**PROJECT DESIGN DOCUMENT FORM
FOR SMALL-SCALE CDM PROJECT ACTIVITIES (F-CDM-SSC-PDD)
Version 04.1**

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Bundled wind power project at Satara, Maharashtra
Version number of the PDD	02
Completion date of the PDD	27/02/2014
Project participant(s)	Sahyadri Industries Limited
Host Party(ies)	India
Sectoral scope(s) and selected methodology(ies)	Sectoral Scope : 01 Project Type : Energy Industries (renewable/non-renewable) Project Category : I.D – Grid connected renewable electricity generation (Version 17: EB 61)
Estimated amount of annual average GHG emission reductions	21481 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Description of the project activity

Sahyadri Industries Limited also known as the "Swastik" group is an established industrial group popularly recognised in the Building Material Industry, has been manufacturing Fibre cement products, building materials and engineering goods over three decades. The group is developed its in house technology of setting up fibre cement product manufacturing plant and has successfully erected 4 consecutive plants. Its products are well accepted across several states in the Indian market.

The group using the technology supplied by M/s Enercon India Ltd India, forays into renewable energy generation with the installation of 6 wind mills each having a capacity of 0.8 MW. Further, Patel individuals (7 members) have also installed 8 wind mills each having a capacity of 0.8 MW thereby totalling to 11.2 MW capacity wind bundle in the state of Maharashtra. The technical details of the WTGs have been discussed in further detail in the subsequent sections of the Project Design Document (PDD).

Objective:

The main objective of the project activity is to generate electrical energy through sustainable means using wind power resources and thereby contribute to climate change mitigation efforts. The electricity generated would be injected to the NEWNE grid and sold to third party or the Grid. The project is not availing any REC or GBI benefits. In the absence of the project activity, the electricity thus supplied would have been generated by GHG intensive fossil fuel based thermal power plants. The project activity also contributes to sustainable social and economic well being along with conservation of environment through use of wind as a renewable source.

WTG Loc no	Date of commissioning	Electricity sale
Sahyadri (Loc nos 71,79,80,81,84)	10th September 2011	To MSEDCL
Sahyadri (Loc no: 86)	30th September 2011	To MSEDCL
CP Patel (Loc no:92)	28th February 2012	To MSEDCL
JP Patel (Loc no:76)	3rd July 2012	To MSEDCL
JV Patel (Loc no:131)	17th February 2011	To third party till March 2012; To MSEDCL thereafter
PL Patel (Loc no:91)	30th September 2011	To MSEDCL
SV Patel (Loc no:132)	17th February 2011	To third party till March 2012; to MSEDCL thereafter
VV Patel (Loc no:90)	30th September 2011	To MSEDCL
VL Patel (Loc no:133)	17th February 2011	To third party till March 2012; to MSEDCL thereafter
VL Patel (Loc nos:135)	30th September 2010	To third party till March 2012; to MSEDCL thereafter

Scenario prior to implementation of the project activity or baseline:

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".

Sustainable development criteria

According to the National CDM Authority (NCDMA), which is the Designated National Authority (DNA) for the Government of India (GoI) in the Ministry of Environment and Forests (MoEF), the contribution of this project towards sustainable development should be demonstrated by considering the following criteria:

- *Social well being*
- *Economic well being*
- *Environmental well being*
- *Technological well being*

Social Well-being

- The project will add to the total power generated in the state thereby curtailing the deficit power situation in the country and the state.
- The project activity will lead to conservation of coal
- The project leads to infrastructure development of the area.
- It provides employment opportunities to local people

Economic Well-being

- The project activity also leads to diversification of the national energy supply, which is dominated by conventional fossil fuel based generating units.

Environmental Well-being

- **Mitigation of GHG emissions:** The project will utilize wind energy for generating electricity which otherwise would have been generated through alternate fuels (most likely - fossil fuel) based power plants, contributing to reduction in specific emissions (emissions of pollutant) including GHG emissions.
- **Resource Conservation:** Being a renewable resource, using wind energy to generate electricity contributes to resource conservation. Thus the project causes no negative impact on the surrounding environment contributing to environmental well-being.

Technological Well-being

- Generation of power using wind turbine generators will motivate other proponents in the surrounding area to invest in renewable energy technologies.

Thus, it is ensured that the project activity meets all the criteria for Sustainable development.

A.2. Location of project activity

A.2.1. Host Party(ies)

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India

A.2.2. Region/State/Province etc.

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Maharashtra

A.2.3. City/Town/Community etc.

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As below

A.2.4. Physical/ Geographical location

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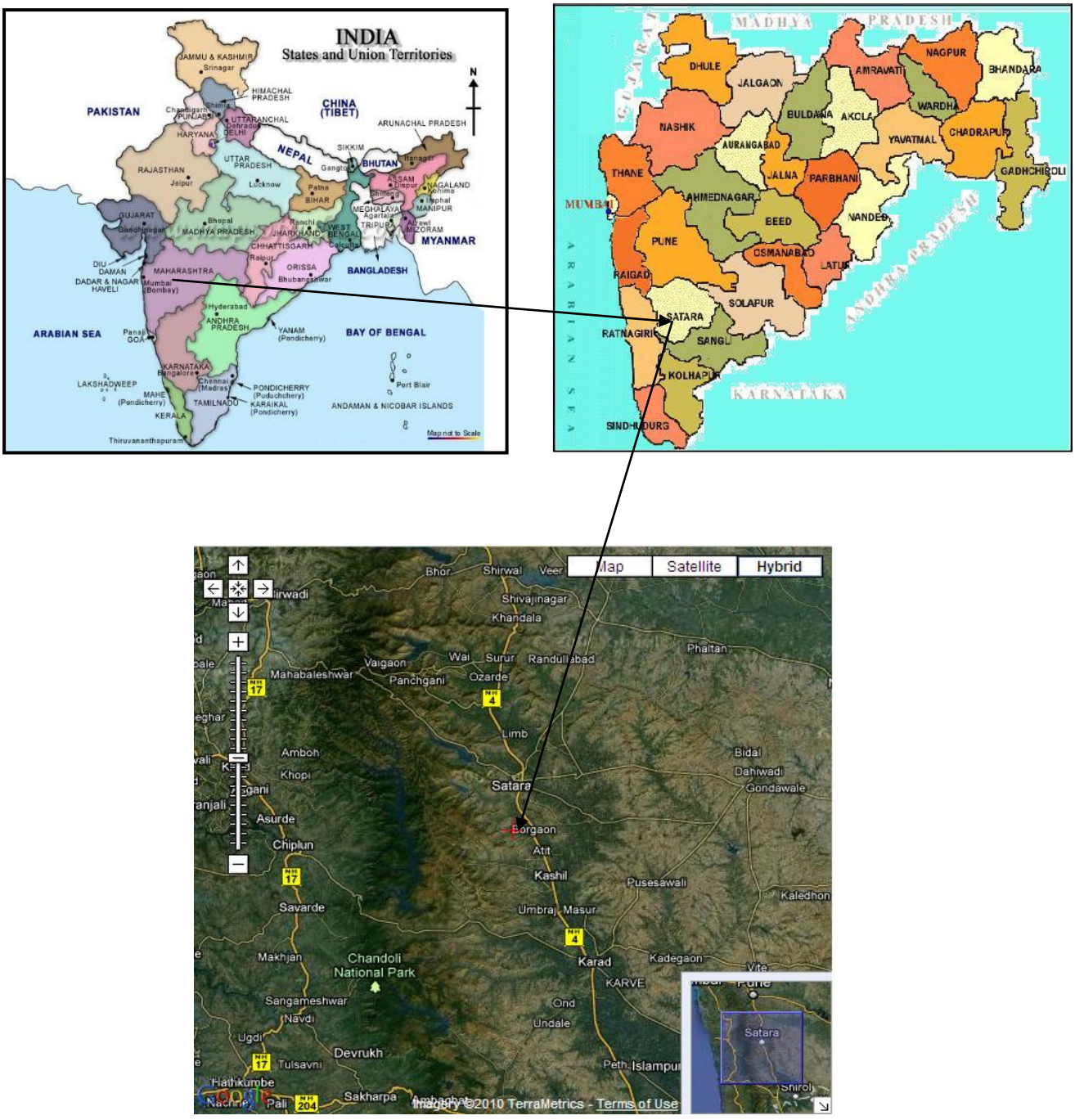
Loc no	Investor	Location	GPS coordinates
71	Sahyadri	Village –Asangaon Taluk- Koregaon District- Satara State- Maharashtra	N 17 51'33.1'' E 74 4' 28.6''
79	Sahyadri	Village – Rautwadi Taluk- Koregaon District- Satara State- Maharashtra	N 17 51'55.9'' E 74 03' 59''
80	Sahyadri	Village – Rautwadi Taluk- Koregaon District- Satara State- Maharashtra	N 17 51' 59.4'' E 74 03'56.5''
81	Sahyadri	Village – Rautwadi Taluk- Koregaon District- Satara State- Maharashtra	N 17 52' 2.9'' E 74 03' 53.6''
84	Sahyadri	Village – Rautwadi Taluk- Koregaon District- Satara State- Maharashtra	N 17 52' 14.7'' E 74 03'46.8''
86	Sahyadri	Village – Rautwadi Taluk- Koregaon District- Satara State- Maharashtra	N 17 52' 17'' E 74 03' 24.6''
92	CP Patel	Village – Lagadwadi/ Rautwadi Taluk- Wai/ Koregaon District- Satara State- Maharashtra	N 17 52'36.9'' E 74 03'3.7''
76	JP Patel	Village – Asangaon Taluk- Koregaon District- Satara State- Maharashtra	N 17 51'50'' E 74 04' 13.2''
131	JV Patel	Village – Chavaneshwar Taluk- Koregaon District- Satara State- Maharashtra	N 17 56' 14.6'' E 74 0' 14.7''
91	PL Patel	Village – Rautwadi Taluk- Koregaon District- Satara State- Maharashtra	N 17 52' 33.9'' E 74 03' 7.7''
132	SV Patel	Village – Chavaneshwar Taluk- Koregaon District- Satara State- Maharashtra	N 17 56' 17.8'' E 74 0' 11.4''
90	VV Patel	Village – Rautwadi Taluk- Koregaon District- Satara State- Maharashtra	N 17 52' 29.7'' E 74 03' 10.5''
133	VL Patel	Village – Chavaneshwar Taluk- Koregaon District- Satara State- Maharashtra	N 17 56' 21.3'' E 74 0' 8.2''
135	VL Patel	Village – Chavaneshwar Taluk- Koregaon District- Satara State- Maharashtra	N 17 56' 33'' E 74 0' 36.5''



