission issues tariff order in respect of procurement of power generated wind generators and there is no mandatory national and/or sectoral policies have come

[5] https://powermin.nic.in/en/content/electricity-act-2003

into effect that would affect the compliance of the current baseline. Hence, it can be concluded the current baseline complies with all relevant mandatory national and/or sectoral policies that have come into effect after the submission of the project activity for validation and are applicable at the time of requesting renewal of the crediting period.

However, in spite of the financial incentives given by the government to renewable power projects in India the generation from the low cost must run resources connected to the Unified Indian Grid has not increased to such an extent that this would lead to more than 50% contribution from the low cost must run resources towards the total generation from the Unified Indian Grid.
The approved small scale methodology for Grid connected renewable electricity generation, AMS-I.D (Version 18), has been used to determine the baseline and the estimation of emission reductions for the applicable crediting period. As referred in the methodology "Tool to calculate the emission factor for an electricity system" (version 07.0)[6] has been used to determine continued validity of the baseline based on combined margin (CM) calculations.

As per CEA database version 15, the fossil fuel dominated electricity is more than renewable sector and is continuing with same pattern. In light of the above discussion it is to be concluded that in accordance with relevant guidelines stipulated in the Project Standard version 02.0, national and/or sectoral policies and circumstances had been considered towards formulating the OM & BM baseline scenario. Hence the baseline scenario as applied for the present project activity remains justified.
As per the approved small scale methodology for Grid connected renewable electricity generation, AMS-I.D (Version 18.0) para 19: "If the project activity is the installation of a Greenfield power plant, 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, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

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

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

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source (where available) and made publically available. The CEA database version 15 is the latest available data at the time of PD submission to DOE for validation, hence same is considered for emission factor calculations.

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

Parameter	Value	Nomenclature	Source
$EF_{grid,CM,y}$	0.9419 tCO_2/MWh	Combined margin CO_2 emission factor for the project electricity system in year y	Calculated as the weighted average of the operating margin (0.75) & 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

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

$EF_{grid,OM,y}$	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

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.

$BE_y=EG_{BL,y}* EF_{CO2,grid,y}$

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)

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

$EF_{CO2,grid,y}$ is calculated as Combined Margin (CM) CO_2 emission factor for the project electricity system in year y.

So, $EF_{CO2,grid,y} = EF_{grid,CM,y} = 0.9419\ tCO_2/MWh$.

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

Thus, Emission Reductions are calculated as follows:

$ERy=BE_y– PE_y– LE_y$

Where:

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

BE_y = Baseline Emissions in year y (t CO_2/y)

PEy = Project emissions in year y (t CO_2/y)

LEy = Leakage emissions in year y (t CO_2/y)

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

$ER_y=BE_y$

B.5. Demonstration of additionality

National Policies

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 18.

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.

Demonstration of additionality for the CDM project activity:

As per the Guidelines on the demonstration of additionality of small-scale project activities (ver. 09 EB 68 Annex 27)[7] of the simplified modalities and procedures for small scale CDM project activities, to establish the project additionality, it has to be shown that the project activity would not have occurred anyway due to at least one of the following barriers:

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

The PP has selected Investment barrier to demonstrate in a conservative and transparent manner that the CDM project activity is financially unattractive, in line with the Annex 34 of EB 35 ("Nonbinding best practice examples to demonstrate additionality for SSC project activities"), a benchmark analysis is used in the project case under investment barrier. The whole procedure followed is in accordance with the para 96 (a) stipulated under Clean development mechanism project standard Version
05.0.

Appropriateness of using benchmark analysis for additionality demonstration and its conformity to guidance 19 of Annex 5, EB 62[8] -

Considering the fact that the alternative to the project is the supply of electricity from the grid (mentioned in para 11 of methodology) & the choice of the developer is to invest or not to invest, benchmark analysis has been considered appropriate for demonstration of additionality, which is in conformity with guidance 19 Annex 5 EB 62, which says "*If the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate.*"

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 –

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:

[7] http://cdm.unfccc.int/Reference/Guidclarif/meth/methSSC_guid05.pdf
[8] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

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 20 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 the lowest of BSE-Sensex, BSE-500, BSE-200 and BSE100 have been considered as Market index as a conservative approach.*

Expected rate of return on a Market portfolio refers to a well-diversified portfolio that is assumed to reflect the behaviour of the market as a whole.

The average market return has been calculated with the help of the Compound Annual Growth Rate (CAGR). The CAGR gives the measure of the average returns from the stock market investments over a period of time. It is a more accurate measure than simple average of returns and is calculated as:

CAGR = (index value at end / index value at beginning) ^ (1 / no. of years) – 1

For calculation of CAGR, the "index value at the beginning" is taken from the base year[9],[10],[11],[12] and the "index value at end" is the value of the index as available at the time of investment decision.

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 until 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 wellbalanced, 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**.**

[9] http://www.bseindia.com/about/abindices/bse30.asp
[10] http://www.bseindia.com/about/abindices/bse500.asp
[11] http://www.bseindia.com/about/abindices/bse200.asp
[12] http://www.bseindia.com/about/abindices/bse100.asp

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 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 the average of Unlevered Beta value arrived for ***five power companies*** *(****TATA Power, Neyveli Lignite, Reliance Infra, CESC, GIPCL****) 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

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, which says, *"In the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on parameters that are standard in the market. The DOE validation of the benchmark shall also include its opinion on whether a company-specific benchmark or a benchmark based on parameters that are standard in the market is suitable in the context of the underlying project activity."*

Moreover, in accordance with Guidance 7 of the Appendix of EB 62, Annex 5, the project investors have also calculated the benchmark using the default value. The inflation rate has been considered based on inflation forecast by IMF. The project participants calculated the benchmark by using the compounding formula referred to in "Corporate Finance by Aswath Damodaran", a highly respected academician in the field of finance, to convert real values to nominal values. The lower of the benchmarks calculated using CAPM and default value have been considered.

