CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Title: Roaring 40's Wind Farms (Khandke) Private Limited
Version: 6.0
Date of completion of PDD: 24/09/2010

A.2. Description of the project activity:

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Roaring 40s Wind Farms (Khandke) Private Limited ("Roaring 40s") is designed to construct a 50.4 MW wind farm in the state of Maharashtra, India. The project was envisaged to be developed in three phases that are due to be implemented in June 2007, November 2007 and December 2007. Therefore the project activity was initially webhosted on 7-June-2007 with the full project capacity of 50.4 MW. However, later the project implementation schedule was revised for the second and third phase of the project activity from November 2007 and December 2007 to May 2008 and December 2008 respectively. In India DNA approval is conditional upon the submission of the nodal agency clearance. Therefore the project activity was divided into three phases so that the DNA can be secured in the phase wise manner and timely completion of the CDM registration can be achieved.

The phase-I of the project consisting of 21 machines of 800kW each amounting to 16.8 MW has been commissioned. The project generates 31.008GWh of electricity per year which shall be supplied to Western regional electricity grid. The wind farms in phase-II and phase-III are proposed to be commissioned subsequently. The project activity of Phase-I has been considered for CDM under this project design document.

The phase-II and Phase-III having capacity of 19.2 MW and 14.4 MW shall be presented as separate CDM projects. The project activity will assist the sustainable growth of Maharashtra state by providing clean and green electricity to the state electricity grid. In line with decision to split the project in three PDDs (one for each phase), the DNA approval was also filed accordingly and secured for each of the three phases (one for each phase).

Objective of the Project

The objective is development, design, engineering, procurement, finance, construction, operation and maintenance of the project activity, 16.8 MW phase-I wind power project ("Project") in the Indian state of Maharashtra to provide reliable, renewable power to the Maharashtra state electricity grid which is part of the Western regional electricity grid. The Project will lead to reduced greenhouse gas emissions because it displaces electricity from fossil fuel based electricity generation plants.

Nature of Project

The Project harnesses renewable resources in the region, and thereby displacing non-renewable natural resources thereby ultimately leading to sustainable economic and environmental development. Enercon (India) Limited ("Enercon") will be the equipment supplier and the operations and maintenance contractor for the Project. The Project is owned by Roaring 40s and Enercon is having the responsibility of operation and maintenance of the wind farm. The generated electricity will be supplied to

Maharashtra State Electricity Distribution Company Limited ("MSEDCL") under a long-term power purchase agreement (PPA) for 13 years.

Contribution to Greenhouse Gas Emissions Reduction

The National CDM Authority (NCDNA) which is the Designated National Authority (DNA) for the Government of India (GoI) in the Ministry of Environment and Forests (MoEF) has stipulated four indicators for sustainable development in the interim approval guidelines for Clean Development Mechanism (CDM) projects from India[1]. The contribution of this project activity towards in terms of these four indicators is provided below:

1. **Social well being:**

- The project activity has led to the development of supporting infrastructure such as road network etc., in the wind park location, which also provides access to the local population.
- The project activity leads to alleviation of poverty by establishing direct and indirect benefits through employment generation and improved economic activities by strengthening of local grid of the state electricity utility.
- Use of a renewable source of energy reduces the dependence on imported fossil fuels and associated price variation thereby leading increased energy security.

2. **Environmental well being:**

- the project activity involves use of renewable energy source for electricity generation instead of fossil fuel based electricity generation which would have emitted gaseous, liquid and/or solid effluents/wastes.
- 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.

3. **Economic well being:**

- the project activity requires temporary and permanent, skilled and semi-skilled manpower at the wind park; this will create additional employment opportunities.
- The generated electricity will be fed into the western regional grid through local grid, thereby improving the grid frequency and availability of electricity to the local consumers (villagers & sub-urban habitants) which will provide new opportunities for industries and economic activities to be setup in the area thereby resulting in greater local employment, ultimately leading to overall development.