A.3. Technologies and/or measures

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Type & Category

As per Appendix B to the simplified modalities and procedures for small scale CDM project activities, the maximum output capacity for a project activity to be considered as small scale CDM project activity should be less than 15 MW. The capacity of the proposed project is 11.2 MW, which is less than the maximum qualifying capacity. The project activity utilizes the wind potential for power generation and exports the generated electricity to the grid. Hence, the project activity falls under the following category:

Sectoral Scope	**:** 1	Energy industries (Renewable / Non Renewable sources)
Type	**:** I	Renewable Energy Projects
Category	**:** "D"	Grid connected renewable electricity generation
Version	: 17.0	

Technology

In wind energy generation, kinetic energy of the wind is converted into mechanical energy and subsequently into electrical energy. Wind turbines capture the wind's energy with three propeller-like blades, which are mounted on a rotor, to generate electricity. The turbines are located on high towers, taking advantage of the stronger and less turbulent wind. As the wind blows through the blades of the windmill, a pocket of low-pressure air forms on the downwind side of the blade. The low-pressure air pocket then pulls the blade towards it, causing the rotor to spin. The rotor turns the shaft that further spins the connected generator. The spinning of this generator produces the required electricity.

The project activity involves the installation of 11 X 0.8 MW Wind Turbine Generators (WTGs) – Type E-53 by M/s Enercon India Ltd. The WTGs have a hub height of 74m and rotor diameter of 53m. The technical details of the WTG are given in the table below:

E_53_0.8 MW

Parameter	Specification
Rated Power	800 kW
Rotor diameter	53 m
Hub Height	74 m
Turbine Type	Direct driven, upwind, horizontal axis wind turbine with variable rotor speed.
Power Regulation	Independent pitch system for each blade.
No. of blades	3
Rated rotational speed	29 rpm
Blade Material	Glass Fibre reinforced Epoxy
Generator type	Synchronous Generator

A.4. Parties and project participants

Party involved (host) indicates a 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	Sahyadri Industries Limited (A private entity)	No

A.5. Public funding of project activity

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No public funds utilized to implement the project activity.

A.6. Debundling for project activity

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According to Appendix C of simplified modalities and procedures for small-scale CDM project activities, '***debundling'*** is defined as the fragmentation of a large project activity into smaller parts. A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities.

According to Paragraph 2 of Appendix C[1], a proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

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

According to above-mentioned points of de-bundling, project activity is not a part of any of the above. It is demonstrated below.

For individual investors, this is the first wind project. For Sahyadri industries, there are only two other CDM wind projects with capacities 4.8 MW and 7.2 MW respectively. The 4.8 MW wind project is located in Rajasthan and Tamilnadu; whereas the 7.2 MW wind project is located in different villages namely Solashi, Mohodekarwadi, Randullabad and Wahagaon in Maharashtra. The closest distance between WTG (Loc no 135) included in the proposed project activity and a WTG (Loc no 145) included in the 7.2 MW wind project is more than 1 km. And no other WTG lies within one kilometre from each other.

Therefore the small scale CDM project activity is not a debundled project activity.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

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Title: Grid connected renewable electricity generation

Reference: The project activity meets the eligibility criteria to use the simplified modalities and procedure for small-scale CDM project activities as set out in paragraph 6 I of decision 17/CP.7. Details of methodology for baseline calculations for CDM projects of capacity less than 15 MW are available in the "Appendix B of the simplified modalities and procedure for small scale CDM project activities".

Methodology: AMS I. D Grid Connected Renewable Electricity Generation
(Version 17, EB 61)
Type I : Renewable Energy Project (Small Scale)
Category : I. "D", Grid Connected Renewable Electricity Generation

Reference has been taken from indicative simplified baseline and monitoring methodologies for selected small scale (CDM projects less than 15 MW) project activity categories.

Tool referred with above methodology is – Version 04, EB 75, Annex 15 of "Tool to calculate the emission factor for an electricity system"

[1] Appendix C to the simplified M&P for the small-scale CDM project activities, http://cdm.unfccc.int/Projects/pac/howto/SmallScalePA/sscdebund.pdf

B.2. Project activity eligibility

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Requirements with respect to technology/measure under AMS I. D. – Grid connected renewable electricity generation (Version 17, EB 61)

Technology/measure	Justification
1. This methodology comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal and renewable biomass, that (a) supply electricity to a national or a regional grid. Or (b) Supply electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The project activity is a wind power project, where the electricity generated will be exported to the NEWNE grid. This electricity expected to be generated from the project activity would have otherwise been generated from power plants connected to the fossil fuel intensive grid. Thus, the project activity comprises of renewable generation unit and displaces fossil fuel based grid electricity. Condition 1a is thus satisfied.
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 Table 2.	As per Table 2 of AMS-I.D, Project supplies electricity to a national/regional grid are allowed to apply AMS-I.D methodology. As discussed earlier, the project activity is a wind power project, where the electricity generated will be exported to the NEWNE grid. Hence justified.
3. This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project proponent does not own any existing power generation equipment at the project site. The proposed project activity is a Greenfield project activity and therefore, the applicability condition is met.
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.	As the proposed project activity does not involve the installation of a hydro power plant, this applicability condition is not relevant.
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	The project activity does not have a non-renewable component. Moreover, the capacity of the project activity does not exceed the eligibility limit of 15MW.

of 15 MW.	
6. Combined heat and power (co-generation) systems are not eligible under this category.	The project activity is not a cogeneration unit and hence this condition is not applicable.
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 a new project activity and does not involve the addition of renewable energy generation units at an existing renewable power generation facility. Therefore, this condition is not applicable.
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.	The project activity does not seek to retrofit an existing facility. Therefore, this applicability condition is also not applicable to the project activity under consideration..

The project activity is installation of 11.2 MW wind power generation project and there would not be any change in the capacity of the project during its crediting period. Since the project generates and exports renewable electricity to the grid system and the capacity of the project activity is well below the qualifying limit of 15 MW. Hence the choice of project Type and category I.D (Version 17, EB 61) is justified.