Input Values for the Financial Calculation

Name of the Project Participant		Arvind Cotsyn Ltd		Arvind Dyeing & Bleaching Mills Pvt Ltd		References
Details of the project						
State where the project is situated		Maharashtra				As Per Offer Letter
No. of machine		1	1	1	1	As Per Offer Letter
Capacity /machine	MW	0.60	1.25	0.60	1.25	As Per Offer Letter
Total Capacity	MW	0.60	1.25	0.60	1.25	
Expected Date of Commissionig		30-Jun-06	30-Jun-06	30-Dec-06	31-Dec-06	As Per Offer Letter

Life of the plant	Years	20	20	20	20	As per WTG Manufacturer specification
Generation andsale of electricity						
PLF	In %	22.78%	19.15%	23.03%	20.12 %	As per Third Party Report in accordance to EB 48 Annex 11
Transmissio nLosses	In %	5.00%	5.00%	5.00%	5.00%	As per MERC Order 2003 , Sec 3.4.5 http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf.
Effective PLF	In %	21.64%	18.19%	21.88%	19.11 %	
Tariff rate at thedecision making	INR/ kWh	3.50	3.50	3.50	3.50	As per MERC Order 2003 , Sec 2.2.3 B http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf.
Increase in tariffstill 13th yr.	INR/ kWh	0.15	0.15	0.15	0.15	As per MERC Order 2003 , Sec 2.2.3 B http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf
Tariff Rate after 13th year	INR/ kWh	2.34	2.34	2.34	2.34	Estimated
Deration after10th year	In %	5.00%	5.00%	5.00%	5.00%	As per MERC Order 2003 , Sec 2.2.3 http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf
Operation and maintenance costand Insurance						
O & M Expenses	INR Milli on	0.75	1.16	0.75	1.16	As Per Offer Letter
Escalation in the operational expenses	In %	5%	5%	5%	5%	As Per Offer Letter
Insurance	INR Milli on	0.05	0.09	0.05	0.09	As per TAC order 2001
Financial parameter s						
TOTAL COST	INR Milli on	35.10	62.50	35.1 0	62.50	As Per Offer Letter
Loan Amount	INR Milli on	24.57	43.75	24.5 7	43.75	
Equity Investment	INR Milli on	10.53	18.75	10.5 3	18.75	
Term loan						
Loan Amount	INR Milli on	24.57	43.75	24.5 7	43.75	MERC order sec 2.2.10 http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf
Interest rate	In %	12.50%	12.50%	12.50%	12.50 %	As per MERC order 2003, sec 2.2.6B http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf
Loan Tenure	Quar t er	40	40	40	40	As per MERC Order 2003 , Sec 2.2.7 B http://www.mercindia.org.in/pdf/Detail_Wind_Energy_Order.pdf
Moratorium Period	Quar t er	4	4	4	4	
Repayment Period	Quar t er	36	36	36	36	

Repayment installments value	INR Million	0.683	1.215	0.683	1.215	
1st installmentfrom	Quarter end	30-Sep-07	30-Sep-07	31-Dec-07	31-Dec-07	
Book Depreciation						
Land Cost	INR Million	0.90	1.50	0.90	1.50	
Salvage value	In %	5%	5%	5%	5%	As per MERC Order 2003, Page 171, Sl No. 22 http://www.mercindia.org.in/pdf/Annexures.pdf
Salvage value	INR Million	1.71	3.05	1.71	3.05	
Gross DepreciableValue	INR Million	34.20	61.00	34.20	61.00	
Net DepreciableValue	INR Million	32.49	57.95	32.49	57.95	
Book Depreciation rate	In %	5.28%	5.28%	5.28%	5.28%	As per MERC Order 2003, Page 171, Sl No. 27 http://www.mercindia.org.in/pdf/Annexures.pdf
Book Depreciation	INR Million	1.81	3.22	1.81	3.22	
Total Residual Value (Land,Plant & Machinery)	INR Million	2.61	4.55	2.61	4.55	
IT Depreciation						
Year-1	In %	80.00%	80.00%	80.00%	40.00%	As Per Income Tax Act, http://www.incometaxindiapr.gov.in/incometax indiacr/contents/ITRules2010/appendix264.htm
Year-2	In %	16.00%	16.00%	16.00%	48.00%	As Per Income Tax Act http://www.incometaxindiapr.gov.in/incometax indiacr/contents/ITRules2010/appendix264.htm
Year-3	In %	3.20%	3.20%	3.20%	9.60%	As Per Income Tax Act http://www.incometaxindiapr.gov.in/incometax indiacr/contents/ITRules2010/appendix264.htm
Year-4	In %	0.64%	0.64%	0.64%	1.92%	As Per Income Tax Act http://www.incometaxindiapr.gov.in/incometax indiacr/contents/ITRules2010/appendix264.htm
Year-5	In %	0.13%	0.13%	0.13%	0.38%	As Per Income Tax Act http://www.incometaxindiapr.gov.in/incometax indiacr/contents/ITRules2010/appendix264.htm
Year-6	In %	0.03%	0.03%	0.03%	0.08%	As Per Income Tax Act http://www.incometaxindiapr.gov.in/incometax indiacr/contents/ITRules2010/appendix264.htm

Year-7	In %	0.01%	0.01%	0.01%	0.02%	As Per Income Tax Act http://www.incometaxindiapr.gov.in/incometax indiacr/contents/ITRules2010/appendix264.htm
Income Tax						
Financial Year		FY 2005 - 2006	FY 2005 - 2006	FY 2005-2006	FY 2005-2006	
Income tax rate	In %	30.00%	30.00%	30.00%	30.00%	As per Budget 2005-06 http://indiabudget.nic.in/ub2005-06/mem/mem1.pdf
MAT	In %	7.50%	7.50%	7.50%	7.50%	As per Budget 2005-06 http://indiabudget.nic.in/ub2005-06/mem/mem1.pdf
Service Tax	In %	10.00%	10.00%	10.00%	10.00%	As per Budget 2005-06 http://indiabudget.nic.in/ub2005-06/mem/mem1.pdf
Surcharge	In %	10.00%	10.00%	10.00%	10.00%	As per Budget 2005-06 http://indiabudget.nic.in/ub2005-06/fb/bill2.pdf
Education cess	In %	2.00%	2.00%	2.00%	2.00%	As per Budget 2005-06 http://indiabudget.nic.in/ub2005-06/bs/speecha.htm
Final Tax rates						
Income tax rate	In %	33.66%	33.66%	33.66%	33.66%	
MAT	In %	8.42%	8.42%	8.42%	8.42%	
Service Tax	In %	10.20%	10.20%	10.20%	10.20%	