4. **Technological well being:**

- Increased interest in wind energy projects will further push R&D efforts by technology providers to develop more efficient and better machinery in future.

[1] http://cdmindia.nic.in/host_approval_criteria.htm

A.3. Project participants:

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Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of India (Host)	Roaring 40s Wind Farms (Khandke) Private Limited	No

The contact details of the entities are provided in Annex – 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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India

A.4.1.2. Region/State/Province etc.:

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Western Region/Maharashtra State

A.4.1.3. City/Town/Community etc:

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The Project is spread across Ranjani, Ratadgaon, Agadgaon and Bardari villages in Khandke Taluk of Ahmednagar District of Maharashtra state in India.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

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Details of physical location of project activities are as follows:

Project Name	Total No. of WEC	Project Capacity (MW)	Name of Village	WEG Location No.	Feeder No	Date of Commissioning	Longitude	Latitude	Unique Identification of WECs
Roaring 40s Wind Farms (Khandke)	21	16.8	Ranjani	83	02	27-Jun-07	N19 10 19.7	E74 54 21.2	R 40s K-01
				84		27-Jun-07	N19 10 14.8	E74 54 28.9	R 40s K-02
				85		27-Jun-07	N19 10 09.1	E74 54 36.2	R 40s K-03
				86		27-Jun-07	N19 10 02.9	E74 54 43.8	R 40s K-04
				87		27-Jun-07	N19 09 52.3	E74 54 36.8	R 40s K-05

Private Limited				88		27-Jun-07	N19 09 44.0	E74 54 37.6	R 40s K-06
				89		27-Jun-07	N19 10 08.5	E74 55 00.0	R 40s K-07
				90		27-Jun-07	N19 10 15.4	E74 54 56.5	R 40s K-08
				91		27-Jun-07	N19 10 23.1	E74 54 51.7	R 40s K-09
			Ratadgoan	17		30-Jun-07	N19 07 09.4	E74 49 56.1	R 40s K-10
				18	03	30-Jun-07	N19 07 19.6	E74 49 52.4	R 40s K-11
				19		30-Jun-07	N19 07 32.6	E74 49 52.5	R 40s K-12
				20		22-Aug-07	N19 07 42.1	E74 49 55.6	R 40s K-13
				112		22-Aug-07	N19 08 08.2	E74 52 19.8	R 40s K-14
				113		22-Aug-07	N19 08 00.1	E74 52 24.8	R 40s K-15
				115	02	19-Dec-07	N19 07 56.6	E74 52 08.5	R 40s K-16
			Agadgoan	92		27-Sep-07	N19 09 55.0	E74 52 56.1	R 40s K-17
				93		27-Sep-07	N19 09 48.6	E74 52 58.7	R 40s K-18
				99		1-Oct-07	N19 09 45.7	E74 52 43.1	R 40s K-19
			Bardari	15	03	12-Oct-07	N19 06 52.7	E74 49 57.7	R 40s K-20
				16		12-Oct-07	N19 06 58.9	E74 49 54.0	R 40s K-21

The project area extends between latitude 19^0, 3.5' to 19^0, 11' North and longitude 74^0, 49' to 74^0, 56' East. The Project is connected to the EIL substation (to be owned by MSETCL) at Village Mehekari (near 33kV Mehekari S/S), Ahmednagar district. The project activity is located at a distance of 120 km from Pune by road. The nearest railway station is at Pune. A location map is attached at Appendix – 1.

