Project design document form for small-scale CDM project activities

(Version 05.0)

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for small-scale CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	Wind Power Project by Rajasthan Gum Private Limited (EKIESL-CDM.September-12-02)
Version number of the PDD	04
Completion date of the PDD	03/07/2014
Project participant(s)	EKI Energy Services Limited
Host Party	India
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	Sectoral Scope 1: Energy Industries (renewable -/non renewable sources) Methodology: - AMS I.D – Grid connected renewable electricity generation – version 17.0
Estimated amount of annual average GHG emission reductions	24,923 tCO2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The proposed CDM project activity is the installation of 7 WTGs having total installed capacity of 14.7 MW. The project will generate energy through renewable source i.e. wind which is a clean energy generating technology, replaces anthropogenic emissions of greenhouse gases (GHG's), which is estimated to be approximately 24,923 tCO_2e per year, thereon displaces 26,008 MWh amount of electricity from the generation-mix of power plants connected to the NEWNE regional grid, which is mainly dominated by thermal/fossil fuel based power plant.

The detailed list of WTG and the state of installation is mentioned in the table:-

Project Promoters' Name	WTG No.	Site	Capacity in MW	State	Purpose
Rajasthan Gum Private Limited	WTG1	Jath	1 x 2.1 MW	Maharashtra	Sale to Grid
	WTG2		1 x 2.1 MW	Maharashtra	Sale to Grid
	WTG3		1 x 2.1 MW	Maharashtra	Sale to Grid
	WTG4		1 x 2.1 MW	Maharashtra	Sale to Grid
	WTG5	Kaladunger	1 x 2.1 MW	Rajasthan	Sale to Grid
	WTG6		1 x 2.1 MW	Rajasthan	Sale to Grid
	WTG7		1 x 2.1 MW	Rajasthan	Captive Usage

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.

Sustainable development indicators

The National CDM Authority (NCDMA), which is the Designated National Authority (DNA) for the Government of India (GOI) under the Ministry of Environment and Forests (MoEF), has mentioned four indicators for the sustainable development in the interim approval guidelines for Clean Development Mechanism (CDM) projects from India[1].Thus the project's contribution towards sustainable development has been addressed based on the following sustainable development aspects:

Social well being
The project activity provided / provides job opportunity to local people during erection, commissioning and maintenance of the wind machines. Frequency of visiting villages and nearby areas by skilled, technicians and industrialist, increase due to installation /site visit/operation and maintenance work related to WTGs. This directly and indirectly positively effects the economy of villages and nearby area.

[1] http://www.cdmindia.in/approval_process.php

Environmental well being
The Wind power is one of the cleanest renewable energy powers and does not involve any fossil fuel. There are no GHG emissions. The impact on land, water, air and soil is negligible. Thus the project activity contributes to environmental well-being without causing any negative impact on the surrounding environment.

Economic well being
The CDM project activity generates permanent and temporary employment opportunity within the vicinity of the project. The electricity supply in the nearby area improves which directly and indirectly improves the economy and life style of the area.

Technological well being
The project activity is step forward in harnessing the untapped wind potential and further diffusion of the wind technology in the region. The project activity leads to the promotion of WTGs and demonstrates the success of wind turbines in the region which further motivate more investors to invest in wind power projects. Hence, the project activity leads to technological well-being.

A.2. Location of project activity

A.2.1. Host Party

India

A.2.2. Region/State/Province etc.

The wind power project is installed at following location.
1) Maharashtra.
2) Rajasthan.

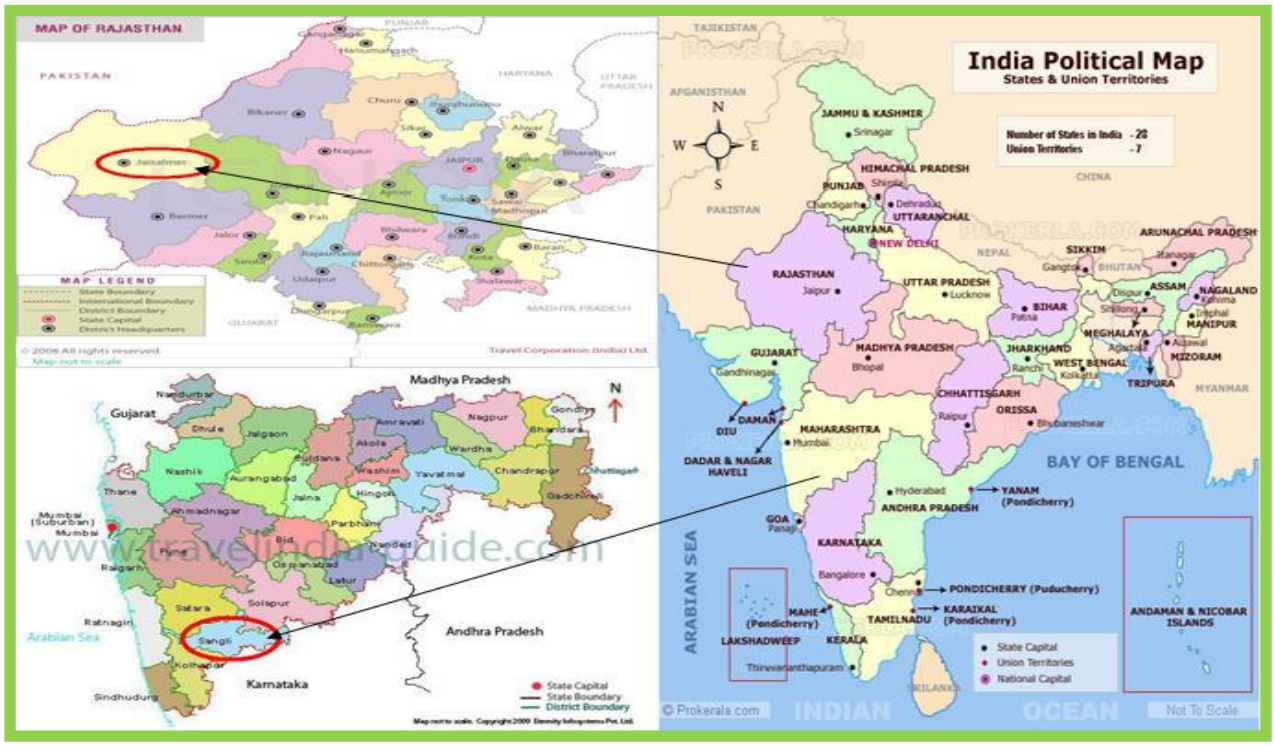
A.2.3. City/Town/Community etc.

Project Promoters' Name	WTG No.	Capacity	Village	Tehsil	District	State
Rajasthan Gum Private Limited	WTG1	1 x 2.1 MW	Yeldhari	Jath	Sangli	Maharashtra
	WTG2	1 x 2.1 MW	Mendhgiri			
	WTG3	1 x 2.1 MW	Mendhgiri			
	WTG4	1 x 2.1 MW	Jath			
	WTG5	1 x 2.1 MW	Kanod	Mohangarh-1	Jaisalmer	Rajasthan
	WTG6	1 x 2.1 MW				
	WTG7	1 x 2.1 MW				

A.2.4. Physical/Geographical location

WTG No.	UID No.	Nearest Airport	Nearest railway station	Latitude	Longitude
WTG1	JTH-67	Pune Airport	Sangli Railway Station	N16° 59' 28.4"	E75° 12' 03.8"
WTG2	JTH-152			N16° 58' 26.7"	E75° 14' 17.8"
WTG3	JTH-158			N16° 58' 50.7"	E75° 13' 35.5"
WTG4	JTH-183			N17° 03' 09.4"	E75° 15' 15.0"

WTG5	KD 89	Jodhpur Airport	Jaisalmer railway station	N27° 09' 38.2"	E71° 07' 31.7"
WTG6	KD 86			N27° 09' 17.4"	E71° 07' 00.1"
WTG7	KD 84			N27° 08' 29.2"	E71° 05' 54.3"



A.3. Technologies and/or measures

Sectoral Scope: 01 – Energy industries (renewable / non renewable sources)
Project Type: I – Renewable Energy Projects
Project Category: I.D. – Grid connected renewable electricity generation (Version 17, EB 61)

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 project activity is the installation of an environmentally safe and sound technology since there are no GHG emissions associated with the electricity generation.