The result of the Financial Analysis is as follows–

WTG Owner	WTG Capacity	Benchmark (Equity IRR)				Benchmark (Default Value)
		BSE 30	BSE 100	BSE 200	BSE 500	
Arvind Cotsyn Ltd	600 kW	15.44%	13.52 %	13.74 %	16.19 %	16.00%
Arvind Cotsyn Ltd	1250 kW	15.44%	13.52 %	13.74 %	16.19 %	16.00%
Arvind Dyeing and Bleaching Ltd	600 kW	15.74%	14.03 %	14.48 %	17.73 %	16.78%
Arvind Dyeing and Bleaching Ltd	1250 kW	15.74%	14.03 %	14.48 %	17.73 %	16.78%

Sr. No.	WTG Owner	WTG Capacity	Equity IRR without CDM in %	Benchmark (Equity IRR) in %
1	Arvind Cotsyn Ltd	600 kW	6.65	13.52
2	Arvind Cotsyn Ltd	1250 kW	7.27	13.52
3	Arvind Dyeing and Bleaching Ltd	600 kW	6.51	14.03
4	Arvind Dyeing and Bleaching Ltd	1250 kW	8.95	14.03

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	Arvind Cotsyn Ltd-600 kW			
Variation %	-10%	Normal	-10%	Breaching Value
PLF	1.52%	6.65%	12.35%	11.99%
O&M	7.80%	6.65%	5.44%	-69.22%
Project Cost	11.72%	6.65%	2.86%	-12.90%
Tariff Rate	2.94%	6.65%	10.95%	15.33%

Equity IRR	Arvind Cotsyn Ltd-1250 kW			
Variation %	-10%	Normal	10%	Breaching Value
PLF	2.27%	7.27%	12.71%	11.43%
O&M	8.23%	7.27%	6.27%	-75.16%
Project Cost	12.26%	7.27%	3.42%	-12.10%
Tariff Rate	3.58%	7.27%	11.40%	14.61%

Equity IRR	Arvind Dyeing and Bleaching Ltd-600 kW			
Variation %	-10%	Normal	10%	Breaching Values
PLF	1.75%	6.51%	11.58%	14.65%
O&M	7.49%	6.51%	5.41%	-86.75%
Project Cost	11.08%	6.51%	2.98%	-15.28%
Tariff Rate	3.06%	6.51%	10.44%	18.64%

Equity IRR	Arvind Dyeing and Bleaching Ltd-1250 kW			
Variation %	-10%	Normal	10%	Breaching Value
PLF	3.75%	8.95%	14.10%	9.88%
O&M	9.78%	8.95%	8.10%	-69.66%

Project Cost	13.74%	8.95%	5.12%	-10.52%
Tariff Rate	5.26%	8.95%	12.93%	12.55%

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. Also, according to a press release by CSE[13], "Maharashtra has more than tripled its wind
	Capacity in the past few years, but has actually decreased in terms of its PLF. Today, in this energy-starved state, wind energy functions at a PLF of 11.7% - a pathetically low figure compared to other states like Tamil Nadu and Karnataka, and certainly to global averages of 25-30 per cent".
O&M	With the country experiencing 5% inflation on an average, the question of O&M coming down is ruled out. Moreover, the purchase orders for all the project proponents provides for a 5% escalation in the cost every year.
Project Cost	The Purchase Order cost for all project proponents is almost equal to the Offer letter cost which was considered during decision making. Since the Purchase Order cost is firm, there is no possibility of project cost going below this level. However, we have conducted sensitivity analysis for all project proponents for project cost being 10.50% 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 considered for the project activity is based on Maharashtra Electricity Regulation commission tariff order dated 24 November 2003. As per MERC tariff order electricity tariff is fixed at INR 3.50/kWh (VAT is not applicable on tariff for sale of electricity) with annual escalation of INR 0.15/kWh and is valid only for 13 years. Thereafter, it is clearly stated in the tariff order that the tariff is subject to revision at the end of the period. Therefore, any assumption on the tariff applicable from 14th year onwards is uncertain. Electricity tariff after 13th year has been estimated based on a "cost-plus" approach, i.e., based on the expected operating costs incurred in year 14 and return on equity. The tariff after 13 year of operation is calculated based on PLF provided in MERC order , net cash flow (taking into account cash inflow /outflow), and cost to be recovered after 13 year of operation. The same approach has been followed by MERC in determining tariff as provided below (extract from MERC): "The commission notes that in cost plus approach, which the commission has adopted for tariff proposal, rate per unit charged by such projects during initial period of 10 years is bound to be higher as during this period the project has various debt related obligations. However it is essential that the consumer is able to enjoy the benefit of cheaper power once all debt related obligations are paid off and project has virtually no variable costs". (Page no.14) "The rate payable gets reduced after 10 years (i.e. after repayment of loan) so that the net average cost of energy gets reduced". (Page no.135) Thus the probability of increase in Tariff rate is negligible for the concerned project activity. However it can be noted that the IRR remains below the benchmark even if an unlikely scenario of a 10% increase in tariff is considered.

[13] http://www.cseindia.org/node/548

Demonstration of Parallel and continuing actions as per the ' guidelines on the demonstration and assessment of prior consideration of the CDM' annex 13 to EB 62[14].

As per para 6 of Annex 13, EB62 project activities with a start date before 2 August 2008 to demonstrate that CDM was seriously considered by indicating awareness of the CDM prior to the project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project. The project participant must also indicate, by means of reliable evidence, that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation. The chronology of events has been provided in the table below. It clearly demonstrates that there is less than 2 years of a gap between the documented evidence showing that continuing and real actions were taken to secure CDM status for the project activity. Thus, it can be ascertained that the WTGs of the Project activity complies with para 6 (a), 6 (b), 7 and 8 (a) of Annex 13, EB62.

Events	**Arvind Cotsyn (India) Ltd.**		**Arvind Dyeing & Bleaching Mills Pvt. Ltd.**	
	0.600 MW X 1	**1.25 MW X 1**	**0.600 MW X 1**	**1.25 MW X 1**
Offer letter	01/07/2005	07/09/2005	05/02/2006	05/02/2006
Investment Decision	10/09/2005	10/09/2005	13/02/2006	13/02/2006
Purchase Order	19/04/2006	13/09/2005	19/04/2006	14/02/2006
Appointed MITCON Consultancy Services Ltd. as 1st CDM Consultant	24/04/2007			
Application filed to MoEF	20/10/2007			
Meeting with MoEF	21/11/2007			
HCA Issuance	27/12/2007			
Signed 1st DOE Contract with SGS India Private Limited	11/01/2008			
1st PDD Webhosted	26/01/2008			
Submission of DVR & PDD Version 05 to 1st DOE	10/04/2009			
Appointed EnKing International as 2nd CDM Consultant	27/05/2010			
Signed 2nd DOE Contract with TUV Nord	19/07/2011			

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

Baseline methodology for project category I.D. has been detailed in paragraphs 18-43 of the approved small scale methodology AMS-I.D. (Version 18, EB 81). Paragraph 23 of the approved methodology applies to this project activity, which states that:

The Emission Factor shall be calculated in a transparent and conservative manner as follows:

[14] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid04.pdf

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.