A.4.2. Category (ies) of project activity:

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The project activity is considered under CDM category zero-emissions **'grid-connected electricity generation from renewable sources'** that generates electricity in excess of 15 MW (limit for small scale project). Therefore as per the scope of the project activity enlisted in the 'list of sectoral scopes and related approved baseline and monitoring methodologies', the project activity may principally be categorized in **Scope Number 1, Sectoral Scope - Energy industries (renewable/ non-renewable sources).**

A.4.3. Technology to be employed by the project activity:

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The Project involves 21-wind energy converters (WECs) of Enercon make (800 kW E-48) with internal electrical lines connecting the Project with local evacuation facility. The WECs generates 3-phase power at 400V, which is stepped up to 33 KV. The Project can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V ± 12.5%. The other salient features of the state-of-art-technology are:

- Gearless Construction - Rotor & Generator Mounted on same shaft eliminating the Gearbox.
- Variable speed function – has the speed range of 18 to 33 RPM thereby ensuring optimum efficiency at all times.
- Variable Pitch functions ensuring maximum energy capture.
- Near Unity Power Factor at all times.

- Minimum drawl (less than 1% of kWh generated) of Reactive Power from the grid.
- No voltage peaks at any time.
- Operating range of the WEC with voltage fluctuation of -20 to +20%.
- Less Wear & Tear since the system eliminates mechanical brake, which are not needed due to low speed generator, which runs at maximum speed of 33 rpm and uses Air Brakes.
- Three Independent Braking Systems.
- Generator achieving rated output at only 33 rpm.
- Incorporates lightning protection system, which includes blades.
- Starts Generation of power at wind speed of 3 m/s.

Enercon has secured and facilitated the technology transfer for wind based renewable energy generation from Enercon GmbH, has established a manufacturing plant at Daman in India, where along with other components the "Synchronous Generators" using "Vacuum Impregnation" technology are manufactured.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

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The estimated emission reductions over the 10 year fixed crediting period would be 291,540 tCO2e as per details on annual emission reductions provided below:

Years	Annual estimation of emission reductions in tonnes of CO2e
*1st year	29,154
2nd year	29,154
3rd year	29,154
4th year	29,154
5th year	29,154
6th year	29,154
7th year	29,154
8th year	29,154
9th year	29,154
10th year	29,154
Total estimated reductions (tonnes of CO2e)	291,540
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	29,154

*1st year begins from the date of registration or 31/01/2010 whichever is later, and each year extends for 12 months.

A.4.5. Public funding of the project activity:

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There is no public finding involved in the Project.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

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Title: Consolidated baseline and monitoring methodology for "Grid-connected electricity generation from renewable sources"
Reference: Approved consolidated baseline methodology ACM0002 (Version 10)

ACM0002 draws upon the following tools which have been used in the PDD:

- Tool to calculate the emission factor for an electricity system – Version 01
- Tool for the demonstration and assessment of additionality – Version 5.2

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

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The Project is wind based renewable energy source, zero emission power project connected to the Maharashtra state grid, which forms part of the Western regional electricity grid. The Project will displace fossil fuel based electricity generation that would have otherwise been provided by the operation and expansion of the fossil fuel based power plants in Western regional electricity grid.

This methodology is applicable to grid-connected renewable power generation project activities under the following conditions:

- Applies to electricity capacity additions from:
  - Run-of-river hydro power plants; hydro power projects with existing reservoirs where the volume of the reservoir is not increased.
  - New hydro electric power projects with reservoirs having power densities (installed power generation capacity divided by the surface area at full reservoir level) greater than 4 W/m2.1
  - Wind sources;
  - Geothermal sources;
  - Solar sources;
  - Wave and tidal sources.
- This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available; and

The approved consolidated baseline and monitoring methodology ACM0002 Version 10 is the choice of the baseline and monitoring methodology and it is applicable because:

- the Project is grid connected renewable power generation project activity
- the Project represents electricity capacity additions from wind sources

- the Project does not involve switching from fossil fuel to renewable energy at the site of project activity since the Project is green-field electricity generation capacities from wind sources at sites where there was no electricity generation source prior to the Project, and
- the geographical and system boundaries of the Western electricity grid can be clearly identified and information on the characteristics of the grid is available.