There is no transfer of technology involved in the project activity. The project activity consists of 7 WTGs of same make and capacities from Suzlon Energy Limited are listed below:-

Project Proponent Name	Capacity of machines Installed	Machine Manufacturer
Rajasthan Gum Private Limited	2.1 MW	Suzlon S-88

Technical details for S-88, 2100 KW Machine manufactured by Suzlon Energy Limited

SR. NO.	PARTICULARS	DETAILS
1	Rated power	2.1 MW
2	Cut-in wind speed	4 m/s
3	Rated wind speed	14 m/s
4	Cut-out wind speed	25 m/s
5	Survival wind speed	59.5 m/s

6	Hub height	80m
7	Rotational Speed	15 to 17.6 rpm
8	Pitch Type	Electrical
9	Diameter	88 m
10	Swept area	6082 m^2
11	Blade material type	Epoxy bounded fibre glass
12	Aerodynamic brake	3 independent systems with blade pitching mechanism
13	Mechanical brake type	Hydraulic disc brake, activated by Hydraulic Pressure + mechanical rotor lock, activity by Hydraulic pressure.
14.	Estimated design Life time	20 years.

All WTGs are based on indigenous technology and the project activity doesn't involve any kind of know how, measures or technology transfer.

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India	EKI Energy Services Limited (Private entity)	No

A.5. Public funding of project activity

There is no public funding from Annex 1 countries and no diversion of Official Development Assistance (ODA) involved in the project activity.

A.6. Debundling for project activity

As per EB 54, Annex 13, Para 2, "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"

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

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 selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

Title: Grid Connected Renewable Electricity Generation[2]
Reference: AMS I.D. (Version 17, EB 61)

The methodology also refers to latest approved versions of "Tool to calculate the emission factor for an electricity system, version 04.0"[3]

As per "Tool to calculate the emission factor for an electricity system" (Version 04)

Applicability Criterion (with Para number reference)	**Project Status**
Para 3. This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that; *a)* Substitutes grid electricity, i.e. where a project activity supplies electricity to a grid OR *b)* A project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	The tool is applicable, as per option (a) of the applicability condition i.e. when calculating baseline emissions for a project activity that substitutes grid electricity.
Para 4. Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, the conditions specified in "Appendix 2: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	The applicability criterion clearly states the applicability of the tool, for grid power plants, thus it fulfill the condition and can be used to calculate emission factor.
Para 5. In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The said proposed CDM project activity is not located partially or totally in Annex I country, thus the applicability condition is met.
Para 6. Under this tool, the value applied to the CO_2 emission factor of biofuels is zero.	The proposed project activity is a grid connected wind power project generating

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

[3] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

	electricity using wind as a potential energy source; furthermore under this tool, the value applied to the CO_2 emission factor of a proposed grid connected project activity is derived by applying six steps as defined in section B.6 of the PDD. Moreover under this project activity biofuels is not used thus the Co_2 Emission Factor cannot be termed as zero.

B.2. Project activity eligibility

The project activity involves generation of grid connected electricity from renewable wind energy. Since the project activity capacity is 14.7 MW, which is less than the maximum qualifying capacity of 15 MW for a small scale CDM project activity under Type-I of the small scale methodologies. The installed capacity will not increase throughout the crediting period of 7 years and the project activity will remain within the limit of small scale in each year of the crediting period. Therefore, small scale methodology AMS I.D is applied.

Justification for the choice has been illustrated as per the requirements set in para 1-8 in methodology AMS I.D Version -17 as follows:

Applicability Criterion (with Para number reference)	**Project Case**
1 This methodology 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 falls under applicability criteria option 1(a) i.e., "*supplying electricity to a national or a regional grid"* which is NEWNE for this project activity and option 1(b) i.e. "*Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling."*

2. Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A2) applies is included in Table 2[4]	The 1st and 3rd option of Table 2 of AMS I.D. Version 17, EB 61 is applicable (please refer footnote).
3. This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	This methodology is applicable to the project activity as, it's an Greenfield project where Option (a) i.e. install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant) . Hence the project activity fulfils the applicable criterion.
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/m2; • 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/m2.	The Project activity is power generation from wind energy source and is not a Hydro Power Project, therefore this eligibility criterion is not applicable to the Project activity.

4

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

5. If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project activity is a 14.7 MW electric power generation project using wind as the source of energy. Unit does not co-fires fossil fuels since wind is the only source of power. Thus the proposed project activity has only renewable component and any non-renewable component is not applied.
6. Combined heat and power (co-generation) systems are not eligible under this category.	The proposed project activity is a 14.7 MW electricity generation project wherein the generation is solely based on Wind energy. There are no combined heat and power (co-generation) systems involved in the 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 installation of small scale bundled wind power project and doesn't involve the addition of new unit to any of existing renewable power generation facility therefore the given criterion is not applicable to 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 entire wind project is a Green field project activity and this project is not the enhancement or up gradation project.

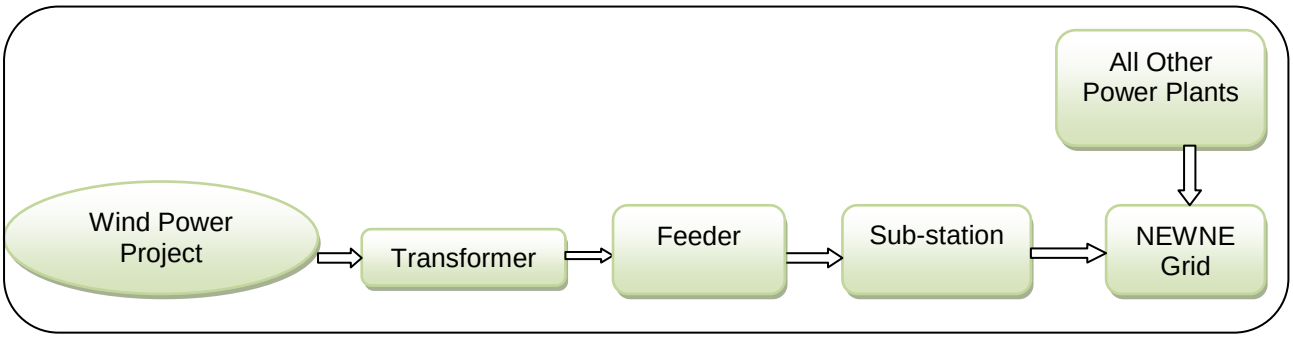
The project activity qualifies as Type I during every year of the crediting period in accordance with applicable provisions for project activity eligibility as discussed above.

B.3. Project boundary

Project boundary has been ascertained using para 9 of AMS I.D. – "The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to".

Hence the project boundary includes the wind turbine generator, sub-stations, grid and all other power plants connected to grid. The proposed project activity will evacuate power to the NEWNE grid and will also for captive utility.

Project Boundary:



The GHG emission sources considered for the project boundary and their explanations are as follows:

Source	Gas	Included	Justification / explanation
(BASELINE) Electricity Generation of NEWNE grid	CO_2	Yes	Major emission sources.
	CH_4	No	Excluded for simplification. This is conservative
	N_2O	No	Excluded for simplification. This is conservative
(PROJECT ACTIVITY) Wind Electricity Generation	CO_2	No	As renewable wind power project, hence not applicable
	CH_4	No	The proposed project is wind power project, hence not applicable
	N_2O	No	The proposed project is wind power project hence not applicable

B.4. Establishment and description of baseline scenario

As per guidelines for baseline in Para 10 of methodology, AMS I.D, Version 17, "*the baseline scenario is the electricity delivered to the grid by 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, proposed project activity will evacuate power to the NEWNE Grid and will use for captive purpose complying with the stated guideline.