Option A. – 'Combined Margin emission factor', has been selected for estimating the emission coefficient of the electricity distribution system according to the procedures described in the "Tool to calculate the emission factor for an electricity system", Version 07.0[15]. As per paragraph 24 of AMS-I.D, Version 18.0, "Calculations shall be based on data from an official source (where available) and made publicly available." Here the data from Central Electricity Authority, Ministry of Power, Government of India has been used as it is the official source and the data is publicly available.

The description below follows the steps of the "Tool to calculate the emission factor for an electricity system, Version 07.0, which has been used to estimate the emission factor.

Step 1: Identify the relevant electricity systems

A "project electricity system" is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints.

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.

Geographical Scope of Indian Electricity Grid:

Northern	Eastern	Western	North-Eastern	Southern
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Andhra Pradesh
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryana	Orissa	Daman & Diu	Manipur	Kerala
Himachal Pradesh	West Bengal	Dadar& Nagar Haveli	Meghalaya	Tamil Nadu
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Telangana
Punjab	Andaman & Nicobar	**Maharashtra**	Nagaland	Puducherry

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

Rajasthan		Goa	Tripura	Lakshadweep
Uttar Pradesh				
Uttarakhand				

Step 2: Choose whether to include off grid power plants in the project electricity system

PP may choose between the following two options to calculate the operating margin and build margin emission factor:

Option 1: Only grid power plants are included in the calculation

Option 2: Both grid power plants and off grid power plants are included in the calculation.

PP has chosen option 1 to calculate operating margin and build margin emission factor.

Step 3: Select a method to determine the operating margin (OM)
As per the tool the calculation of the operating margin emission factor is based on one of the following methods:
(a) Simple operating margin;
(b) Simple adjusted operating margin;
(c) Dispatch data analysis operating margin;
(d) Average operating margin

CO_2 Baseline Database Version 15[16], published by Central Electricity Authority (hereafter CEA Database) has been referred for the values of OM. As per the "Tool to calculate the emission factor for an electricity system" (Version 07.0, Annex 4, EB 100), any of the four methods can be used, however, the simple OM method can be used only if the low-cost/must run resources constitute less than 50% of the total grid generation in: 1) average of the five most recent years, or 2) based on long term averages for hydroelectricity production.
Operating Margin has been calculated using the Simple OM method as the low-cost/must run resources constitute less than 50% of the total grid generation of the Unified Indian Grid in average of the five most recent years.

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

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

Data Source: Central Electricity Authority (CEA) database Version 15, Dec 2019[17]

For the simple OM method, emission factors can be calculated using either of the two following data vintages:

- **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. For grid power plants, a 3 –year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period is taken, or
- **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

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

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

be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1, or y-2) should be used throughout all crediting periods.

PP has chosen ex ante option and emission factor determined at validation stage will be the same throughout the crediting period.

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

Simple OM has been calculated using "Tool to calculate the emission factor for an electricity system" (Version 07.0, Annex 4, EB 100).
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. This may be calculated by any of the two options:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system. This option can only be used if:

a) The necessary data for Option A is not available; and
b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

PP has opted for option A and used data provided by CEA, Version 15[18].

Calculation Approach:
The Simple OM has been calculated using the following formula:

$$EF_{grid,OMsimple,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:
$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m = All power units serving the grid in year y except low-cost / must-run power units
y = The relevant year as per the data vintage chosen in Step 3

Determination of $EF_{EL,m,y}$
The emission factor of each power unit m should be determined as follows:

- Option A1. If for a power unit m data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined as follows:

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

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,m,y}$ = Amount of fossil fuel type "i" consumed by power plant / unit m in year y (mass or volume unit)
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO2/GJ)
$EG_{m,y}$ = Net electricity generated and delivered to the grid by power plant / unit m in year y (MWh)
m = All power plants / units serving the grid in year y except low-cost / must-run power plants / units
i = All fossil fuel types combusted in power plant / unit m in year y
y = The three most recent years for which data is available at the time of submission of the PDD to the DOE for validation (for ex ante option)

The three most recent years for which data was available at the time of submission to the DOE included 2016-17, 2017-18 and 2018-19 and the same is presented below and in Appendix 3 of the PDD.

	Net Generation in Operating Margin (GWh) (incl. Imports)		
	2016-17	**2017-18**	**2018-19**
INDIAN Grid	916,278	960,693	995,957

	Simple Operating Margin (tCO_2/MWh) (incl. Imports)		
	2016-17	**2017-18**	**2018-19**
INDIAN Grid	0.9636	0.9543	0.9685

Weighted Generation Operating Margin	
INDIAN Grid	**0.9622**

The generation weighted average value for these three years works out to 0.9622 for the unified Indian grid. Thus,
$EF_{Grid,OM,y}$ = 0.9622 tCO_2/MWh

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

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.
With regards to data vintage, the project participant wishes to use Option 1 i.e, 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 sample group of power units m used to calculate the build margin has been determined as per the following procedure, consistent with the data vintage selected above:

(a) The set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-}units}$) was identified and their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh) was determined;

(b) The annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh) was determined. The set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) (SET≥20%) was identified and their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh) was determined;

(c) From $SET_{5\text{-}units}$ and $SET_{\geq 20\%}$ the set of power units that comprises the larger annual electricity generation (SET_{sample}) was selected;

Since none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, this set SET_{sample} has been used to calculate the build margin.

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activities, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20 per cent of the annual electricity generation of the project electricity system (if 20 per cent falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);
If the annual electricity generation of that set is comprises at least 20 per cent of the annual electricity generation of the project electricity system (i.e. $AEG_{SETsample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore Steps (e) and (f).

Otherwise:

(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20 per cent of the annual electricity generation of the project electricity system (if 20 per cent falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample\text{-}CDM\text{->}10yrs}$)

The data pertaining to the units thus identified are detailed in the Version 15 of the Baseline Carbon Dioxide Emissions database of the CEA[19].