B.3. Description of the sources and gases included in the project boundary

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	Source	Gas	Included?	Justification/Explanation
Baseline	Grid-connected electricity generation	CO_2	Yes	In the baseline scenario the electricity would have been sourced from the western grid which in turn would be connected to fossil fuel fired power plants which emit CO2.
		CH_4	No	No methane generation is expected to be emitted.
		N_2O	No	No nitrous oxide generation is expected to be emitted.
Project Activity	Greenfield wind energy conversion system	CO_2	No	The project activity does not emit any emissions.
		CH_4	No	No methane generation is expected to be emitted.
		N_2O	No	No nitrous oxide generation is expected to be emitted.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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According to ACM0002, for project activities that do not modify or retrofit an existing electricity generation facility, the baseline scenario is the following:

Electricity delivered to the grid by the project 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 below.

As the Project does not modify or retrofit an existing generation facility, the baseline scenario is the emissions generated by the operation of grid-connected power plants and by the addition of new generation sources. This is estimated using calculation of Combined Margin multiplied by electricity delivered to the grid by the Project.

Variable	**Data Source**
EG_y – Electricity generated	Records maintained by project proponents
Parameter	**Data Source**
$EF_{OM,\ y}$ = Operating Margin Emission Factor (tCO2/MWh)	CEA Data
$EF_{BM,\ y}$ = Build Margin Emission Factor (tCO2/MWh)	CEA Data
EFy – Grid Emission Factor	Calculated as the weighted average of the operating margin and build margin

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

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The project activity has been conceived as a CDM project since its inception. The bids were invited from the different suppliers in India and Enercon (India) limited was selected as the supplier for further negotiation. DPR was prepared taking to consideration the final negotiated offer of Enercon. The Roaring 40s has considered the incentive from the CDM before the start of the project activity and the evidence for the same can be verified by the validator - Resolution passed by the Board of Directors of Roaring 40s in the board meeting dated 19-March-2007 and confirmation from HSBC (lenders to the project). In addition the Project proponent has placed the order with Enercon (India) Limited dated 23 November 2007 for providing CDM consultancy up to registration of the project activity even before the start date of the project activity.

The project is financed with long term debt from HSBC at the rate of 12.50%. The project is evaluated against the interest rate offered by commercial financial institute (HSBC in this case) for purpose of additionality. The starting date of the project activity is considered as 19-April-2007, being the date of placement of purchase order for the wind energy generators.

The PDD was prepared within two month of the placement of the purchase order in the month of May and was finally web-hosted within three months for webhosting on 7-June-2007. The ACM0002 version 6 in which the PDD was initially web-hosted was outdated on 13-August-2008 and therefore PDD was again web-hosted with revised ACM0002 version 07 on 16-October-2008. The project proponent was invited by host DNA on 13-Feburary-2008 and DNA was finally released on 28-May-2008. The timeline for the activities is presented below in the table that were initiated by the project proponent before webhosting of the PDD:-

S.No.	Activity	Date
1	Board Resolution	19-Mar-07
2	Placement of Purchase order	19-Apr-07
3	Preparation of the PDD for 50.4 MW	19-April-2007 to 22-May-2007
4	Web-hosting of the PDD for 50.4 MW	7-Jun-07

As per guidelines on demonstration and assessment of prior consideration of the CDM annex 22 of EB-49, the project proponent the PP has taken continuing and real action to secure CDM status of the project activity.

The latest additionality tool i.e. Tool for the demonstration and assessment of additionality version 5.2 approved by CDM Executive Board is used to demonstrate project additionality.

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

Define realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps:

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

1. Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity.

These alternatives are to include:

- The proposed project activity undertaken without being registered as a CDM project activity;
- Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario that deliver outputs services (e.g., cement) or services (e.g. electricity, heat) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology;
- If applicable, continuation of the current situation (no project activity or other alternatives\ undertaken).