Further, as per Para 11 of AMS I.D, Version 17, "*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."*

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

Where,

BE_y Baseline Emissions in year y (t CO_2)

$EG_{BL,y}$ Quantity of net electricity supplied to the grid from project activity in year *y* (MWh)

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

As per para 12 of the methodology AMS I D Version 17, the methodology provides following approaches for emission factor calculations:

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

OR

(b) *The weighted average emissions (in t CO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used*

Option (a) has been considered to calculate the grid emission factor as per the 'Tool to calculate the emission factor for an electricity system' since data is available from an official source.

For the calculation of emission reduction CO_2 Baseline Database for the Indian Power Sector, **Version 08, January 2013** published by Central Electricity Authority (CEA), Government of India has been used.[5]

The data base is consistent with the "Tool to calculate the emission factor for an electricity system" Version 04.0, published by CDM Executive board.

The combined margin emissions factor is calculated as follows:

$EF_{CO2,grid,y} = EF_{OM}*W_{OM} + EF_{BM}*W_{BM}$

Where:

EF_{BM}: Build margin CO_2 emission factor in year 'y' (tCO_2/MWh)
EF_{OM}: 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 (%)

In case of wind power generation project $W_{OM} = 0.75$ and $W_{BM} = 0.25$

Simple Operating Margin for NEWNE Grid (including imports)

	2009-10	2010-11	2011-12	Weighted Average
NEWNE	0.9777	0.9707	0.9688	0.9723

Source: CO_2 Baseline Database for the Indian Power Sector, CEA, Version 8.0

Build Margin for NEWNE Grid (not adjusted for imports)

	2009-10	2010-11	2011-12
NEWNE	0.8123	0.8590	0.9164

Source: CO_2 Baseline Database for the Indian Power Sector, CEA, Version 8.0

Emission Factor NEWNE Grid (Combined Margin)

The combined margin emissions factor is calculated for NEWNE Grid as follows:

$EF_{CO2,grid,y} = EF_{OM}*W_{OM} + EF_{BM}*W_{BM}$
$= 0.9723*0.75 + 0.9164*0.25$
$= \mathbf{0.9583}$

Particulars	Details	Source
Operating Margin (tCO_2/MWh)	0.9723	CO_2 Baseline Database for the Indian Power Sector, CEA, Version 8.0
Built Margin (tCO_2/MWh)	0.9164	
Combined Margin (tCO_2/MWh)	0.9583 (Calculated as above)	

B.5. Demonstration of additionality

[5] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver7.pdf

National Policies

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

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

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

Hence the project investor has not considered them in developing the baseline scenario for the project activity. Instead the baseline scenario is based on hypothetical situation without the provincial and sectoral polices being in place. Hence the selection of baseline scenario confirms to Annex 3 of EB 22. Moreover the project under consideration is a wind power project and the methodology itself specifies the baseline of the project activity which has been elaborated in section B.4 of the PDD.

Demonstration of additionality for the CDM project activity:

As per Guidelines on the Demonstration of Additionality of Small-scale Project Activities (ver. 9 EB 68 Annex 27)[7], 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:

- **Investment barrier**: a financially more viable alternative to the project activity would have led to higher emissions;
- **Technological barrier**: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
- **Barrier due to prevailing practice**: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
- **Other barriers**: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

The project investor has selected Investment barrier to demonstrate in a conservative and transparent manner that the proposed CDM project activity is financially unattractive. In line with the guidelines stipulated under Annex 34 of EB 35 ("Non-binding best practice examples to

[6] http://powermin.gov.in/acts_notification/electricityact2003/ status.htm

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

demonstrate additionality for SSC project activities"), a benchmark analysis is used in the project case under investment barrier.

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 & 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.

Selection of Financial Indicator:

As the project is 100% equity financed, the decision to invest or not to invest is based on the returns generated by the equity investment; hence post tax Equity IRR has been identified as the relevant financial indicator for investment analysis at the time of decision making.

Selection of Benchmark:

The benchmark has been considered in accordance with Guidance 15 of EB 62 Annex 05, "The values in the table in Appendix A may also be used, as a simple default option".

Methodology deployed for arriving at a suitable value of Benchmark using Default Value has been described below:

- As the proposed project activity generates power utilizing wind energy, Group 1 as per para 5 of Appendix of EB 62, Annex 5 has been identified as a suitable category.
- The investment analysis has been carried out in Nominal terms. Accordingly, Default value as given in Para 8, Appendix, Annex 5, EB 62 has been adjusted by adding suitable forecasted inflation rate taken from RBI (Central Bank, India).
- Project investor has calculated Benchmark based on WPI median inflation rate. As per Para 7 of Appendix of EB 62, Annex 5, the inflation forecast should be for the duration of the crediting period. However, since RBI provides forecast inflation only for 5 & 10 years, the project investor has calculated benchmark using both the durations and the most conservative value is considered as Benchmark for the project activity.

The benchmark has been computed in the following manner:

Nominal Benchmark[9] = {(1+Real Benchmark)*(1+Inflation rate)}-1

Where,
Real Benchmark = Default Value, i.e., 11.75% (as per Appendix of Annex 5, EB 62)
Inflation rate = Projected Inflation Rate for India in next 5 and 10 years (RBI Forecast)

Key Assumptions supporting financial projections:

Input values are 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.

Parameters	WTG 1,2,3 & 4	Source
State	Maharashtra	Offer Letter dated 12-Apr-2012
Capacity (MW)	2.1	Offer Letter dated 12-Apr-2012
No. of WTGs	4	Offer Letter dated 12-Apr-2012

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

[9] As per Pg. 320 of Corporate Finance, Second Edition of Aswath Damodaran

Total Capacity (MW)	8.4	
Expected Date of Commissioning	30-Sep-12	Offer Letter dated 12-Apr-2012
Life of the plant (Years)	20	Technical Specifications
PLF (%)	19.85%	As per Third Party Report in accordance to EB 48 Annex 11
De-ration	NA	
Tariff (INR)	4.86	MERC Tariff Order dated 30-Mar-2012
O&M Expenses (INR MN)	10.34	Offer Letter dated 12-Apr-2012
Escalation in O&M Expenses (%)	5%	Offer Letter dated 12-Apr-2012
O&M free for years	1	Offer Letter dated 12-Apr-2012
Insurance (INR MN)	0.72	TAC Order
Total Project Cost (INR MN)	480	Offer Letter dated 12-Apr-2012
Loan Amount (INR MN)	NA	
Land Cost (INR MN)	14.40	As per management decision
Salvage Value in %	10%	As per CERC order dt. 03.12.2009
Book Depreciation Rate (%)	15.33%	Companies Act
Residual Value	60.96	Calculated
IT Depreciation (%)	15%	Income Tax Act
Additional Depreciation in Year-1 (%)	20%	Finance Act
Corporate Tax (%)	32.45%	Finance Act
MAT (%)	20.01%	Finance Act
Service Tax (%)	12.36%	Finance Act