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

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available and will be calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m = Power units included in the build margin
y = Most recent historical year for which power generation data is available

The Build Margin has been calculated ex ante during the second crediting period. For ex ante calculation the most recent data available has been used and the build margin thus calculated is 0.8811 tCO2/MWh for the unified Indian grid. Therefore,
$EF_{Grid,BM,y}$ = 0.8811 tCO_2/MWh.

Step 6: Calculate the Combined Margin (CM) Emission Factor

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.

The emission factor for grid electricity or Grid Emission Coefficient (also referred as CO_2 Emission factor) is calculated as the weighted average of the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,,y}$), where the weights W_{OM} and W_{BM} for wind &solar projects, by default, are W_{OM} = 0.75 & W_{BM} = 0.25.$EF_{grid,CM,y}$ is calculated as below and are expressed in tCO_2/MWh.

$EF_{grid,CM,y}$ = $EF_{grid,OM,y}$ x W_{OM} + $EF_{grid,BM,y}$ x W_{BM}
Where,
$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor in year y (tCO_2 / MWh) = $EF_{CO2,grid,y}$ (tCO_2 / MWh)
$EF_{grid,BM,y}$ = 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 (%)
W_{BM} = Weighting of Build Margin emissions factor (%)

Hence, the Baseline Emission Factor is calculated as below:
$EF_{Grid,CM,y}$ = w_{OM} * $EF_{Grid,OM,y}$ + w_{BM} * $EF_{Grid,BM,y}$
= 0.9622 * 0.75 + 0.8811 * 0.25
= 0.9419 tCO_2/MWh

- **Estimation of Baseline Emission:**

Baseline emission for the Indian Grid has been calculated as follows:

As per para 19 of the methodology AMS-I. D. Version 18,
"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 project activity evacuates power to the Unified Indian Grid & completely comply with the para 19 of AMS-I. D. Ver 18.

As per para 22 of the methodology AMS–I. D. Version 18,
The baseline emissions are the product of electrical energy baseline EG_{BLy} expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

$BE_y = EF_{Grid,CM,y} \times EG_{PJ,y}$
Where:

BE_y	Baseline Emissions in year y (t CO2)
$EG_{PJ,y}$	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)
$EF_{Grid,CM,y}$	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)

If the project activity is the installation of a greenfield power plant, then:
$EG_{PJ,y} = EG_{PJ,facility,y}$

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

- **<u>Calculation of the Project Emissions (PE_y):</u>**

As per para 39 of AMS-I. D. Version 18
For most renewable energy project activities, $PE_y = 0$. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of "ACM0002: Grid-connected electricity generation from renewable sources":

(a) Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption);
(b) Emissions from water reservoirs of hydro power plants.

As this project activity is a wind power plant, the project emission is considered zero.

- **<u>Calculation of the Leakage calculation (LEy):</u>**

As per para 42 of AMS-I.D. Version 18
General guidance on leakage in biomass project activities shall be followed to quantify leakages pertaining to the use of biomass residues. **It is not applicable for the project activity as it is a wind power plant, thus leakage emissions are considered to be zero.**
$LE_y = 0$

- **<u>Emission Reduction Calculation:</u>**

The emission reduction of the project activity is calculated as the difference between the baseline emissions, project emissions and emission due to leakage.

Emission Reduction = Baseline Emission – Project Emission – Leakage Emission
Thus, Emission reductions are calculated as follows:
$ER_y = BE_y - PE_y - LE_y$ ***(1)***

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)

As $\mathbf{PE_y = LE_y = 0}$; therefore, $\boldsymbol{ER_y = BE_y = EF_{Grid,CM,y} \times EG_{PJ,y}}$

Where:

$EG_{PJ,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{Grid,CM,y}$ = CO_2 emission factor of the grid in year y (t CO_2/MWh)

Thus, $ER_y = BE_y$
Emission reductions in year y (t CO_2/y) = Baseline Emissions in year y (t CO_2/y)
In case of the project activity, Grid emission factor has been fixed ex-ante.

B.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{CO2,grid,y}$
Data unit	tCO_2/MWh
Description	CO_2 emission factor of the grid in year y (t CO_2/MWh)
Source of data	CO_2 Baseline Database for the Indian Power Sector, Version 15, CEA https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver15.pdf
Value(s) applied	For –Unified Indian Grid-0.9419
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 B.6.1 above.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante

Data/Parameter	EF_{OM}
Data unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
Source of data	CO_2 Baseline Database for the Indian Power Sector, Version 15, CEA https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver15.pdf
Value(s) applied	Unified Indian Grid.- 0.9622
Choice of data or measurement methods and procedures	The data has been sourced from the Central Electricity Authority (CEA) Carbon Dioxide database.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante

Data/Parameter	EF_{BM}
Data unit	tCO_2/MWh
Description	Build margin CO_2 emission factor in year y (tCO_2/MWh)
Source of data	CO_2 Baseline Database for the Indian Power Sector, Version15, CEA https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver15.pdf
Value(s) applied	Unified Indian Grid.- 0.8811
Choice of data or measurement methods and procedures	The data has been sourced from the Central Electricity Authority (CEA) Carbon Dioxide database. The link to the database is provided below:
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter 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:
$ER_y = BE_y - PE_y - LE_y$
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)

As per para 39 of AMS-I. D. Version 18
For most renewable energy project activities, PEy = 0. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of "ACM0002: Grid-connected electricity generation from renewable sources":

(a) Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption);
(b) Emissions from water reservoirs of hydro power plants.

As this project activity is a wind power plant, the project emission is considered zero.