B.3. Project boundary

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As per Paragraph 9 of SSC methodology AMS I.D. (Version 17), the project boundary is defined as "The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system[2] that the CDM project power plant is connected to. Accordingly, the project boundary is shown below:

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

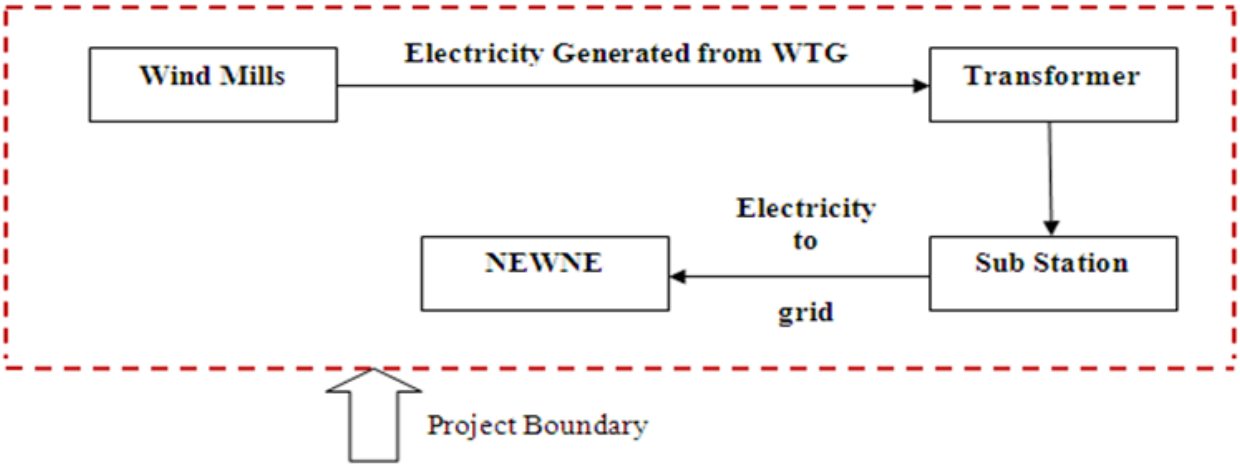

Figure. 03: Project Boundary

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

Source	Gas	Included	Justification / explanation

[2] Refer to the latest approved version of the "Tool to calculate the emission factor for an electricity system" for definition of an electricity system.

(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

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As per Version 17 of AMS-I.D. *Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories*, the baseline is determined as follows.

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.

Therefore, as per paragraphs 10 & 11 of SSC methodology AMS I.D (Version 17), the baseline emissions are calculated as per the electrical energy baseline produced by the renewable generating unit multiplied by an emission factor that must be computed in a transparent & 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 kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

The Central Electricity Authority (CEA) has published CO_2 baseline database in its version 8.0 (January 2013). The values for OM, BM, and CM are given excluding and including imports. For the present project activity, including imports are considered.

The present project activity is located in the state of Maharashtra, which falls within the network of the NEWNE grid (Integrated Electricity system). The power generated from the project activity will be exported to the Western Grid, which is a part of the integrated grid system, i.e. the NEWNE Grid, as per the "CO_2 Baseline Database for Indian Power Sector", Version 8, January 2013, by Central Electricity Authority (CEA), Government of India.

Therefore, as per the methodology, the baseline emission and the emission reduction from project activity are estimated based on the quantum of electricity to be exported by the project activity to the grid and the Emission Factor (EF) of the NEWNE grid for the project activity. The Combined Margin (CM) Emission Factor has been calculated as the combination of Operating Margin (OM) and Build Margin (BM) emission factors with the weight age value of 0.75 and 0.25 respectively. To calculate the emission factor, the "CO_2 Baseline Database of Indian Power Sector", version 08, January 2013, which is based on the "Tool to calculate the emission factor for an electricity system" and published by Central electricity Authority (CEA), Government of India has been used.

The project activity does not result in any direct or indirect emission of greenhouse gases, or any leakages outside the project boundary.

B.5. Demonstration of additionality

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The project activity meets the eligibility criteria to use simplified modalities and procedure for small-scale CDM project activities as set out in paragraph 6 (c) of decision 17/CP.7.

As per the decision 17/CP.7 Para 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.
Further referring to guidelines on the demonstration of additionality of small scale project activities EB 68 version 9.0, project participants shall provide a qualitative explanation to show that the project activity would not have occurred anyway due to at least one of the following listed barrier(s) ;

a) Investment Barrier
b) Technological Barrier
c) Barrier due to prevailing practice
d) Other Barriers

National Policies relevant to the project activity

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

The Electricity Act 2003:

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 utilisation of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy. Generation of electricity using wind is not mandated by any National and/or Sectoral regulation. Also, use of conventional fossil fuels like coal is being promoted by the Ministry of Power to achieve the capacity addition targets set in the tenth and eleventh five year plans for the country. This is primarily because the country has large coal reserves. These reserves in the country provide a ready and economical resource and ensure energy security for India. Hence, coal has been identified as the mainstay fuel for power generation till 2012[3].

The act also empowered the State Electricity Commissions to specify the terms and conditions for the determination of tariffs in their respective states.

Investment Analysis

The project activity involves generation of electricity using wind which would be exported to the grid. Since the project activity involves generation of income through sale of electricity to the grid, an investment analysis has been chosen as the appropriate method to demonstrate the financial viability of the project. The benchmark approach has been applied for this purpose and the project proponent has conducted financial analysis taking the equity IRR as the financial indicator to prove additionality.

As per the Guidance on the Assessment of Investment Analysis, "In general a minimum period of 10 years and a maximum of 20 years will be appropriate for considering the period of assessment". Hence a period

[3] www.**powermin**.**nic**.in/whats_new/pdf/Ministerial_Forum_at_the_20th_World_Energy.pdf

of assessment of 20 years has been chosen for analysis. The project proponent has conducted financial analysis taking the equity IRR as the financial indicator to prove additionality.

The Equity IRR of the project has been calculated based on the key assumptions listed below:

Investor-Sahyadri 6 x 0.8 MW			
Description	**Value**	**Units**	**Source**
Capacity Per WTG	0.80	MW	Technology Specifications
No. Of Machines	6	Units	
Total Capacity	4.80	MW	Calculated
Gross Units Generated per year	16.00	Lakh Units/Machine/Yr	Proposal from Enercon
Net Saleable Units	16.00	Lakh Units/Machine/Yr	Calculated
Total Saleable Units	96	Lakh Units/Yr	Calculated
PLF	22.83%		Calculated
Other Parameters			
Per unit sale price for power	3.50	INR/unit	Proposal (3.50 with escalation of 0.15 till 13th yr)
O&M charges	33.00	INR lakhs	Assumed based on Proposal (from 4th Year)
Escalation in O&M	5.00%		Proposal from Enercon
O&M Service Tax	10.30%		Assumed based on data observed in previous projects
Depreciation (Companies Act)	5.28%		Indian Companies Act
Depreciation (IT Act)	80.00%		Indian IT Act
Interest rate on LT debt	11.00%		Bank sanction
Corporate Tax Rate	33.22%		Indian IT Act
Minimum Alternate Tax (MAT) Rate	19.93%		Indian IT Act
Debt & Equity			
Debt Contribution	75%		Bank sanction
Equity Contribution	25%		Bank sanction
Total Project Cost	2766	INR lakhs	Calculated
Debt Contribution	2075	INR lakhs	Calculated
Equity Contribution	692	INR lakhs	Calculated
Moratorium	1	Years	Assumed
Actual Loan Repayment Period	7	Years	Assumed
Emission Reductions			
Net Saleable energy	9,600	MWh	Calculated
Emission Factor of NEWNE Grid	0.959	tCO2/MWh	CEA Database Ver 8.0
Baseline Emissions	9,206	tCO2/Yr	Calculated
Project Emissions	0	tCO2/Yr	Calculated
Leakage Emissions	0	tCO2/Yr	Calculated
Emission Reductions	9,206	tCO2/Yr	Calculated
Price Per CER	12	Euro	Assumed
INR:Euro (Exchange Rate)	60	INR/Euro	Assumed