Parameters	WTG 5 & 6	Source
State	Rajasthan	Offer Letter dated 30-Jun-2012
Capacity (MW)	2.1	Offer Letter dated 30-Jun-2012
No. of WTGs	2	Offer Letter dated 30-Jun-2012
Total Capacity (MW)	4.2	
Expected Date of Commissioning	30-Sep-12	Offer Letter dated 30-Jun-2012
Life of the plant (Years)	20	Technical Specifications
PLF (%)	20.66%	As per Third Party Report in accordance to EB 48 Annex 11
Tariff (INR)	4.46	RERC Tariff Order dated 14-Dec-2011
O&M Expenses (INR MN)	5.17	Offer Letter dated 30-Jun-2012
Escalation in O&M Expenses (%)	5%	Offer Letter dated 30-Jun-2012
O&M free for years	1	Offer Letter dated 30-Jun-2012
Insurance (INR MN)	0.36	TAC Order
Total Project Cost (INR MN)	240	Offer Letter dated 30-Jun-2012
Loan Amount (INR MN)	NA	
Land Cost (INR MN)	7.20	As per management decision
Salvage Value in %	10%	As per RERC notification dt. 23.03.2009
Book Depreciation Rate (%)	15.33%	Companies Act
Residual Value	30.48	Calculated
IT Depreciation (%)	15%	Income Tax Act
Additional Depreciation in Year-1 (%)	20%	Finance Act

Corporate Tax (%)	32.45%	Finance Act
MAT (%)	20.01%	Finance Act
Service Tax (%)	12.36%	Finance Act

Parameters[10]	WTG 7	Source
State	Rajasthan	Offer Letter dated 6-Aug-2012
Capacity (MW)	2.1	Offer Letter dated 6-Aug-2012
No. of WTGs	1	Offer Letter dated 6-Aug-2012
Total Capacity (MW)	2.1	
Expected Date of Commissioning	30-Sep-12	Offer Letter dated 6-Aug-2012
Life of the plant (Years)	20	Technical Specifications
PLF (%)	20.66%	As per Third Party Report in accordance to EB 48 Annex 11
Transmission & Wheeling Losses (%)	8.00%	As per Policy for Promoting Generation of Electricity from Wind, 2011
Tariff (INR)	5.50	As per Electricity Bill
Wheeling Charges (INR/kWh)	0.055	As per Policy for Promoting Generation of Electricity from Wind, 2011
Transmission Charges (INR/kW/Month)	76.00	As per Policy for Promoting Generation of Electricity from Wind, 2011
O&M Expenses (INR MN)	2.58	Offer Letter dated 6-Aug-2012
Escalation in O&M Expenses (%)	5%	Offer Letter dated 6-Aug-2012
O&M free for years	1	Offer Letter dated 6-Aug-2012
Insurance (INR MN)	0.18	TAC Order
Total Project Cost (INR MN)	120	Offer Letter dated 6-Aug-2012
Loan Amount (INR MN)	NA	
Land Cost (INR MN)	3.60	As per management decision
Salvage Value in %	10%	As per RERC notification dt. 23.03.2009
Book Depreciation Rate (%)	15.33%	Companies Act
Residual Value	15.24	Calculated
IT Depreciation (%)	15%	Income Tax Act
Additional Depreciation in Year-1 (%)	20%	Finance Act
Corporate Tax (%)	32.45%	Finance Act
MAT (%)	20.01%	Finance Act
Service Tax (%)	12.36%	Finance Act

Sr. No.	WTG Owner	Inflation Forecast		Benchmark	
		5-Year	10-Year	5-Year	10-Year
WTG 1,2,3 & 4	Rajasthan Gum Private Limited	6.10%	5.80%	18.57%	18.23%
WTG 5 & 6		6.10%	5.80%	18.57%	18.23%
WTG 7		6.20%	6.00%	18.68%	18.46%

[10] Seperate financial analysis has been done for this WTG 7 as it is used for captive purpose, while the other two WTGs (WTG 5 & 6) are selling the electricity generated to the state electricity board.

The result of the analysis is as follows:

WTG No.	Equity IRR without CDM	Benchmark
WTG 1,2,3 & 4	9.29%	18.23%
WTG 5 & 6	8.58%	18.23%
WTG 7	8.73%	18.46%

This substantiates that the investment is not financially attractive (equity IRR for the project activity is less than the Benchmark) for all WTGs. Thus it can be easily concluded that project activity is additional & is not business as usual scenario.

Sensitivity Analysis

As per Guidance 20 and 21 of Annex 5 of EB 62 Annex 5, only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation 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	**WTG 1,2,3 & 4**			
Variation %	-10%	Normal	10%	Breaching Value
PLF	7.56%	9.29%	10.98%	57.48%
O&M	9.62%	9.29%	8.99%	-366.10%
Project Cost	10.83%	9.29%	8.04%	-40.95%
Tariff Rate	7.56%	9.29%	10.98%	57.48%

Equity IRR	**WTG 5 & 6**			
Variation %	-10%	Normal	10%	Breaching Value
PLF	6.85%	8.58%	10.20%	64.85%
O&M Cost	8.88%	8.58%	8.24%	-393.39%
Project Cost	10.04%	8.58%	7.32%	-44.15%
Tariff Rate	6.85%	8.58%	10.20%	64.85%

Equity IRR	**WTG 7**			
Variation %	-10%	Normal	10%	Breaching Value
PLF	6.82%	8.73%	10.56%	58.41%

O&M Cost	9.04%	8.73%	8.42%	-399.40%
Project Cost	10.23%	8.73%	7.47%	-44.12%
Tariff Rate	6.82%	8.73%	10.56%	58.41%

Addressing Guidance 20 & 21 of EB 62, Annex 5, Sensitivity Analysis has been carried out.

The rationale of sensitivity is, *"The ultimate objective of the sensitivity analysis is to determine the likelihood of the occurrence of a scenario other than the scenario presented, in order to provide a cross-check on the suitability of the assumptions used in the development of the investment analysis."*

Variable	Probability to breach the benchmark
PLF	PLF considered in financials for all WTGs is the maximum envisaged as per the offer letter. Therefore, variation in PLF of more than 10% is highly unlikely. However, if we refer the breaching values for all Project Investors, Breaching value of PLF for all WTGs is above 10%. Hence probability of PLF breaching is unlikely to happen.
O&M Cost	Breaching value of O&M Cost for all WTGs is below (-100%). Hence, even, if the O & M cost is reduced to zero IRR will not cross the benchmark. However, reduction of O & M to zero is the most unlikely scenario.
Project Cost	Since the Purchase Order cost is firm, there is no possibility of project cost going below this level. Even then, sensitivity analysis is carried out for project cost being 10% less than that considered during decision making for all WTGs, though for none of the WTGs, the actual project cost has varied by 10%. Even at this level, the IRR does not breach the Benchmark for any of the WTGs. Hence, there is no any probability of the Benchmark being breached.
Tariff Rate	The tariff is determined by PPA which is fixed for years mentioned as per the respective State Electricity Board's tariff order. Hence, there is no probability of any variation for the same.

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.

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[11].

Client Name	Letter of Intent	Prior CDM Intimation
WTG 1,2,3 & 4	15-May-12	2-Nov-2012
WTG 5 & 6	13-Jul-12	2-Nov-2012
WTG 7	11-Aug-12	2-Nov-2012

All the project proponents have intimated the NCDMA and the UNFCCC of the commencement of the project activity and of their intention to seek CDM status within six months of the project activity start date. Hence, the proposed project activity is in compliance with Para 2 of Annex 13, EB 62.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

Applied Methodology: AMS I.D, version 17, EB 61

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

As per the para 3 of the AMS – I.D, version 17, EB 61, "This methodology is applicable to project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition[12]; (c) Involve a retrofit[13] of (an) existing plant(s); or (d) Involve a replacement[14] of (an) existing plant(s).

Baseline Estimation:

Baseline estimation methodology for project category *I.D* has been detailed in paragraphs 10-19 of the approved small scale methodology *AMS I.D*. (Version 17, EB 61). Paragraph 12 of the approved methodology, which is applicable to this project activity, states that:

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

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

OR

b.) The weighted average emissions (in t CO2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Option (a) of the two methods has been chosen to calculate grid emission factor. Also as per "Tool to calculate the emission factor for an electricity system" (Version 04.0, Annex 15, EB 75) following six steps has been followed:

Step 1: Identify the relevant electricity systems
Central Electricity Authority of India (CEA), Ministry of Power, Government of India (Host Country) has given the delineations of the project electricity system and the connected electricity system in India.