The baseline alternative for the project activity is pre-defined in ACM0002 as generation of equivalent amount of electricity by operation of grid-connected power plants and by addition of new generation sources. Accordingly, the realistic and credible alternatives to the project activity are:

(a) The Project is not undertaken as a CDM project activity.

(b) Equivalent amount of electricity being generated through operation of grid-connected power plants and addition of new generation sources

Outcome of Step 1a: Alternatives (a) and (b) above have been identified as realistic and credible alternative scenario(s) to the project activity

Sub-step 1b: Consistency with mandatory laws and regulations:

2. The alternative(s) shall be in compliance with all mandatory applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution. (This Sub-step does not consider national and local policies that do not have legally binding status.)
3. If an alternative does not comply with all mandatory applicable legislation and regulations, then show that, based on an examination of current practice in the country or region in which the law or regulation applies, those applicable legal or regulatory requirements are systematically not enforced and that non compliance with those requirements is widespread in the country. If this cannot be shown, then eliminate the alternative from further consideration;
4. If the proposed project activity is the only alternative amongst the ones considered by the project participants that is in compliance with mandatory regulations with which there is general compliance, then the proposed CDM project activity is not additional.

There are no legal and regulatory requirements that prevent Alternatives (a) and (b) from occurring.

Outcome of Step 1b: Identified realistic and credible alternative scenario(s) to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations.

Proceed to Step 2 (Investment analysis) or Step 3 (Barrier analysis). (Project participants may also select to complete both steps 2 and 3.)

Step 2: Investment Analysis

Determine whether the proposed project activity is not:

(a) The most economically or financially attractive; or

(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

To conduct the investment analysis, use the following Sub-steps:

Sub-step 2a: Determine appropriate analysis method

1. Determine whether to apply simple cost analysis, investment comparison analysis or benchmark analysis (Sub-step 2b). If the CDM project activity and the alternatives identified in Step 1 generate no financial or economic benefits other than CDM related income, then apply the simple cost analysis (Option I). Otherwise, use the investment comparison analysis (Option II) or the benchmark analysis (Option III).

Sub-step 2b: Option I. Apply simple cost analysis

2. Document the costs associated with the CDM project activity and the alternatives identified in Step 1 and demonstrate that there is at least one alternative which is less costly than the project activity.

"If it is concluded that the proposed CDM project activity is more costly than at least one alternative then proceed to Step 4 (Common practice analysis)".

Sub-step 2b: Option II. Apply investment comparison analysis

1. Identify the financial indicator, such as IRR, NPV, cost benefit ratio, or unit cost of service (e.g., levelized cost of electricity production in $/kWh or levelized cost of delivered heat in $/GJ) most suitable for the project type and decision-making context.

Sub-step 2b: Option III. Apply benchmark analysis

2. Identify the financial/economic indicator, such as IRR, most suitable for the project type and decision context.
3. When applying Option II or Option III, the financial/economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer. Only in the particular case where the project activity can be implemented by the project participant, the specific financial/economic situation of the company undertaking the project activity can be considered.
4. Discount rates and benchmarks shall be derived from:
    a. Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data;
    b. Estimates of the cost of financing and required return on capital (e.g. commercial lending rates and guarantees required for the country and the type of project activity

concerned), based on bankers views and private equity investors/funds' required return on comparable projects;

c. A company internal benchmark (weighted average capital cost of the company), only in the particular case referred to above in paragraph 5. The project developers shall demonstrate that this benchmark has been consistently used in the past, i.e. that project activities under similar conditions developed by the same company used the same benchmark;
d. Government/official approved benchmark where such benchmarks are used for investment decisions;
e. Any other indicators, if the project participants can demonstrate that the above Options are not applicable and their indicator is appropriately justified.

Option I – Simple cost analysis is not applicable as the project activity sells electricity to the Utility and obtains economic benefits in the form of electricity tariffs.

The Project Proponent proposes to use **Option III – Benchmark Analysis** and the financial indicator that are identified as the *post-tax* project IRR.