As per para 42 of AMS-I.D. Version 18
General guidance on leakage in biomass project activities shall be followed to quantify leakages pertaining to the use of biomass residues. It is not applicable for the project activity, thus leakage emissions are considered to be zero.
LEy = 0
Thus, $ER_y = BE_y$
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:-
$ER_y = BE_y$

The WTG wise annual estimated generation and baseline emission is entered in table below. The annual generation is estimated as,
Annual generation(MWh) = Capacity of WTG in MW × PLF × (1- Transmission Loss) × 8760 Hours

WEG Owner Name	Capacity (MW)	PLF	Transmission Loss	Net Generation	Emission Factor	Baseline emission
				(MWh/year)	(tCO_2/MWh)	(tCO_2e/ year)
Arvind Cotsyn (India) Ltd.	0.6	22.78%	5%	1,137	0.9419	1,071
Arvind Cotsyn (India) Ltd.	1.25	19.15%	5%	1,992	0.9419	1,876
Arvind Dyeing & Bleaching Mills Pvt. Ltd.	0.6	23.03%	5%	1,150	0.9419	1,083
Arvind Dyeing & Bleaching Mills Pvt. Ltd.	1.25	20.12%	5%	2,093	0.9419	1,971
Total				**6,372**		**6,002**

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	6,002	0	0	6,002
Year 2	6,002	0	0	6,002
Year 3	6,002	0	0	6,002
Year 4	6,002	0	0	6,002
Year 5	6,002	0	0	6,002
Year 6	6,002	0	0	6,002
Year 7	6,002	0	0	6,002
Total	42,014	0	0	42,014
Total number of crediting years	7			
Annual average over the crediting period	6002	0	0	6002

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{BL,y}$
Data unit	kWh/yr
Description	Net Electricity supplied to the grid
Source of data	JMR (Joint Meter Reading) issued by MSEDCL (Maharashtra State Electricity Distribution Company Ltd.)
Value(s) applied	6,372,000 (Estimated value)

Measurement methods and procedures	The net electricity exported is the basis for estimating emission reductions from the proposed project activity. Net electricity is referred from the monthly joint meter reading certificates/credit notes issued by MSEDCL. The power generated by WTG is stepped up by a step up transformer and fed into the 33 kV Feeder line. Power from WTGs other than the project proponent is also fed in the same 33 kV feeder line. This common feeder line culminates at the 33 kV/220 kV substation, where the joint-metering is done on monthly basis. The joint-metering is done at the 33 kV/220 kV MSEDCL substation, having shared Main meter and check meter, which is connected with WTGs other than the project proponent. The metered net electricity is apportioned among the various project developers based on the electricity metered at the respective WTG locations (or reading at the WTG-Controller). The apportioned metered net electricity corresponding to individual WTG is then issued separately by MSEDCL in a share certificate, and this construes the net electricity generated by individual WTG to the grid. Net electricity generated will be calculated from the main meter connected to the feeder. The Net electricity supplied to the grid by the project activity is calculated as a difference of electricity exported to the grid, electricity imported from the grid obtained from joint meter reading certificates/credit notes issued by MSEDCL as per below equation: $EG_{BL,y} = EG_{Export} - EG_{Import}$ The joint reading at metering point is carried out once in a month in presence of Suzlon officials and MSEDCL and the PP has no role in the apportioning and net energy calculations. The PP is provided with JMR based on which the invoice is raised.
Monitoring frequency	Continuous monitoring, hourly measurement and Monthly recording from Energy Meters
QA/QC procedures	Annual calibration of all the meters is undertaken at required intervals and faulty meters will be duly replaced immediately. The meters would be of accuracy class 0.5s or higher as per State electricity board regulations.
Purpose of data	The Data/Parameter is required to calculate the baseline emission
Additional comment	The data will be archived for 2 years beyond the crediting period or the last issuance of CERs for the project, whichever occurs later

Data/Parameter	EG_{Export}
Data unit	kWh /year
Description	Quantity of Electricity exported to the grid
Source of data	JMR issued by MSEDCL
Value(s) applied	6,372,000 (Estimated value)
Measurement methods and procedures	Electricity exported to MSEDCL is measured at the main meter connected to the incoming feeder at the 33 kV/220 kV substation.
Monitoring frequency	Continuous monitoring, hourly measurement and Monthly recording from Energy Meters
QA/QC procedures	Annual calibration of all the meters are undertaken at required intervals and faulty meters will be duly replaced immediately. The meters are of accuracy class 0.5s or higher as per State electricity board regulations.
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.

Data/Parameter	EG_{Import}
Data unit	kWh /year
Description	Quantity of Electricity imported from the grid
Source of data	JMR issued by MSEDCL
Value(s) applied	0 (Ex-ante value is assumed to be zero, while ex-post value will be monitored during verification)
Measurement methods and procedures	Electricity imported from MSEDCL is measured at the main meter connected to the incoming feeder at the 33 kV/220 kV substation.
Monitoring frequency	Continuous monitoring, hourly measurement and Monthly recording from Energy Meters
QA/QC procedures	Annual calibration of all the meters are undertaken at required intervals and faulty meters will be duly replaced immediately. The meters are of accuracy class 0.5s or higher as per State electricity board regulations.
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.

B.7.2. Sampling plan

Sampling is not required for the given project activity.

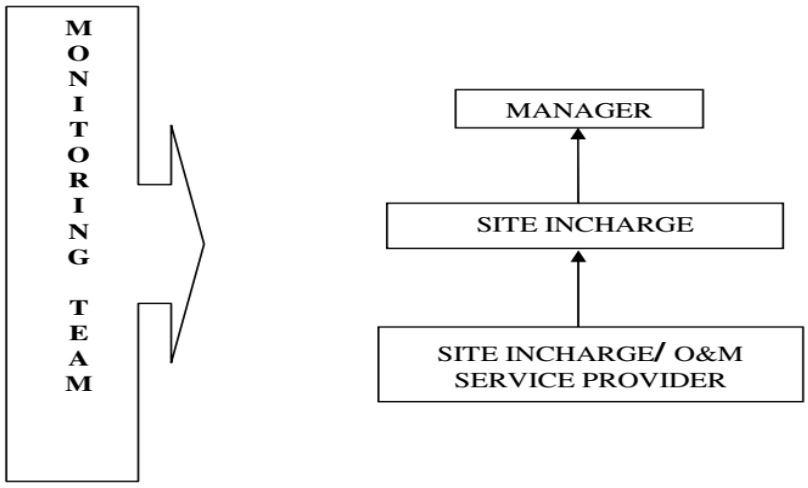
B.7.3. Other elements of monitoring plan

The monitoring plan for the propose project activity is developed as per the procedure for AMS ID small scale project activity. The monitoring plan is implemented by the project proponent.