As per CEA, the Indian power system is divided into two independent regional grids, namely NEWNE & Southern. Each grid covers several States. Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the problems relating to the regional grid. Each State in a regional grid meets its demand with its own generation facilities and with allocation of power plants owned by the central agencies such as NTPC and NHPC etc. Depending on the demand and generation, there are electricity imports and exports between the States of a regional grid. There are also electricity transfers between regional grids.

Geographical Scope of two regional grids:

[12] A capacity addition is an increase in the installed power generation capacity of an existing power plant through: (i) The installation of a new power plant besides the existing power plant/units; or (ii) The installation of new power units, additional to the existing power plant/units. The existing power plant/units continue to operate after the implementation of the project activity.

[13] Retrofit (or rehabilitation or refurbishment). It involves an investment to repair or modify an existing Power plant/unit, with the purpose to increase the efficiency, performance or power generation capacity of the plant, without adding new power plants or units, or to resume the operation of closed (mothballed) power plants. A retrofit restores the installed power generation capacity to or above its original level. Retrofits shall only include measures that involve capital investments and not regular maintenance or housekeeping measures.

[14] Replacement. It involves investment in a new power plant or unit that replaces one or several existing unit(s) at the existing power plant. The installed capacity of the new plant or unit is equal to or higher than the plant or unit that was replaced.

NEWNE				Southern
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	Dadra & Nagar Haveli	Meghalaya	Tamil Nadu
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Pondicherry
Punjab	Andaman - Nicobar	Maharashtra	Nagaland	Lakshadeep
Rajasthan		Goa	Tripura	
Uttar Pradesh				
Uttaranchal				

For the purpose of calculating the emission reductions achieved by any CDM project, the "Tool to calculate the emission factor for an electricity system" (Version 04.0, Annex 15, EB 75) requires that the "project electricity system is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints". This implies that the grid emission factors could be most appropriately calculated at the level of the two regional grids. As per the delineation given by CEA, Rajasthan, Maharashtra falls into the NEWNE Regional Grid.

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

Project Investor 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.

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

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

(a) Simple operating margin;
(b) Simple adjusted operating margin;
(c) Dispatch data analysis operating margin;
(d) Average operating margin

CO_2 Baseline Database Version 8, 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 04.0, Annex 15, EB 75), any of the four methods can be used.

However, the data required to calculate simple adjusted OM or Dispatch data analysis is not possible due to lack of availability of this activity data to the project developers. The choice of other two options for calculating the operating margin emission factor depends on the generation of electricity from low cost/must run sources.

In the context of the methodology 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. A Low-cost/must-

run resource typically includes hydro, geothermal, wind, low cost biomass, nuclear and solar generation.

	2007-08	2008-09	2009-10	2010-11	2011-12
NEWNE	19.0%	17.4%	15.9%	17.6%	19.2%
South	27.1%	22.8%	20.6%	21.0%	21.0%
India	21.0%	18.7%	17.1%	18.4%	19.6%

Data Source: Central Electricity Authority (CEA) database Version 8, Jan'2013

Thus the above table clearly states that operating margin can be calculated using the Simple OM method as the low-cost/must run resources constitute less than 50% (only % - Average of three years, as shown in table below) of the total grid generation of the NEWNE Grid in average of the three most recent years. And the average emission rate method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation.

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.

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

Project Investor 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 04.0, Annex 15, EB 75). Project Investor has opted for option (A) *"*Based on the net electricity generation and a CO_2 emission factor of each power unit*"* and used data provided by CEA, Version 7. Net electricity generation and absolute CO_2 emission of all generating power plants serving the system, not including low-cost/ must–run power plants, calculated from CEA database and CO_2 emission per unit net electricity generation (tCO_2/MWh) estimated for year 2009-10, 2010-11 and 2011-12. 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.

Please refer Baseline emission sheet for detail simple OM emission factor calculation.

Net Generation in Operating Margin (MWh) (incl. Imports)

	2009-10	2010-11	2011-12
NEWNE	462,327,095	476,986,721	502,300,383

Simple Operating Margin (tCO_2/MWh) (incl. Imports)

	2009-10	2010-11	2011-12

NEWNE	0.9777	0.9707	0.9688

Simple Operating Margin (NEWNE) = Generation weighted average of the simple operating Margin

= 0.9723 (tCO_2/MWh)

In the project activity, the full generation-weighted average (ex-ante) for the most recent 3 years for which data are available at the time of PDD submission has been considered. Hence Operating Margin value will remain fixed and need not be monitored during the crediting period.

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

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

For NEWNE Grid

	2011-12
NEWNE	0.9164

BM values have been taken from CO_2 Baseline Database for the Indian Power Sector, Version 8. CO_2 Baseline Database for the Indian Power Sector is published by Central Electricity Authority, Ministry of Power, Govt. of India.

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

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 projects, by default, are W_{OM} = 0.75 & W_{BM} = 0.25 $EF_{grid,\ CMy}$ is calculated as below and are expressed in tCO_2/MWh.
Emission Factor NEWNE Grid (Combined Margin)

Particulars	Details	Source
Operating Margin (tCO_2/MWh)	0.9723	CEA
Built Margin (tCO_2/MWh)	0.9164	CEA
Combined Margin (tCO_2/MWh)	0.9583	Calculated

As per para 11 of the methodology AMS I. D Version 17,
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.

$$BE_y = EG_{BL,y} * EF_{CO_2,grid,y}$$

Where:

BE_y	Baseline Emissions in year *y* (tCO_2)
$EG_{BL,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{CO2,grid,y}$	CO_2 emission factor of the grid in year y (t CO_2/MWh)

As per para 23 of the methodology AMS I.D Version 17,

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 20 of AMS I.D Version 17,

For most renewable energy project activities, PE_y = 0

As per para 22 of AMS ID Version 17

If the energy generating equipment is transferred from another activity, leakage is to be considered. It is not applicable for the project activity, thus leakage emissions are considered to be zero.
So, LE_y= 0

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	$EF_{grid, OM, y}$
Unit	tCO_2/MWh
Description	Operating Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 08, January 2013[15]
Value(s) applied	0.9723
Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 04.0" as 3-year generation weighted average using data for the years 2009-2010, 2010-2011, & 2011-2012. The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 8.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{grid,BM,y}$
Unit	tCO_2/MWh
Description	Build Margin CO_2 emission factor in year y
Source of data	Calculated from CEA database, Version 08, January 2013[15]
Value(s) applied	0.9164

[15] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver8.pdf

Choice of data or Measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 04.0" for the year 2011-2012. The data is obtained from "CO_2 Baseline Database for Indian Power Sector" version 8.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2 / MWh
Description	Combined Margin CO_2 emission factor in year y
Source of data	"Calculated as per "Tool to calculate the emission factor for an electricity system, version 04.0" as 3-year generation weighted average using data for the years 2009-2010, 2010-2011, & 2011-2012. The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 8.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Value(s) applied	0.9582
Choice of data or Measurement methods and procedures	Calculated using the CM approach as per "Tool to calculate the emission factor for an electricity system[16], version 04.0" The data reflects the Combined Margin Emission Factor of the NEWNE Grid for the year 2011-12
Purpose of data	For the calculation of the Baseline Emission
Additional comment	This Parameter is fixed ex-ante for the entire crediting period.

B.6.3. Ex ante calculation of emission reductions

Formula used to calculate the net emission reduction for the project activity is

$ER_Y = BE_Y – PE_Y – LE_Y$

Where,
ER_Y = Emission Reduction in tCO_2/year
BE_Y = Baseline emission in tCO_2/year
PE_Y = Project emissions in tCO_2/year
LE_Y = Leakage Emissions in tCO_2/year

Baseline Emission (BE_Y)

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 an emission factor.