Investor- CP Patel 1x 0.8 MW			
Description	**Value**	**Units**	**Source**
Capacity Per WTG	0.80	MW	Technology Specifications
No. Of Machines	1	Units	
Total Capacity	0.80	MW	Calculated
Gross Units Generated per year	16.00	Lakh Units/Machine/Yr	Proposal from Enercon
Net Saleable Units	16.00	Lakh Units/Machine/Yr	Calculated
Total Saleable Units	16	Lakh Units/Yr	Calculated
PLF	22.83%		Calculated
Other Parameters			
Per unit sale price for power	3.50	INR/unit	Proposal (3.50 with escalation of 0.15 till 13th yr)
O&M charges	5.50	INR lakhs	Assumed based on proposal (from 4th Year)
Escalation in O&M	5.00%		Proposal from Enercon
O&M Service Tax	10.30%		Assumed based on data observed in previous projects
Depreciation (Companies Act)	5.28%		Indian Companies Act
Depreciation (IT Act)	80.00%		Indian IT Act
Interest rate on LT debt	11.00%		Bank sanction
Corporate Tax Rate	30.90%		Indian IT Act
Debt & Equity			
Debt Contribution	75%		Bank sanction
Equity Contribution	25%		Bank sanction
Total Project Cost	461	INR lakhs	Calculated
Debt Contribution	346	INR lakhs	Calculated
Equity Contribution	115	INR lakhs	Calculated
Moratorium	1	Years	Assumed
Actual Loan Repayment Period	7	Years	Assumed
Emission Reductions			
Net Saleable energy	1,600	MWh	Calculated
Emission Factor of NEWNE Grid	0.959	tCO2/MWh	CEA Database Ver 8.0
Baseline Emissions	1,534	tCO2/Yr	Calculated
Project Emissions	0	tCO2/Yr	Calculated
Leakage Emissions	0	tCO2/Yr	Calculated
Emission Reductions	1,534	tCO2/Yr	Calculated
Price Per CER	12	Euro	Assumed
INR:Euro (Exchange Rate)	60	INR/Euro	Assumed

Investor- JP Patel 1x 0.8 MW			
Description	**Value**	**Units**	**Source**
Capacity Per WTG	0.80	MW	Technology Specifications
No. Of Machines	1	Units	
Total Capacity	0.80	MW	Calculated
Gross Units Generated per year	16.00	Lakh Units/Machine/Yr	Proposal from Enercon
Net Saleable Units	16.00	Lakh Units/Machine/Yr	Calculated
Total Saleable Units	16	Lakh Units/Yr	Calculated
PLF	22.83%		Calculated
Other Parameters			
Per unit sale price for power	3.50	INR/unit	Proposal (3.50 with escalation of 0.15 till 13th yr)
O&M charges	5.50	INR lakhs	Assumed based on proposal (from 4th Year)
Escalation in O&M	5.00%		Proposal from Enercon
O&M Service Tax	10.30%		Assumed based on data observed in previous projects
Depreciation (Companies Act)	5.28%		Indian Companies Act
Depreciation (IT Act)	80.00%		Indian IT Act
Interest rate on LT debt	11.00%		Bank sanction
Corporate Tax Rate	30.90%		Indian IT Act
Minimum Alternate Tax (MAT) Rate	0.00%		Indian IT Act
Debt & Equity			
Debt Contribution	75%		Bank sanction
Equity Contribution	25%		Bank sanction
Total Project Cost	461	INR lakhs	Calculated
Debt Contribution	346	INR lakhs	Calculated
Equity Contribution	115	INR lakhs	Calculated
Moratorium	1	Years	Assumed
Actual Loan Repayment Period	7	Years	Assumed
Emission Reductions			
Net Saleable energy	1,600	MWh	Calculated
Emission Factor of NEWNE Grid	0.959	tCO2/MWh	CEA Database Ver 8.0
Baseline Emissions	1,534	tCO2/Yr	Calculated
Project Emissions	0	tCO2/Yr	Calculated
Leakage Emissions	0	tCO2/Yr	Calculated
Emission Reductions	1,534	tCO2/Yr	Calculated
Price Per CER	12	Euro	Assumed
INR:Euro (Exchange Rate)	60	INR/Euro	Assumed

Investor- JV Patel 1 x 0.8 MW			
Description	**Value**	**Units**	**Source**
Capacity Per WTG	0.80	MW	Technology Specifications
No. Of Machines	1	Units	
Total Capacity	0.80	MW	Calculated
Gross Units Generated per year	16.00	Lakh Units/Machine/Yr	Proposal from Enercon
Net Saleable Units	16.00	Lakh Units/Machine/Yr	Calculated
Total Saleable Units	16	Lakh Units/Yr	Calculated
PLF	22.83%		Calculated
Other Parameters			
Per unit sale price for power	3.50	INR/unit	Proposal (3.50 with escalation of 0.15 till 13th yr)
O&M charges	5.50	INR lakhs	Assumed based on proposal (from 4th Year)
Escalation in O&M	5.00%		Proposal from Enercon
O&M Service Tax	10.30%		Assumed based on data observed in previous projects
Depreciation (Companies Act)	5.28%		Indian Companies Act
Depreciation (IT Act)	80.00%		Indian IT Act
Interest rate on LT debt	11.00%		Bank sanction
Corporate Tax Rate	30.90%		Indian IT Act
Minimum Alternate Tax (MAT) Rate	0.00%		Indian IT Act
Debt & Equity			
Debt Contribution	75%		Bank sanction
Equity Contribution	25%		Bank sanction
Total Project Cost	461	INR lakhs	Calculated
Debt Contribution	346	INR lakhs	Calculated
Equity Contribution	115	INR lakhs	Calculated
Moratorium	1	Years	Assumed
Actual Loan Repayment Period	7	Years	Assumed
Emission Reductions			
Net Saleable energy	1,600	MWh	Calculated
Emission Factor of NEWNE Grid	0.959	tCO2/MWh	CEA Database Ver 8.0
Baseline Emissions	1,534	tCO2/Yr	Calculated
Project Emissions	0	tCO2/Yr	Calculated
Leakage Emissions	0	tCO2/Yr	Calculated
Emission Reductions	1,534	tCO2/Yr	Calculated
Price Per CER	12	Euro	Assumed
INR:Euro (Exchange Rate)	60	INR/Euro	Assumed

Investor- PL Patel 1 x 0.8 MW			
Description	**Value**	**Units**	**Source**
Capacity Per WTG	0.80	MW	Technology Specifications
No. Of Machines	1	Units	
Total Capacity	0.80	MW	Calculated
Gross Units Generated per year	16.00	Lakh Units/Machine/Yr	Proposal from Enercon
Net Saleable Units	16.00	Lakh Units/Machine/Yr	Calculated
Total Saleable Units	16	Lakh Units/Yr	Calculated
PLF	22.83%		Calculated
Other Parameters			
Per unit sale price for power	3.50	INR/unit	Proposal (3.50 with escalation of 0.15 till 13th yr)
O&M charges	5.50	INR lakhs	Assumed based on proposal (from 4th Year)
Escalation in O&M	5.00%		Proposal from Enercon
O&M Service Tax	10.30%		Assumed based on data observed in previous projects
Depreciation (Companies Act)	5.28%		Indian Companies Act
Depreciation (IT Act)	80.00%		Indian IT Act
Interest rate on LT debt	11.00%		Bank sanction
Corporate Tax Rate	30.90%		Indian IT Act
Minimum Alternate Tax (MAT) Rate	0.00%		Indian IT Act
Debt & Equity			
Debt Contribution	75%		Bank sanction
Equity Contribution	25%		Bank sanction
Total Project Cost	461	INR lakhs	Calculated
Debt Contribution	346	INR lakhs	Calculated
Equity Contribution	115	INR lakhs	Calculated
Moratorium	1	Years	Assumed
Actual Loan Repayment Period	7	Years	Assumed
Emission Reductions			
Net Saleable energy	1,600	MWh	Calculated
Emission Factor of NEWNE Grid	0.959	tCO2/MWh	CEA Database Ver 8.0
Baseline Emissions	1,534	tCO2/Yr	Calculated
Project Emissions	0	tCO2/Yr	Calculated
Leakage Emissions	0	tCO2/Yr	Calculated
Emission Reductions	1,534	tCO2/Yr	Calculated
Price Per CER	12	Euro	Assumed
INR:Euro (Exchange Rate)	60	INR/Euro	Assumed