The parameter needs to be regularly monitored to calculate the emission reduction is the net electricity supplied to the grid. Therefore the procedure to monitor and metering of electricity is done according to the procedure given below:

The authority and responsibility of Project management as well as registration, monitoring measurement and reporting lies with Project Proponents. Project Proponents have envisaged a Project Team to ensure proper and continuous monitoring of the performance of WTGs and generation of Power. The same has been outlined below:

The operational and management structure



Organizational Structure for monitoring

Designation	Responsibilities
MANAGER	Holds complete control over monitoring aspects pertaining to the project
SITE INCHARGE	• Recording • Verification • Storage of Data
SITE INCHARGE/ O&M SERVICE PROVIDER	• Operation and Maintenance • Storage of data • Data Recording

Metering and Data Archiving:

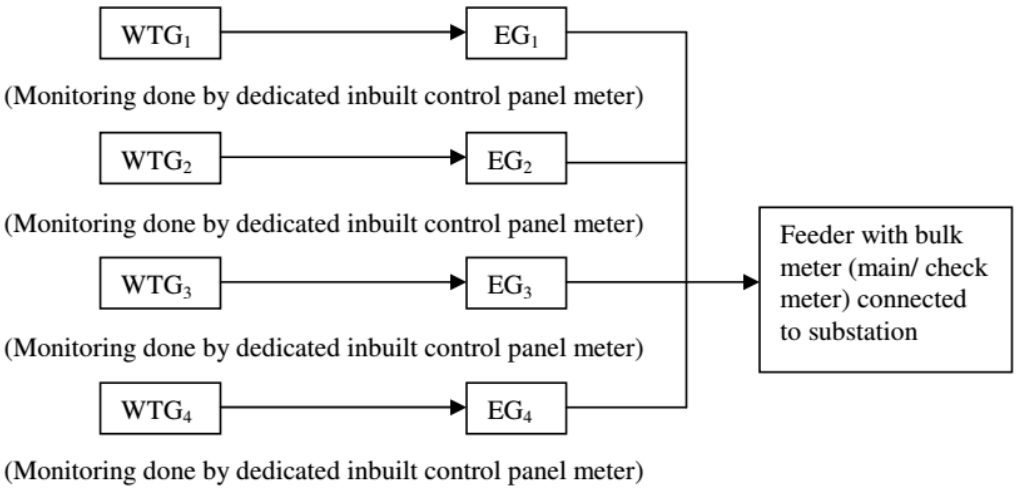
The general conditions set out for metering, recording, meter readings, meter inspections, Test & Checking and communication shall be as per the PPA (Power Purchase Agreement) with MSEDCL.

1. Metering Arrangement:

This CDM project activity has evacuation facilities for sale to grid and the evacuation facility is essentially maintained by the state utility MSEDCL.

General Layout of Metering System at site:

Each substation is connected to a number of wind turbines. The generation reading is collectively displayed by the substation meter. The net generation of each of the wind turbines is then calculated in the following manner:



The generated electricity is measured through inbuilt control panel meter of the WTGs. The monitoring of electricity generation from all these wind turbines is done at common monitoring station as a part of central monitoring system.

WTG No.	WTG Owner	UID No.	Site	Discom	SEB Sub-station	Connectivity (Feeder)
WTG1	Arvind Cotsyn Ltd- 600 kW	W-66	Tisangi	MSEDCL	33/11kV Savlaj Substation	Ghatnandre Feeder No.III

WTG2	Arvind Cotsyn Ltd- 1250 kW	G-377	Dhondewadi	MSEDCL	33/220Kv Ghatnandre Substation	Ghatnandre Feeder No.I
WTG3	Arvind Dyeing & Bleaching Mills Pvt Ltd- 600 kW	W-11	Nagaj	MSEDCL	33/11kV Kundalpur Substation	Ghatnandre Feeder No.IV
WTG4	Arvind Dyeing & Bleaching Mills Pvt Ltd- 1250 kW	G-335	Tisangi	MSEDCL	33/11kV Savlaj Substation	Savlaj

The meter details, metering arrangement, feeder connectivity is under state electricity board and PP do not have any control on it.

- The primary measurement of the electricity fed to the state utility grid is carried out jointly at the incoming feeder of the state power utility, MSEDCL which is located at the sub-station. Representatives of MSEDCL and the PP remain present during recording of the meter readings.
- The primary measurement is done through main meter which is located at the sub-station. Also a check meter was installed to measure the delivery of wind energy during periods when the main meter or its related accessories have failed or developed a fault.
- If during any of the monthly meter readings, the variation between the main meter and the check meter is more than the permissible limit of error of accuracy class, all the meters are retested and calibrated immediately by MSEDCL.
- Secondary monitoring is done at individual WTG level. Each WTG is equipped with SCADA based monitoring system which is connected to the Central Monitoring Station (CMS) of the wind farm maintained by Suzlon Energy Limited and provide the continuous data, which also can be seen through the online connected monitor. The generation data of individual machine can be monitored as a real-time entity at CMS. Using data stored in CMS; hourly, Daily and monthly reports can be generated if required.
- Wherever, more than one Power Producer(s) are delivering energy produced by them using the common evacuation system and through the common metering equipment, a common agency (EPC contractor) is responsible for JMR with MSEDCL. The joint meter reading taken at common evacuation system is supported by meter readings of individual power producers using such common evacuation system. Based on this break up, limited to total energy delivered, the power generated from the individual WTGs are certified by MSEDCL. The calculation of the breakup is done according to the formula as below:

$EG_{BL,Y}=EG_{Export,1} - EG_{Import,1}$

Net Electricity Exported = Electricity Export – Electricity Import

Electricity Export ($EG_{Export,1}$) and Import($EG_{Import,1}$) are recorded monthly at the meter at project site .

Joint Metering Procedure: The joint reading at metering point is carried out once in a month in presence of Suzlon officials and MSEDCL and the PP has no role in the apportioning and net energy calculations. The PP is provided with JMR based on which the invoice is raised. Joint meter reading is furnished to Superintending Engineer for further processing. Wherever more than one project owners are delivering the energy through common power evacuation facility and through common metering equipment, there Joint meter reading is supported by the meter readings of individual meters installed at wind energy generator. Based on Joint Meter Reading and individual

meter reading a break of electricity generated from individual wind energy generator is prepared and certified by MSEDCL. Billing records are maintained by project owner.

2. **Metering Equipment, Measurement and Recording:** Metering equipment is of bidirectional electronic tri-vector meters of accuracy class 0.5% for the Project (both Main and check meters). The meters are electronic tri vector meters and provide continuous and real time data. Hence hourly measurement is possible from the meters; however the monthly measurement is done through Joint Metering procedure as described below.