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

Where,
$EG_{BL,y}$ = Total quantity of net electricity delivered to the NEWNE grid

Project Investors' Name	Capacity	PLF(%)	Grid	Generated Power(MWh) p.a	Baseline Emission Factor	Baseline emissions (tCO_2/ year)

[16] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

					(tCO$_2$/MWh)	
Rajasthan Gum Private Limited	2.1*4	19.85%	NEWNE	14,606	0.9583	13,997
	2.1*2	20.66%	NEWNE	11,402	0.9583	10,926

$EF_{CO2, grid, y}$ = Baseline emission factor
= 0.9583 tCO_2/MWh

BE_y = 26,008* 0.9583
= 24,923

Since $ER_y = BE_y$

Therefore ER_y = 24,923

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)
2014-15	24,923	0	0	24,923
2015-16	24,923	0	0	24,923
2016-17	24,923	0	0	24,923
2017-18	24,923	0	0	24,923
2018-19	24,923	0	0	24,923
2020-2021	24,923	0	0	24,923
2021-2022	24,923	0	0	24,923
Total	174,461	0	0	174,461
Total number of crediting years	7			
Annual average over the crediting period	24,923	0	0	24,923

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$EG_{BL, y, RJ}$
Unit	MWh/yr
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh).
Source of data	1) Breakup of Net Export as per Monthly Generation Report and Joint Meter Reading authorized by R.R.V.P.N.L. 2) The quantity of net electricity supplied to the grid (i.e. Net Export in kWh) by the project activity will be taken from the break-up sheet prepared by Suzlon India Limited on the basis of monthly Joint Meter Reading (JMR) certificate certified by Rajasthan Rajya Vidyut Prasaran Nigam Limited (RRVPNL). 3) The value for net electricity supplied to the grid will be cross verified from the monthly invoice raised by the project participant.

Value(s) applied	11,098
Measurement methods and procedures	**Metering at 33 kV/220 kV level:** The electricity generated by the project activity WTG/s is evacuated to the pooling station at 33 kV/220 kV level. The project activity WTG/s along with other WTGs, are connected to the feeder-wise metering point/s, where each metering point consists of both main & check meters. These energy meters (type: tri-vector) are having accuracy class of 0.2s. The joint meter reading is taken on monthly basis at these metering point/s by the representatives of PP & State Utility, which records parameters like export, import. The electricity (export and import) for the connected WTG/s is apportioned on monthly basis by the State Utility at 33 kV/220 kV level on the basis of generation ratio at the applicable metering point (ratio of controller reading of connected WTG to the controller reading for all WTGs connected to the applicable metering point) and the electricity (export, import etc) recorded by the energy meters at 33 kV/220 kV GSS on monthly basis. It will give export kWh & import kWh for connected WTG. The net export obtained at 33 kV/220 kV level for any given month for the connected WTG is then obtained by: **Net Export = Export kWh – Import kWh** All these metering points are further connected to the common delivery point at the 220 kV level. **Metering at 220 kV level:** The common metering point at 220 kV GSS concurrently records total electricity (total export and total import) receiving from all connected metering points. The common metering point consists of both main & check meters. These energy meters (type: tri-vector) are having accuracy class of 0.2s. The monthly JMR is taken by the representative of PP & State Utility.

Monitoring frequency	Billing of the energy will be done based on the energy break up available at the metering at 220 kV level. **Transmission loss:** The total transmission loss occurred during export of the electricity between the 33/220 kV level pooling station & 220 kV level common delivery point is calculated as the difference between total aggregated reading of exports for all metering points at 33/220 kV level and the total reading of exports for same metering points recorded at the 220 kV level. Similarly, transmission loss occurred during import of the electricity is also calculated. The PP/WTG wise transmission loss during export & import is calculated by multiplying the values of arrived transmission loss for export & import for wind farm with the Generation Ratio at common delivery point (ratio of electricity generated by installed WTG to the total generation by all the connected WTGs/ or connected metering points under common delivery point). The values of transmission loss during export & import for the given WTG are subtracting from $EG_{Export,\ metering\ point}$ & $EG_{Import,\ metering\ point}$ respectively to get the values of export and import respectively for the given month. **Net electricity delivered to the Grid:** The net electricity delivered to the Grid by the given WTG for the given month (net export kWh) is then obtained by subtracting import from export. The values of the net electricity delivered to the Grid are aggregated annually to get $EG_{BL,y}$. The value of net electricity delivered to the Grid ($EG_{BL,y}$) by the project activity per annum is converted to MWh before the calculation of emission reductions.
QA/QC procedures	Monthly
Purpose of data	• Annual Testing of all the meters will be undertaken and faulty meters will be duly replaced immediately. • However the meters will be calibrated at-least once in 3 years. • The Net Units generated will be cross checked against the invoice raised by the Project Investor towards the Discom • The energy meter is of 0.2 accuracy class.
Additional comment	The Data/Parameter is required to calculate the baseline emission

Data / Parameter	$EG_{BL,y,MH}$
Unit	MWh/yr
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
Source of data	Credit Report as per Monthly Generation Report
Value(s) applied	14,606

Measurement methods and procedures	Data Type: Measured Monitoring equipment: Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: Annually Electricity exported to the grid is in kWh. However for the calculation purpose electricity exported is converted in MWh.
Monitoring frequency	Monthly
QA/QC procedures	Annual calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately. The meters will be of accuracy class 0.2.
Purpose of data	The Data/Parameter is required to calculate the baseline emission
Additional comment	Data will be archived electronically for a period of 2 years beyond the end of crediting period.

B.7.2. Sampling plan

Sampling is not required for the given project activity.

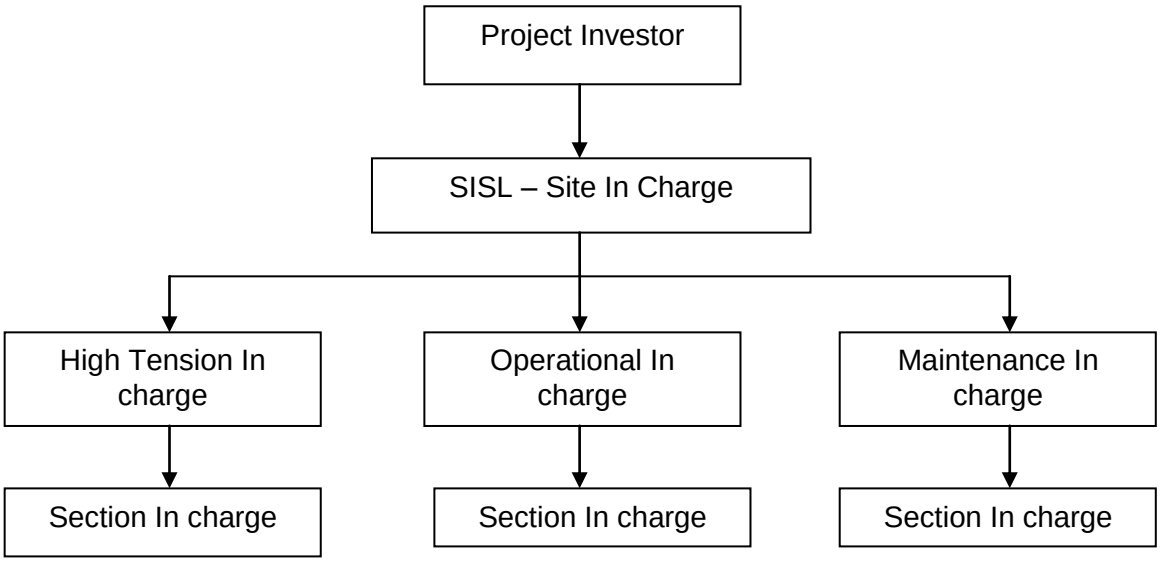
B.7.3. Other elements of monitoring plan

Organisational Structure for data recording and monitoring

Monitoring Plan at Rajasthan State

A detailed description of metering measurements methods procedures to be applied to the project activity has been well incorporated in section B.7.1, favouring Rajasthan-sites.