Investor- S V Patel 1 x 0.8 MW			
Description	**Value**	**Units**	**Source**
Capacity Per WTG	0.80	MW	Technology Specifications
No. Of Machines	1	Units	
Total Capacity	0.80	MW	Calculated
Gross Units Generated per year	16.00	Lakh Units/Machine/Yr	Proposal from Enercon
Net Saleable Units	16.00	Lakh Units/Machine/Yr	Calculated
Total Saleable Units	16	Lakh Units/Yr	Calculated
PLF	22.83%		Calculated
Other Parameters			
Per unit sale price for power	3.50	INR/unit	Proposal (3.50 with escalation of 0.15 till 13th yr)
O&M charges	5.50	INR lakhs	Assumed based on proposal (from 4th Year)
Escalation in O&M	5.00%		Proposal from Enercon
O&M Service Tax	10.30%		Assumed based on data observed in previous projects
Depreciation (Companies Act)	5.28%		Indian Companies Act
Depreciation (IT Act)	80.00%		Indian IT Act
Interest rate on LT debt	11.00%		Bank sanction
Corporate Tax Rate	30.90%		Indian IT Act
Minimum Alternate Tax (MAT) Rate	0.00%		Indian IT Act
Debt & Equity			
Debt Contribution	75%		Bank sanction
Equity Contribution	25%		Bank sanction
Total Project Cost	461	INR lakhs	Calculated
Debt Contribution	346	INR lakhs	Calculated
Equity Contribution	115	INR lakhs	Calculated
Moratorium	1	Years	Assumed
Actual Loan Repayment Period	7	Years	Assumed
Emission Reductions			
Net Saleable energy	1,600	MWh	Calculated
Emission Factor of NEWNE Grid	0.959	tCO2/MWh	CEA Database Ver 8.0
Baseline Emissions	1,534	tCO2/Yr	Calculated
Project Emissions	0	tCO2/Yr	Calculated
Leakage Emissions	0	tCO2/Yr	Calculated
Emission Reductions	1,534	tCO2/Yr	Calculated
Price Per CER	12	Euro	Assumed
INR:Euro (Exchange Rate)	60	INR/Euro	Assumed

Investor-VV Patel 1 x 0.8 MW			
Description	**Value**	**Units**	**Source**
Capacity Per WTG	0.80	MW	Technology Specifications
No. Of Machines	1	Units	
Total Capacity	0.80	MW	Calculated
Gross Units Generated per year	16.00	Lakh Units/Machine/Yr	Proposal from Enercon
Net Saleable Units	16.00	Lakh Units/Machine/Yr	Calculated
Total Saleable Units	16	Lakh Units/Yr	Calculated
PLF	22.83%		Calculated
Other Parameters			
Per unit sale price for power	3.50	INR/unit	Proposal (3.50 with escalation of 0.15 till 13th yr)
O&M charges	5.50	INR lakhs	Assumed based on proposal (from 4th Year)
Escalation in O&M	5.00%		Proposal from Enercon
O&M Service Tax	10.30%		Assumed based on data observed in previous projects
Depreciation (Companies Act)	5.28%		Indian Companies Act
Depreciation (IT Act)	80.00%		Indian IT Act
Interest rate on LT debt	11.00%		Bank sanction
Corporate Tax Rate	30.90%		Indian IT Act
Minimum Alternate Tax (MAT) Rate	0.00%		Indian IT Act
Debt & Equity			
Debt Contribution	75%		Bank sanction
Equity Contribution	25%		Bank sanction
Total Project Cost	461	INR lakhs	Calculated
Debt Contribution	346	INR lakhs	Calculated
Equity Contribution	115	INR lakhs	Calculated
Moratorium	1	Years	Assumed
Actual Loan Repayment Period	7	Years	Assumed
Emission Reductions			
Net Saleable energy	1,600	MWh	Calculated
Emission Factor of NEWNE Grid	0.959	tCO2/MWh	CEA Database Ver 8.0
Baseline Emissions	1,534	tCO2/Yr	Calculated
Project Emissions	0	tCO2/Yr	Calculated
Leakage Emissions	0	tCO2/Yr	Calculated
Emission Reductions	1,534	tCO2/Yr	Calculated
Price Per CER	12	Euro	Assumed
INR:Euro (Exchange Rate)	60	INR/Euro	Assumed

Investor-VL Patel 2 x 0.8 MW			
Description	**Value**	**Units**	**Source**
Capacity Per WTG	0.80	MW	Technology Specifications
No. Of Machines	2	Units	
Total Capacity	1.60	MW	Calculated
Gross Units Generated per year	16.00	Lakh Units/Machine/Yr	Proposal from Enercon
Net Saleable Units	16.00	Lakh Units/Machine/Yr	Calculated
Total Saleable Units	32	Lakh Units/Yr	Calculated
PLF	22.83%		Calculated
Other Parameters			
Per unit sale price for power	3.50	INR/unit	Proposal (3.50 with escalation of 0.15 till 13th yr)
O&M charges	11.00	INR lakhs	Assumed based on proposal (from 4th Year)
Escalation in O&M	5.00%		Proposal from Enercon
O&M Service Tax	10.30%		Assumed based on data observed in previous projects
Depreciation (Companies Act)	5.28%		Indian Companies Act
Depreciation (IT Act)	80.00%		Indian IT Act
Interest rate on LT debt	11.00%		Bank sanction
Corporate Tax Rate	30.90%		Indian IT Act
Minimum Alternate Tax (MAT) Rate	0.00%		Indian IT Act
Debt & Equity			
Debt Contribution	75%		Bank sanction
Equity Contribution	25%		Bank sanction
Total Project Cost	922	INR lakhs	Calculated
Debt Contribution	692	INR lakhs	Calculated
Equity Contribution	231	INR lakhs	Calculated
Moratorium	1	Years	Assumed
Actual Loan Repayment Period	7	Years	Assumed
Emission Reductions			
Net Saleable energy	3,200	MWh	Calculated
Emission Factor of NEWNE Grid	0.959	tCO2/MWh	CEA Database Ver 8.0
Baseline Emissions	3,068	tCO2/Yr	Calculated
Project Emissions	0	tCO2/Yr	Calculated
Leakage Emissions	0	tCO2/Yr	Calculated
Emission Reductions	3,068	tCO2/Yr	Calculated
Price Per CER	12	Euro	Assumed
INR:Euro (Exchange Rate)	60	INR/Euro	Assumed

Based on the above, the following IRR values for the different sub-projects were arrived as summarized:

Sub projects	Post Tax Equity IRR without CDM (Financial indicator)
Sahyadri WTGs (6 WTGs)	9.49%
Patel individuals (each)	11.76%

Selection of Benchmark

Real cost of equity = 11.75 % (as per Investment analysis guidelines)
Inflation = 5% (RBI report) (available at the time of investment decision)
http://www.rbi.org.in/scripts/PublicationsView.aspx?id=12291

Nominal cost of equity = 16.75% for all subprojects in project activity

Sensitivity Analysis

The project proponents have also conducted the sensitivity analysis for the project activity. As per the "Guidance on the Assessment of Investment Analysis":

"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 (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and

the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets."

Hence only power generation or PLF, Tariff, Capital cost and O&M charges are included in the sensitivity analysis.

As per the above guidance, the sensitivity analysis has been carried out with respect to the following parameters:

1. Generation
2. Tariff
3. Capital Cost
4. O&M charges

Sahaydri 6 x 0.8 MW

Sensitivity Analysis (±10%)	(+10%)	(-10%)
Power Generation	12.19%	6.74%
Project cost	7.10%	12.45%
Tariff Escalation	11.80%	7.14%
O&M charges	9.25%	9.73%

Patel individuals

Sensitivity Analysis (±10%)	(+10%)	(-10%)
Power Generation	14.99%	8.59%
Project cost	9.13%	15.08%
Tariff Escalation	14.53%	9.06%
O&M charges	11.50%	12.02%

Conclusion:

The sensitivity analysis demonstrates that the project returns do not meet the benchmark rate of return at any scenarios. Hence additional.

Since the project is not generating enough returns, it may be difficult in maintaining repayment obligations. In view of the above risks, the cash flow expected to be generated through CDM funds are critical for improving the Equity IRR and making the project financially viable. Thus, the project proponent has considered CDM funds before taking the decision to set up the wind power plant. From the above analysis it can be witnessed that the project activity is not financially viable without CDM funds. Therefore, the project is additional.

The project proponent has seriously considered CDM funds for the project activity. The project implementation schedule and the CDM schedule have been undertaken in parallel. The same has been demonstrated in the table below:

Schedule	
Event/ Decision	**Date**
Technical offer	23/04/2010
Investment decision made by project proponents to set up Wind power project with CDM funds	15/05/2010 & 10/05/2010
Appointment of Sahyadri Industries Limited as focal point	10/05/2010
Placement of purchase order for WTG	17/05/2010& 11/05/2010

Stakeholder consultation meeting held for CDM project activity	12/06/2010
Intimating UNFCCC/DNA about CDM consideration for the project	23/10/2010
Approach DOEs for validation services	During October 2010
Agreement with previous DOE	15/12/2010
First webhosting	09/03/2011 to 07/04/2011
HCA	18/12/2012
Current Webhosting	03/01/2014

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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The emission reductions for the project activity will be calculated using the following formula as mentioned in AMS I.D. – Version 17

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

Where,
ER_y is the Emission reductions during the year y
BE_y is the Baseline emissions during the year y
PE_y is the Project emissions during the year y
LE_y is the Leakage emissions during the year y

Baseline emissions:

Method of calculation of combined margin emission factor: "Tool to calculate the emission factor for an electricity system", Version 04.