3. **Meter Test Checking:** All the main and check meters are tested for accuracy annually with reference to a portable standard meter which is of an accuracy class of 0.1%. The portable standard meter is owned by the Corporation at its own cost and expense and tested and certified at least once every year against an accepted laboratory standard meter in accordance with electricity standards. The meters are deemed to be working satisfactorily if the errors are within specifications for meters of 0.5% accuracy class. The consumption registered by the main meters alone are hold good for the purpose of billing as long as the error in the main meter is within the permissible limits.

a) If during the annual tests, the main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the permissible limits, then billing will be as per the main meter as usual. The check meter is, however, calibrated immediately.

b) If during the annual tests, the main meter is found to be beyond permissible limits of error, but the corresponding check meter is found to be within permissible limits of error, then the billing for the month up to the date and time of such test shall be as per the check meter. There will be a revision in the bills for the period from the previous calibration test up to the current test based on the readings of the check meter. The main meter shall be calibrated immediately and billing for the period thereafter till the next monthly meter reading shall be as per the calibrated main meter.

c) If during the annual tests, both the main meters and the corresponding check meters are found to be beyond the permissible limits of error, both the meters shall be immediately calibrated and the correction applied to the reading registered by the main meter to arrive at the correct reading of energy supplied for billing purposes for the period from the last month's meter reading up to the current test. Billing for the period thereafter till the next monthly meter reading shall be as per the calibrated main meter.

d) If during any of the monthly meter readings, the variation between the main meter and the check meter is more than that permissible for meters of 0.5 % accuracy class, all the meters shall be retested and calibrated immediately

e) In the event that the main/check meter error is found at the time of the meter calibration after the issuance of CERs during the crediting period, the correction of the meter error for the CER calculation will be incorporated in the next issuance of the CERs.

f) In the event that the date of registration is in the middle of the month, while the JMR is issued on monthly basis at the end of the month. The CERs will be estimated based on meter readings at the receiving station for the period from the start date of the project registration and the end of the month.

1. **Records:** O&M Contractor Suzlon Energy Ltd. maintains an accurate and up to date operating log at the wind farm. All the records are preserved for 2 years beyond the crediting period.

2. **Billing:** The billing is done on monthly basis as per statement taken by MSEDCL at the end of each month for the energy supplied.

Operation & Maintenance: The project proponents have signed an "Operation and Maintenance" agreement with M/s Suzlon Infrastructure Services Ltd (a subsidiary of SEL) for the operation and maintenance of wind turbines.

Suzlon Energy Limited (SEL) is an ISO 9001 and ISO 14001 Certified company & follows all training & other documentation procedures required there under. The performance of the turbines, safety in operation and scheduled /breakdown maintenances are organized and monitored by the contractor. So the authority and responsibility of project management lies with the contractor.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

Purchase Order date of 1x1.25 MW WTG of Arvind Cotsyn (India) Ltd. - 13/09/2005

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

Renewable Crediting Period

C.3.2. Start date of crediting period

20/02/2021(Second Crediting Period)

C.3.3. Duration of crediting period

07 years & 00 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

This 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 WEG can be ignored when compared to Emission reductions. Project activity results into GHGs emission reduction equivalent to **6,002 t CO_2/year.**

As per the Schedule 1 of Ministry of Environment, Forest and Climate Change (MoEFCC - Government of India) notification dated September 14, 2006, P - 10, 1 (c), activities are required to undertake environmental impact assessment studies.[20]The present project activity being a small scale power project using clean and renewable source like wind, does not fall under the list of activities which require Environmental Impact Assessment (EIA). Therefore, the project proponent has not conducted any Environmental Impact Assessment (EIA) for the project activity.

Impact on Land use

The land that has been acquired for the project activity is barren and unfertile. The land was unutilized before the project activity. PP has bought the land for the project activity and has obtained necessary approvals for installation of windmills.

[20] http://environmentclearance.nic.in/writereaddata/EIA_notifications/2006_09_14_EIA.pdf

Impact on Soil Use
The quantity of solid / liquid discharge likely to be generated during the construction phase is negligible and has no noticeable impact on soil use.

Impact on Air Environment
WEG is a green technology to generate electricity and there is no emission of GHG during any phase of their operation or construction. The only source of possible GHG emission can be the transport vehicles but they are negligible and can be ignored.

Tran's boundary environmental or social impacts
No trans-boundary effects have been noticed due to the implementation of the project activity.

D.2. Environmental impact assessment

Not applicable as the project activity is a renewable energy project. There are no negative environmental impacts envisaged from the project activity. All the clearances related to the same had been submitted to the DOE.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

The followings are the local stakeholders for the project activity:

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

Project participant issued letters to the respective stakeholders requesting them to attend meeting or depute representatives at respective venues.
The agenda of the meeting was fixed as follows:

- Welcome
- Description of the project
- Queries and responses from the participant and the stakeholders.
- Vote of thanks

The stake holder's view is project participant in its own small way is contributing positively to local economy & development.

Name of the PP	Meeting Date	Location of the Local Stakeholder Meeting		
		Village	District	State
Arvind Cotsyn (India) Ltd.	11/09/2007	Wagholi CMS	Sangli	Maharashtra
Arvind Dyeing & Bleaching Mills Pvt Ltd				

E.2. Summary of comments received

Stakeholders had no objections from installations of WTGs; instead they have openly said that wind
power projects helped them by:

- Additional revenue generated thro' land / lease to outsiders like contractors & their employees
- Job opportunities for day -to - day maintenance and security of WTGs
- Developments of roads
- No any adverse impact on rains, agriculture

E.3. Consideration of comments received

The stakeholders have given positive feedback and thus no measures were required to be taken

SECTION F. Approval and authorization

The Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India gave the approval for this project activity on 10th December, 2007.

Appendix 1. Contact information of project participants

Organization name	Arvind Cotsyn (India) Ltd.
Country	India
Address	Plot No. 1-12, Phase II, Sector-A, Shri Laxmi Co-Op, Industrial Estate, Hatkanangale, Dist. Kolhapur, Maharashtra 416 109
Telephone	+91-230-2436525
Fax	-
E-mail	acilich@bsnl.in
Website	http://www.arvindtex.in/cotcyn.html
Contact person	Shyamsunder Marda

Appendix 2. Affirmation regarding public funding

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

Appendix 3. Applicability of methodologies and standardized baselines

Please refer section B of the PDD for the same

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

Please refer to section B.6.1 of the PDD

Appendix 5. Further background information on monitoring plan

Please refer section B.7.3 for information on monitoring plan

Appendix 6. Summary report of comments received from local stakeholders

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

Appendix 7. Summary of post-registration changes

Not Applicable

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Document information

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

Version	*Date*	*Description*
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.

Decision Class: Regulatory
Document Type: Form
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