The organizational hierarchy of Project Proponent & Suzlon Infrastructure Services Ltd. (SISL) Project management is as follows:



Monitoring Plan:

QA/QC Procedures:

The main and backup meter installed at connected substations for monitoring of the project activity are electronic tri-vector energy meters of 0.2 accuracy class. Each meter is jointly inspected and sealed on behalf of project proponent and RRVPNL, in the presence of its authorised representatives. All main and backup meter are calibrated annually by RRVPNL or its representatives.

Description of calibration of WTG Controller

The controller used for the WTGs which is an SCS Controller is a micro-processor based intelligent controller which has been specially designed for control of wind turbines. It uses a Woodward Multi function Relay that has three current inputs from CT and three direct voltage inputs (690 Volts). The analog values of current / voltage is converted into digital signal internally using A/D Converters at very high sampling rate. A software program reads these values and displays instantaneous parameters such as voltage, current, power factor, kVAh, kVArh and kWh. These instantaneous values are then time integrated and displayed / stored. Woodward relay is having no display and needs special protocol to view energy readings as this relay is communicating digital signal through special communication protocol. Moreover, turbine cannot run without this relay hence it cannot be removed for calibration, hence, it is not possible to calibrate.

Data Management and Data Archiving:

Copies of the break-up sheet, invoices raised on Discom and sales receipts will be retained and archived for the entire crediting period plus two years by the project proponent.

Procedures for Data Adjustments/Uncertainties:

Data uncertainty in the project activity monitoring could occur under the following circumstances:

1. During the monthly joint meter reading at connected substations, the reading of the main meter and backup meter are cross checked to insure that the meters are working within the permissible limit. If during the cross checking the reading is found to be outside the permissible limit of accuracy, then calibration is done to identify the meter with the error and the faulty meter is replaced immediately. The meter reading for that month is to be taken from the correct meter.
2. During the monthly joint meter reading at the connected substations, if the display defect is in the main meter than in that case the backup meter reading are considered for the purpose of preparation of the break-up sheet and billing purpose. Defective main meter will be replaced immediately.
3. During the monthly joint meter reading at the connected substation, if the display defect is in the check meter than in that case the main meter reading are considered for the purpose of preparation of the break-up sheet and billing purpose. Defective check meter will be replaced immediately.
4. If during the annual calibration of the meters at the connected substations, the main meter is found to be outside the permissible limit of accuracy and if the main meter reading have been used to prepare the break-up sheet, then the identified error would be applied to all the measured value since the date of last calibration. Further the main meter would be replaced immediate.
5. If during the annual calibration of the meters the connected substations, the check meter is found to be outside the permissible limit of accuracy and if the check meter reading have been used to prepare the break-up sheet, then the identified error would be applied to all the measured value since the date of last calibration. Further the check meter would be replaced immediate.

Procedure for data apportioning:

Apportioning of net electricity generation from each WTG located at Rajasthan determined by SEB is as follows:

The apportioning of the electricity is the responsibility of the State Utility. The sample apportioning procedure adopted for any given WTG for any given month is given below:

Generation Ratio at metering point (33 kV/220 kV level GSS): The generation ratio is the ratio of electricity generated by installed WTG of PP to the total generation by all the connected WTGs to the applicable metering point.

$$G_{R,\text{ metering point}} = EG_{\text{Controller, WTG}} / EG_{\text{Controller, metering point}} \quad \text{(a)}$$

Where,

$G_{R,\text{ metering point}}$: Generation Ratio at metering point

$EG_{\text{Controller, WTG}}$: Electricity generated by installed WTG of PP connected to the applicable metering point

$EG_{\text{Controller, metering point}}$: Total generation by all the connected WTGs to the applicable metering point

Calculation of net electricity exported at applicable metering point:

The Main and Check meters at the applicable metering point measure a number of parameters including export and import for all the connected WTGs.

The import, kWh by the WTG at the metering point is calculated in the following manner:

$$EG_{\text{Import, metering point}} = G_{R,\text{ metering point}} \times EG_{\text{Total Import, metering point}} \quad \text{(b)}$$

Where,

$EG_{\text{Import, metering point}}$: Import, kWh by the WTG at the metering point

$G_{R,\text{ metering point}}$: Generation Ratio at metering point

$EG_{\text{Total Import, metering point}}$: Total Import, kWh by all the WTGs at the metering point

The export, kWh by the WTG at the metering point is calculated in the following manner:

$$EG_{\text{Export, metering point}} = G_{R,\text{ metering point}} \times EG_{\text{Total Export, metering point}} \quad \text{(c)}$$

Where,

$EG_{\text{Export, metering point}}$: Export, kWh by the WTG at the metering point

$G_{R,\text{ metering point}}$: Generation Ratio at metering point

$EG_{\text{Total Export, metering point}}$: Total Export, kWh by all the WTGs at the metering point

The net electricity exported by the WTG at the 33 kV/220 kV level metering point is calculated by subtracting equation (b) from (c).

Thus, the net electricity exported at 33 kV/220 kV level metering point:

$$= EG_{\text{Export, metering point}} - EG_{\text{Import, metering point}} \quad \text{(d)}$$

Transmission Loss Calculation:

The total transmission loss occurred during export of the electricity between the 33/220 kV level pooling station & 220 kV level common delivery point is calculated as the difference between total aggregated reading of export for all metering points at 33/220 kV level and the total reading of export for same metering points recorded at the 220 kV level. Similarly transmission loss occurred during import of the electricity is also calculated.

The PP/WTG wise transmission loss during export & import is calculated by multiplying the values of arrived transmission loss for export & import for wind farm with the Generation Ratio at common delivery point.

Generation Ratio at common delivery point:

It is the ratio of electricity generated by installed WTG to the total generation by all the connected WTGs/ or connected metering points under common delivery point.

$$G_{R,\text{ Common Delivery Point}} = EG_{\text{Controller, WTG}} / EG_{\text{Controller, Common Delivery Point}} \quad \text{(e)}$$

Where,

$G_{R,\text{ Common Delivery Point}}$: EG Controller, Common Delivery Point
$EG_{\text{Controller, WTG}}$: Electricity generated by installed WTG
$EG_{\text{Controller, Common Delivery Point}}$: Total generation by all the connected WTGs/ or connected metering points under common delivery point

Calculation of net electricity delivered to the Grid:

The values of transmission loss during export & import for the given WTG are subtracting from $EG_{\text{Export, metering point}}$ & $EG_{\text{Import, metering point}}$ respectively to get the values of export and import respectively for the given month.

The net electricity delivered to the Grid by the given WTG for the given month (net export kWh) is then obtained by subtracting import from export.
Thus,

= Export – Import (f)

These apportioned values viz., import, export and net export kWh can be referred from the Monthly Break up of net export units report.

Monitoring Plan at Maharashtra State

For Maharashtra Site – Following section includes –

1. Monitoring Methods and Procedures

2. QA/QC procedures

3. Data uncertainties and adjustments

For WTG in the project activity, the MSEDCL would report net electricity exported and imported from the grid. The net electricity supplied to the grid would be reported as the difference between the net export and import from the WTG. The electricity export and import data will be monitored via main and check meters connected to feeders at the respective sub-station. Multiple WTGs would be connected to each feeder, one of which would be part of the project activity (WTGs owned by Rajasthan Gum Private Limited) and rest of which would not be part of the project activity (WTGs owned by other entities). MSEDCL follows an apportioning procedure to account for electricity generation from individual WTGs based on data from individual WTG controllers. The electricity exported and imported from the grid is recorded on a monthly basis, jointly in the presence of Investor representatives (O&M Contractors) and MSEDCL personnel. Following the joint meter readings, the O&M Contractors provide the readings of the WTG controller to MSEDCL. Based on the monthly export and import data as per main/check meters and the WTG controller readings, MSEDCL provides a break-up of the electricity exported and imported for each WTG.