The combined margin calculations estimate the baseline emission factor for grid. It consists of a combination of operation margin (OM) and build margin (BM) factors obtained from publication issued by Central Electricity Authority (CEA) of India- CO_2 Baseline Database for the Indian Power Sector, Version 08, published during January 2013.

Calculation of the Baseline Emission Factor

As per version 4.0 of Tool to calculate emission factor for an electricity system, following steps are included in the calculation of the emission factor for the baseline scenario:

STEP 1: Identify the relevant electricity systems.
STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional).
STEP 3: Select a method to determine the operating margin (OM).
STEP 4: Calculate the operating margin emission factor according to the selected method.
STEP 5: Calculate the build margin (BM) emission factor
STEP 6: Calculate the combined margin (CM) emissions factor.

The Central Electricity Authority (CEA) has published CO_2 baseline database in its version 8.0. The values for OM, BM, CM are given excluding and including imports. For the present project activity, including imports are considered.

Step 1: Identifying the relevant electricity system

Grid/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 (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

The Southern grid and the NEWNE Grid form the two independent regional grids of India. As the project activity comprises the project activity located in the state of Himachal Pradesh , the NEWNE grid is applicable to the proposed CDM project.

Each state in a regional grid meets its own demand with its own generation facilities and also with allocation from power plants owned by the central sector. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The volume of the net transfers between the regions in India is relatively small and electricity is largely produced and consumed within the same states. Consequently, it is appropriate to assume that the impacts of the project activity will be confined to the regional gird in which it is located. Hence for the purpose of estimation of the baseline emission factor, the NEWNE grid has been chosen as the relevant electricity system.

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

Off-grid power plants have not been included in the project electricity system

Step 3: Selection of an Operating Margin method

The project proponent wishes to use the Simple Operating Margin (OM) method for the estimation of the baseline. The use of the Simple OM method is justified as the share of the low cost/ run resources constitute less than 50% of the total grid generation.

The data pertaining to the total grid generation and the low/cost must run resources have been included in Annex 3.

The data pertaining to the total grid generation and the low/cost must run resources have been included here.

	2006-07	2007-08	2008-09	2009-10	2010-11
NEWNE	18.5%	19.0%	17.4%	15.9%	17.6%
South	28.3%	27.1%	22.8%	20.6%	21.0%
India	20.9%	21.0%	18.7%	17.1%	18.4%

Note: As per the above information, it can be clearly established that the share of the low cost/ run resources constitute to less than 50% of the total grid generation.

With regards to data vintage, the project participant wishes to use the ex-ante option.

Step 4: Calculation of the OM according to the Simple OM method (ex ante)

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2e/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units.

The data provided by the Central Electricity Authority (CEA), an official data source has been relied upon for the calculation of the OM. The latest version of the database, Version 8 has been used. The OM

calculations have been based upon generation data, fuel consumption and the Gross Calorific value (GCV) of the fuel.

Option A has been chosen for calculating Operating Margin emission factor for the project. OM has been determined based on fuel consumption and net efficiency generation of each power plant/ unit, since fuel consumption data for each power plant/ unit is available.

Assumptions

The following assumptions have been made in case of unavailability of data at station level:

Net generation: In case of stations where only gross generation is available, CEA standard values for auxiliary consumption have been applied to calculate the net generation data.

GCV: Default GCV values for some thermal power stations have been used for cases where station specific data was unavailable.

The following assumptions have been in case of unavailability of data at unit level:
Net generation: The data is not monitored at a unit level and hence the following assumptions have been made:

1. The auxiliary consumption (in % of gross generation) of the unit was assumed to be equal to that of the respective stations in the following cases:
   - All units of a station fall into the build margin; or
   - All units of a station have the same installed capacity; or
   - The units in the station have different capacities but do not differ with respect the applicable standard auxiliary consumption.

2. In all other cases, standard values for auxiliary consumption adopted by CEA were applied.

Fuel consumption and GCV: Fuel consumption and GCV are generally not measured at unit level. Instead, the specific CO_2 emissions of the relevant units were directly calculated based on heat rates.

Calculation Approach

The Simple OM has been calculated using the following formula:

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}\right)}{EG_y}$$

Where:

$EF_{grid, OM\ simple, y}$ Simple operating margin CO_2 emission factor in year *y* (tCO_2e/MWh)
$FC_{i, y}$ Amount of fossil fuel type *i* consumed in the project electricity system 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* (tCO_2e/GJ)
EG_y Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year *y* (MWh)
I All fossil fuel types combusted in power sources in the project electricity system in year *y*
y The relevant year as per the data vintage chosen in Step 3

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

	2009-10	2010-2011	2011-2012	Average
NEWNE	0.98	0.97	0.97	0.9733

Source: CEA version 8.0 User guide

Step 5: Calculate the build margin emission factor (ex ante)

The build margin emissions factor is the generation-weighted average emission factor (tCO_2e/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 (tCO_2e/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_2e/MWh)
m	Power units included in the build margin
y	Most recent historical year for which power generation data is available

Build Margin (tCO_2/MWh) (not adjusted for imports)

	2011-2012
NEWNE	0.92

Source: CEA version 8.0 User guide

Step 6: Calculation of the combined Build Margin emission factor

The combined margin emission factor will be calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where,

$EF_{grid, BM, y}$	= Build margin CO_2 emission factor in year y (tCO_2e/MWh)
$EF_{grid, OM, y}$	= Operating margin CO_2 emission factor in year y (tCO_2e/MWh)
w_{OM}	= Weightage of operating margin emissions factor (%)
w_{BM}	= Weightage of build margin emissions factor (%)

As per the 'Tool to calculate the Emission Factor for an electricity system' version 04, the default values for w_{OM} and w_{BM} are taken as 0.75 and 0.25 respectively as per the guidance provided for wind project activities for the first crediting period and subsequent crediting periods.

Hence, the Baseline Emission Factor is calculated using the formula stated below:

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

Hence, the Baseline Emission Factor is calculated as below:
For the NEWNE grid:
$EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}$
= 0.75 x 0.9733 + 0.25 x 0.92
= 0.959 tCO_2/MWh (rounded off)

Thus for ex-ante emission reduction calculations, the baseline emission factor for the NEWNE grid = 0.959 tCO_2/MWh.

Baseline Emissions

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

BE_y : Baseline Emissions in year *y*; t CO_2
$EG_{BL, y}$: Energy baseline in year *y*; kWh
$EF_{CO2,grid,y}$: Emission Factor in year y; t CO_2e/kWh for the grid (combined margin incl imports)

Project Emissions
As per AMS I.D (Version 17), the project emissions are zero.
Therefore,
PE_y = 0 tCO_2e

Leakage Emissions
As per AMS I.D. (Version 17), and leakage emissions are to be taken into account ***"****If the energy generating equipment is transferred from another activity, leakage is to be considered.* Since transfer of equipment is not envisaged in the project activity, the leakage emissions will be equal to zero. Therefore,
LE_y = 0 tCO_2e

Emission Reductions
As per AMS I.D (Version 17), the emission reductions are calculated as follows:
$ER_y = BE_y – PE_y - LE_y$
Where:

ER_y	Emission reductions in year *y* (t CO2e/y).
BE_y	Baseline emissions in year y; t CO_2
PE_y	Project emissions in year *y* (t CO2/y).
LE_y	Leakage emissions in year *y* (t CO2/y).

B.6.2. Data and parameters fixed ex ante
(Copy this table for each piece of data and parameter.)

Data / Parameter	Operating Margin emission factor
Unit	tCO_2/ MWh
Description	CO_2 Operating Margin emission factor for the NEWNE region grid (Three years average-2009-2010, 2010-2011, 2011-2012)
Source of data	CO_2 Baseline Database for the Indian Power Sector, User Guide (Version 8,
Value(s) applied	0.9733
Choice of data or Measurement methods and procedures	The Central Electricity Authority of India prepares the data
Purpose of data	For the calculation of grid emission factor for estimating the baseline emissions
Additional comment	This database is an official publication of Government of India for the purpose of CDM baseline. It is based on most recent data available to the Central Electricity Authority and hence considered authentic. As the calculation of baseline emission has been done *ex ante* its value will remain fixed for the entire crediting period.

Data / Parameter	Build Margin emission factor
Unit	tCO_2/ MWh
Description	CO_2 Build Margin emission factor for the NEWNE region grid 2011-2012
Source of data	CO_2 Baseline Database for the Indian Power Sector, User Guide (Version 8)
Value(s) applied	0.92
Choice of data or Measurement methods and procedures	The Central Electricity Authority of India prepares the data.
Purpose of data	For the calculation of grid emission factor
Additional comment	This database is an official publication of Government of India for the purpose of CDM baselines. It is based on most recent data available to the Central Electricity Authority and hence considered authentic. As the calculation of baseline emission has been done *ex ante* its value will remain fixed for the first crediting period

Data / Parameter	$EF_{CO2,grid,y}$
Unit	tCO_2 / MWh
Description	$EF_{CO2,grid,y}$ is the grid Emission Coefficient calculated in a transparent and conservative manner as Combined Margin (CM) which is the combination of Operation Margin (OM) and Build Margin (BM) (OM & BM have been calculated ex-ante)
Source of data	Grid emission factor calculation: $EF_{CO2,grid,y}$ = $0.75 \times EF_{OM,y} + 0.25 \times EF_{BM,y}$ = $0.75 \times 0.9733 + 0.25 \times 0.92$ = 0.959 tCO_2/MWh Values of OM and BM are taken from CEA User Guide, CO_2 Baseline Database for the Indian Power Sector, Version 08.
Value(s) applied	0.959
Choice of data or Measurement methods and procedures	The $EF_{CO2,grid,y}$ calculation is based on the guidelines in emission tool.
Purpose of data	For the calculation of emission reductions from the project activity.
Additional comment	The calculation is done *ex ante*.

B.6.3. Ex-ante calculation of emission reductions

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As described in the section above, the total emission reduction achieved in a year would be $ER_y = BE_y$

Where,

ER_y = Emission reductions for the year for which ER_y is being calculated in tCO_2e

BE_y = Baseline emissions for the year for which BE_y is being calculated in tCO_2e

Baseline emissions:

The baseline emissions are calculated based on the given formula:

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

The capacity of the project activity power plant is 7.2 MW

Assuming a plant load factor of 16 Lakh units/ WTG/year the total electricity generated from the plant can be calculated as: (as per EB 48 Annex 11)

$EG_{EXP,y}$ = 14 WTGs x 16 Lakh units/ WTG/ year x 10^5 units/1 Lakh units x 1 MWh/10^3 units

= 22400 MWh/year (1 Lakh units = 10^5 units; 1 MWh = 10^3 units; 1 unit = 1kWh)

$EG_{IMP,y}$ = 0

Since the project activity does not involve any auxiliary consumption of electricity, the total electricity generated will be exported to the grid.

$EG_{BL,y}$ = 22400 - 0 = 22400 MWh/year

BE_y = 22400 MWh/ year x 0.959 tCO_2 /MWh

= 21481 tCO_2 /year (rounded off)

Therefore, emission reductions from the project activity are:

$ER_y = BE_y = 21481$ **tCO_2 /year**

B.6.4. Summary of ex-ante estimates of emission reductions

Year	Baseline emissions (tCO_2 e)	Project emissions (tCO_2 e)	Leakage (tCO_2 e)	Emission reductions (tCO_2 e)
2014-15	21481	0	0	21481
2015-16	21481	0	0	21481
2016-17	21481	0	0	21481
2017-18	21481	0	0	21481
2018-19	21481	0	0	21481
2019-20	21481	0	0	21481
2020-21	21481	0	0	21481
Total	150367	0	0	150367
Total number of crediting years	7			
Annual average over the crediting period	21481	0	0	21481

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

(Copy this table for each data and parameter.)

Data / Parameter	$EG_{BL, y}$
Unit	MWh/yr.
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y. This is calculated figure and will be used in ER calculation.
Source of data	Calculated based on Joint Meter Reading Sheets and generation reports issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) for all the feeders to which WTGs of the project activity are connected.
Value(s) applied	22400 MWh/year. The value will be checked with invoices.
Measurement methods and procedures	Net electricity supplied will be calculated as the difference of electricity exported to and imported from the grid measure using the readings taken at the main/check meter installed at the interconnection point. $EG_{facility,y} = EG_{export,y} - EG_{import,y}$ Joint Meter Reading Sheets and generation report issued by Maharashtra State Electricity Distribution Co. Ltd. on a monthly basis shall be used for this purpose. Apportioning procedure for deriving net electricity generated by the project activity has been explained in the section B.7.2 of the PDD.
Monitoring frequency	Monthly recording
QA/QC procedures	The value of this parameter can be cross checked with all the invoices generated for the sold electricity during the year y. The meters shall be calibrated on a regular basis as per norms mentioned in the PPA. The calibration is usually done by MSEDCL or electrical inspector every year.
Purpose of data	For calculation of emission reductions
Additional comment	The data would be archived for the entire crediting period +2 years.

Data / Parameter	$EG_{EXP, y}$
Unit	MWh/year
Description	Quantity of electricity exported by the Project to the grid in year y
Source of data	Joint Meter Reading Sheets and generation reports issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) for all the feeders to which WTGs of the project activity are connected. EG export, y will be summation of readings of individual Joint Meter Reading Sheets. $EG_{EXP, y}$ is also accounted for transmission losses (if any)
Value(s) applied	**22400**
Measurement methods and procedures	Meters with accuracy class of 0.2 s at the metering point (Main Meter) are installed. Check meter with separate CT/PT of class 0.2s also installed. Quantity of electricity exported by the Project to the grid would be calculated using the sum of readings taken at the main/check meter installed at the interconnection points. Data monitoring would take place at the substation on a continuous basis and will be recorded on at least monthly basis. On the basis of these readings taken, a generation report would also be issued by MSEDCL.
Monitoring frequency	Continuous monitoring and monthly recording
QA/QC procedures	The value of this parameter can be cross checked with all the invoices generated for the sold electricity during the year y. The meters shall be calibrated on a regular basis as per norms mentioned in the PPA. The calibration is usually done by MSEDCL or electrical inspector every year.
Purpose of data	For calculation of emission reductions
Additional comment	The data would be archived for the entire crediting period +2 years.

Data / Parameter	$EG_{IMP, y}$
Unit	MWh/ year
Description	Quantity of electricity imported by the Project to the grid in year y
Source of data	Joint Meter Reading Sheets and generation reports issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) for all the feeders to which WTGs of the project activity are connected. EGimport,y will be summation of readings of individual Joint Meter Reading Sheets.
Value(s) applied	**0**
Measurement methods and procedures	Meters with accuracy class of 0.2 s at the metering point (Main Meter) are installed. Check meter with separate CT/PT of class 0.2s also installed. Quantity of electricity exported by the Project to the grid would be calculated using the sum of readings taken at the main/check meter installed at the interconnection points. Data monitoring would take place at the substation on a continuous basis and will be recorded on at least monthly basis. On the basis of these readings taken, a generation report would also be issued by MSEDCL.
Monitoring frequency	Continuous monitoring and monthly recording
QA/QC procedures	The value of this parameter can be cross checked with all the invoices generated for the sold electricity during the year y. The meters shall be calibrated on a regular basis as per norms mentioned in the PPA. The calibration is usually done by MSEDCL or electrical inspector every year
Purpose of data	For calculation of emission reductions
Additional comment	The data would be archived for the entire crediting period +2 years.

B.7.2. Sampling plan

>>

Not Applicable

B.7.3. Other elements of monitoring plan

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As per paragraph 22 of SSC methodology AMS I.D. (Version 17), the monitoring plan should consist of metering the net electricity supplied by the project activity to the grid. Accordingly, the following two parameters will be monitored by the project proponent on a continuous basis:

$EG_{EXP, y}$ Electricity exported by the project activity (kWh/year)
$EG_{IMP, y}$ Electricity imported from the grid (kWh/year)

The net electricity supplied by the project activity, $EGBL,_y$ is then measured/ calculated as

$$EG_{BL,y} = EG_{EXP, y} – EG_{IMP, y}$$

The operations and monitoring of WTGs performance has been outsourced to the technology supplier M/s. Enercon India Private Limited. All the WTGs at a particular site are connected & captured in a digital system located at that site. The captured data is then directly uploaded to the Customer Relationship Management (CRM) system. From the CRM, the daily generation reports are made available to Sahyadri Industries Limited on the customized website. The CRM manager is responsible for monitoring the WTGs and communicating results to Sahyadri Industries Limited. Any failure in the WTG, including in its monitoring system, will trigger the interlocking circuit will stop generation of electricity immediately.