The net electricity generation from each WTG is determined by MSEDCL as follows:

$$\text{Export from WTG} = \frac{\text{Generation at WTG controller}}{\text{Total generation at all WTG controllers for the feeder}} \times \text{Export from MSEDCL main/check meter}$$

$$\text{Import from WTG} = \frac{\text{Generation at WTG controller}}{\text{Total generation at all WTG controllers for the feeder}} \times \text{Import from MSEDCL main/check meter}$$

The above calculations would be carried out solely by MSEDCL and only the final apportioned electricity export, import, and net export for each WTG would be reported by MSEDCL in the Credit Notes. The details of the joint meter readings are not reported in the credit notes issued by MSEDCL.

A monthly joint meter reading of the energy meters would be carried out by MSEDCL officials and O&M contractors (representatives of the project promoter).

Procedures to deal with Data Uncertainty

Main and check meters for the project activity are of at least 0.2 accuracy class. Accuracy tests will be carried out at least once every year to ensure that the meters are working within their accuracy class. In addition to this, on a monthly basis main meter and check meter readings would be noted by representatives of the project promoter. To check that both meters are working within their accuracy class, the electricity export measured by the main meter and the electricity export measured by the check meter would be compared. If the difference between the two values is greater than 0.2% (sum of accuracy class of the two meters), it would be established that one or both of the meters is giving erroneous readings. In such a scenario, MSEDCL would be notified and requested to check the accuracy of both the main and check meter. The erroneous meter(s) would be identified and calibrated or replaced. The following actions would be carried out for determination of emission reductions:

- By default main meter readings are considered in the credit notes and for emission reduction calculations. If the main meter is found to be erroneous, the check meter readings would be used in the credit notes and for emission reduction calculations. The main meter would be calibrated or replaced with a new calibrated energy meter.
- If the check meter is found to be erroneous, the main meter readings would by default be considered. The check meter would be calibrated or replaced with a new calibrated energy meter.
- If both meters are found to be erroneous, and then emission reductions will be adjusted in a conservative manner to account for the error percentage reported for the respective period. Both energy meters would be calibrated or replaced with new calibrated energy meters.

Difference between Accuracy Tests and Calibration

Accuracy tests will be conducted by MSEDCL personnel on the main and check energy meters at least once every year. The accuracy tests will be carried out using a standard portable meter to verify that the error percentage in the main and check meters is within the permissible limit. Calibration is conducted by MSEDCL personnel in case the error in the main or check meter is found to be beyond the permissible limit. In such a scenario, the erroneous meter may be replaced with a new calibrated energy meter.

Description of calibration of WTG Controller

The controller used for the WTGs which is an SCS Controller is a micro-processor based intelligent controller which has been specially designed for control of wind turbines. It uses a Woodward Multi function Relay that has three current inputs from CT and three direct voltage inputs (690 Volts). The analog values of current / voltage is converted into digital signal internally using A/D Converters at very high sampling rate. A software program reads these values and displays instantaneous parameters such as voltage, current, power factor, kVAh, kVArh and kWh. These instantaneous values are then time integrated and displayed / stored. Woodward relay is having no display and needs special protocol to view energy readings as this relay is communicating digital signal through special communication protocol. Moreover, turbine cannot run without this relay hence it cannot be removed for calibration, hence, it is not possible to calibrate.

B.7.4. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

31/05/2014 is the date of completion of study on application of the selected methodology (AMS I.D - version 17.0). Further, the standardized baseline is not applicable for this project activity.

Ms. Rucha Natu Consultant- EKI Energy Services Limited is the entity responsible for the application of the selected methodology. Project participant for this project activity as indicated in Appendix 1 below.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

Start date of the project activity is the Letter of Intent date of Rajasthan Gum Private Limited- 15.05.2012. (The First Letter of Intent date among all WTG's)

C.1.2. Expected operational lifetime of project activity

20 Years 00 Months

C.2. Crediting period of project activity

C.2.1. Type of crediting period

Renewable crediting period of 7 years 00 Months have been opted for the project activity. This is the first crediting period of the project activity.

C.2.2. Start date of crediting period

20/07/2014 or Date of submission of complete request for registration by the DOE whichever is later.

C.2.3. Length of crediting period

07 Years 00 Months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

Proposed project activity is using renewable energy generation technology which is free from any kind of anthropogenic emission. Project activity is not having any negative environmental impact. Only small amounts of oily and solid wastes associated with the installation of the WTG can be ignored when compared to Emission reductions. Project activity will result into GHGs emission reduction equivalent to 24, 923 t CO_2/year.

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

impact assessment studies[17]. As the wind power generation projects are not listed in any of the categories of the schedule, it does not require Environmental Impact Assessment.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

The followings are the local stakeholders for the project activity:

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

All the stakeholders have been invited through submission of the invitation letter (delivered in hand) to attend the stakeholders meeting.

In the introductory speech, Mr. Binu C. Verghese, (email: benbinuvarghese@gmail.com), along with other representatives of EKI Energy Services Limited welcomed the gathering and informed the stakeholders about the project activity; project's associated benefits with respect to CO_2 emission reductions and explained the purpose of conducting the stakeholder meeting in order to gather the views and comments of the local stakeholders on the project activity. Subsequent to the introductory speech, comments were received from the stakeholders.

The Minutes of meeting with comment sheet from Local Stakeholders & Invitation letter receipt copy has been submitted to the DOE:-

Name of Project Investor	Invitation Date	Meeting Date	Location of the LSM	
			Site	State
Rajasthan Gum Private Limited	24.08.2012	15.09.2012	Jath	Maharashtra
	24.08.2012	12.09.2012	Kaladunger	Rajasthan

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 through 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. Report on consideration of comments received

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

SECTION F. Approval and authorization

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

The letter of approval from the party involved in the project activity is not available at the time of submitting the PDD to the validating DOE.

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☒ Project participant ☒ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	EKI Energy Services Limited.
Street/P.O. Box	Maharani Road
Building	325- Block C, Prem trade Centre
City	Indore
State/Region	Madhya Pradesh
Postcode	452 007
Country	INDIA
Telephone	0731-3220581
Fax	0731-4289086
E-mail	business@enkingint.org
Website	www.enkingint.org
Contact person	Mr. Manish Dabkara
Title	Director
Salutation	Mr.
Last name	Dabkara
Middle name	-
First name	Manish
Department	CDM Services Dept.
Mobile	+91-9907534900
Direct fax	+91-0731-4289086
Direct tel.	+91-0731-4289086
Personal e-mail	manish@enkingint.org

Appendix 2. Affirmation regarding public funding

No public funding for this project activity was received from annex 1 parties.

Appendix 3. Applicability of methodology and standardized baseline

Please refer section B of the PDD for the same.

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

From CO2database of CEA, Version 08 published by Government of India, Ministry of Power Central Electricity Authority, Government of India.

CENTRAL ELECTRICITY AUTHORITY: CO2 BASELINE DATABASE	
VERSION	8
DATE	January'13
BASELINE METHODOLOGY	ACM0002 / Ver 12.2.0 and "Tool to Calculate the Emission Factor for an Electricity System", Version 04.0

Net Generation in Operating Margin (GWH) (incl. Imports)			
	2009-10	2010-11	2011-12
NEWNE	462,327.095	476,986.721	502,300.383

	Simple Operating Margin (tCO2/MWh) (incl. Imports) (1) (2)		
	2009-10	2010-11	2011-12
NEWNE	0.9777	0.9707	0.9688

	Weighted Generation Operating Margin
NEWNE	**0.9723**

	Build Margin (tCO2/MWh) (not adjusted for imports)		
	2009-10	2010-11	2011-12
NEWNE	0.8123	0.8590	**0.9164**

	Combined Margin Emission Factor
NEWNE	**0.9583**

Appendix 5. Further background information on monitoring plan

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

Appendix 6. Summary of post registration changes

Not applicable.