Net Generation of each WTG @ Electricity Board (EB)

$$= \frac{\text{(Generation @ Individual WTG Meter) x (Total Net Generation @ EB)}}{\text{Total Controller Generation of WTGs connected on a feeder}}$$

Each WTG in the project activity will be equipped with an EB meter to record the amount of electricity exported. Each WTG is connected to a Central Monitoring Station, and monitored using automated computerized monitoring system. This server has a central location and is operated and maintained by M/s Enercon India Ltd.

The electricity export readings at each WTG shall be recorded by the O&M contractor (M/s Enercon India Ltd) on a daily basis by using the monitoring system at the project site. Apart from the project proponent, the O&M contractor will also be part of the CDM team who will be responsible for monitoring, recording maintenance and checking. The calibration of the monitoring equipment will be undertaken on an annual basis in accordance with the requirements of state electricity board. If any of the meters is found to be faulty, electricity board officials will replace the faulty meter and the readings for this period shall be taken from check meter or log data maintained by M/s Enercon India Ltd.

Sahyadri Industries Limited is overall responsible for storing and archiving data as well as the preparation of monitoring report and communicates with EB of UNFCCC for project performance, registration and verification of the CDM project activity.

Internal audits & Performance review
The records are regularly audited and checked by the senior officials from project proponent on an annual basis. The officials will monitor the actual emission reduction. The O&M in-charge will be responsible for taking readings at site.

Apportioning of electricity: In case dates of monitoring period do not match with the dates of Joint Meter Reading Sheets / Generation reports issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL):

Apportioning will be carried out based on ratio of generation data recorded using LCS meters installed at the WTG. The LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WTGs.
The emission reductions of that particular period (from the date of registration of the project till the end of the month) will be calculated based on percentage generation of that particular period at WTG using LCS data multiplied with the total units generated in the month as per the Joint Meter Reading Sheets / Generation report issued by Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL).
The sample calculation is furnished below:

Generation from SIL WTGs for the monitoring period = A (From LCS data)
Generation from SIL WTGs for the billing period = B (From LCS data)
Net energy exported from SIL WTGs for the billing period = C (JMR/Generation share report by MSEDCL)

Net energy export used for calculation of emission reduction for the monitoring period = (C * A / B)

Emergency Preparedness
In case of monitoring meter failure or errors, the grid officials would immediately replace the meter with a calibrated meter. There are two meters provided at each feeder: a Main Meter and a Check Meter. In case

of failure of one of the meters, generation will be calculated based on the corresponding norms (Section 11.02 [c], [d] & [e]) as laid down in the Power Purchase Agreement:

"*[c] If during testing, both the Main and Check Meter are found within the permissible limit of error i.e. 0.5%, the energy consumption will be as per the Main Meter. If during test, any of the Main Meters is found to be within the permissible limits of error but the corresponding Check Meter is beyond the permissible limit; the energy consumption will be as per the Main Meter. The Check Meter shall be calibrated immediately.*

If during the tests, the Main Meter is found to be beyond the permissible limits of error, but the corresponding Check Meter is found to be within the permissible limits of error, then the energy consumption for the month to-date and time of such test shall be in accordance with Check Meter.
The Main Meter shall be calibrated immediately and the energy for the period thereafter 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 0.5%, all the meters shall be re-tested and calibrated immediately.

[e] The correction required as per the result of the testing will be applied to the generation and consumption of energy for the period from last meter reading to the time of such test checks. Energy for the periods thereafter shall be in accordance with the calibrated Main Meter."

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

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>
11/05/2010 (Date of placement of purchase order for WTGs invested by Patel individuals)

C.1.2. Expected operational lifetime of project activity

>>
20 years 0 months[4]

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>
Renewable crediting period

C.2.2. Start date of crediting period

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[4] http://www.windmeasurementinternational.com/wind-turbines/om-turbines.php

03/04/2014 or the date of registration whichever is later.

C.2.3. Length of crediting period

>>

7 years 0 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

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The Ministry of Environment and Forests (MoEF), Government of India, under the Environment Impact Assessment Notification vide S.O. 3067 (E) dated 01/12/2009 has listed a set of industrial activities in Schedule I of the notification which for setting up new projects or modernization/ expansion will require environmental clearance and will have to conduct an Environment Impact Assessment (EIA) study. The Notification does not require wind power projects to carry out an EIA study. Therefore, an EIA is not required to be conducted by the project proponent. However, the project proponent has obtained a "No Objection Certification" from the State Electricity Board as per the requirement.

Wind energy system operations do not generate air or water emissions and do not produce hazardous waste. Nor do they deplete natural resources such as coal, oil, or gas, or cause environmental damage through resource extraction and transportation, or require significant amounts of water during operation. Wind's pollution-free electricity can help reduce the environmental damage caused by power generation. Wind energy generation being a cleaner technology will eliminate the emission of pollutants (SO_x, NO_x, PM etc.) resulting from power generation industry. Thus this would lead to an overall decrease in the Green House Gas emission.

Implementation of renewable technologies will result in reduction in demand and conservation of coal and other rapidly depleting fossil fuels. At the same time, the project will also encourage implementation of more efficient, advanced and environmentally friendly technologies in the region.

According to the Environment Impact Assessment notification vide S.O. 3067 (E) dated 01/12/2009, EIA is not required for wind power plants. However, the project has obtained the Consent for Establishment from the respective state authorities for carrying out its operation in the state of Maharashtra.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

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Sahyadri Industries Limited identified the following local stakeholders to be associated with the project activities, directly or indirectly:

1. Enercon Employees
2. Local Villagers
3. Government officials (District Magistrate, etc.)

In order to address and incorporate the concerns of the local stake-holders, Sahyadri Industries Limited sent out invitation letters to the stake-holders considerable number of days in advance. The letter contained information of the date & site of the meeting along with a clear picture of the agenda of the meeting along with a broad description of the project activity. A public notice (in Hindi, the local language and English) inviting the stakeholders to the meeting was intimated on 28th May, 2010.The venue for the stakeholder meeting held on 12th June 2010 was at Hotel Lake view, Rahimatpur Road, Godoli Naka, Satara Maharashtra. The dcouments pertaining to local stakeholder meeting are submitted for validation.

E.2. Summary of comments received

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Sahyadri Industries Limited has already received all necessary approvals / clearances / permissions from various local bodies which represent the local stakeholders. The stake holders meetings was conducted at

the venue and was attended by the office bearers and residents of the nearby villages and those employed in the project activity. The local villagers and the office bearers expressed their happiness with the setting up of an environment friendly power project in their village as it had resulted in generation of direct and indirect employment opportunities both for literate and illiterate people. Development of infrastructure in the locality was highly appreciated. The employees hired for the project activity from the local area stated that the project activity has provided them with a means of livelihood in their own village and will help them in getting equipped with technical skills.

E.3. Report on consideration of comments received

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Sahyadri Industries Limited has taken care of all the conditions stipulated in the relevant clearances and no adverse comment has been raised.

SECTION F. Approval and authorization

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Letter of approval from host party is available and submitted for validation.

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Appendix 1: Contact information of project participants

Organization	Sahyadri Industries Limited
Street/P.O. Box	J. N. Road,
Building	"Swastik House"
City	Pune
State/Region	Maharashtra
Postcode	400 037
Country	India
Telephone	+91-20 2644 4625/26/27
Fax	+91-20 2645 8888
E-mail	sujoshi@silworld.in
Website	www.silworld.in
Contact person	
Title	Director
Salutation	Mr.
Last name	Joshi
Middle name	U
First name	S
Department	
Mobile	093710 18570
Direct fax	+91-20 2645 8888
Direct tel.	+91-20 2644 4625
Personal e-mail	sujoshi@silworld.in

Appendix 2: Affirmation regarding public funding

- The project has not received any public funding and Official Development Assistance (ODA).
- The project is a unilateral project.

Appendix 3: Applicability of selected methodology

Please refer section B.1 of the PDD for the same.

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

BASELINE INFORMATION
Refer Section B.6.1 for detailed calculation of OM, BM & CM.

Appendix 5: Further background information on monitoring plan

As explained in section B.7.3

Appendix 6: Summary of post registration changes

Not Applicable

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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change history box by adding EB meeting and annex numbers in the Date column.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for small-scale CDM project activities" (EB 66, Annex 9).
03	EB 28, Annex 34 15 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.
02	EB 20, Annex 14 08 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
01	EB 07, Annex 05 21 January 2003	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		