Commercial lending rate of HSBC (lender to Roaring 40s project) has been considered as the appropriate benchmark in accordance with Para 6(b) sub step 2(b) of the Additionality tool. The additionality of the project has therefore been evaluated against a benchmark of 12.5% post tax project IRR.

Sub-step 2c: Calculation and comparison of financial indicators (only applicable to Options II and III):

5. Calculate the suitable financial indicator for the proposed CDM project activity and, in the case of Option II above, for the other alternatives. Include all relevant costs (including, for example, the investment cost, the operations and maintenance costs), and revenues (excluding CER revenues, but possibly including *inter alia* subsidies/fiscal incentives, ODA, etc, where applicable), and, as appropriate, non-market cost and benefits in the case of public investors if this is standard practice for the selection of public investments in the host country.
6. Present the investment analysis in a transparent manner and provide all the relevant assumptions, preferably in the CDM-PDD, or in separate annexes to the CDM-PDD, so that a reader can reproduce the analysis and obtain the same results. Refer to all critical techno-economic parameters and assumptions (such as capital costs, fuel prices, lifetimes, and discount rate or cost of capital). Justify and/or cite assumptions in a manner that can be validated by the DOE. In calculating the financial/economic indicator, the project's risks can be included through the cash flow pattern, subject to project-specific expectations and assumptions (e.g. insurance premiums can be used in the calculation to reflect specific risk equivalents).
7. Assumptions and input data for the investment analysis shall not differ across the project activity and its alternatives, unless differences can be well substantiated.
8. Present in the CDM-PDD submitted for validation a clear comparison of the financial indicator for the proposed CDM activity and:
    a. The alternatives, if Option II (investment comparison analysis) is used. If one of the other alternatives has the best indicator (e.g. highest IRR), then the CDM project activity can not be considered as the most financially attractive;
    b. The financial benchmark, if Option III (benchmark analysis) is used. If the CDM project activity has a less favorable indicator (e.g. lower IRR) than the benchmark, then the CDM project activity cannot be considered as financially attractive.

For carrying out the investment analysis, we have used data and assumptions available from various MERC orders and other publicly available information sources.

The key assumptions used for calculating the post-tax project IRR are set out below:

Assumptions for Financial Model		**Reference**
Capacity of Machines in kW	800	
Number of Machines	21	
Project Capacity in MW	16.80	
Project Cost per MW (INR in Millions)	53.2211	Detailed Project Report/Final negotiated offer

Operations		
Plant Load Factor	21.07%	Enercon Data
Insurance Charges @ % of capital cost	0.18%	As envisaged in DPR
Operation & Maintenance Cost % of capital cost	1.20%	DPR/ Can be cross checked from actual O & M contract
% of escalation per annum on O & M Charges	5.0%	DPR/ Can be cross checked from actual O & M contract

Tariff		
Base year Tariff (2007-08) - INR./kWh	3.50	Tariff Order
Annual Escalation (INR./kWh per Year)	0.15	Tariff Order
Tariff applicable for year 13 (INR./kWh)	5.30	Tariff Order
Tariff applicable beyond year 13 (INR./kWh)	Cost+16% ROE	Calculated as per MERC assumptions

Project Cost	**Rs Million**	
WEG Components	534.45	Detailed Project Report/Final negotiated Offer
concrete section	84.00	Detailed Project Report/Final negotiated Offer
transport		Detailed Project

	21.00		Report/Final negotiated Offer Detailed Project
steel tower	23.10		Report/Final negotiated Offer Detailed Project
dp structure	10.50		Report/Final negotiated Offer Detailed Project
foundation	77.70		Report/Final negotiated Offer Detailed Project
transport	21.00		Report/Final negotiated Offer
Sub-Total	**771.75**		**Computed**
erection and commissioning	21.00		Detailed Project Report/Final negotiated Offer Detailed Project
Meda Fee		8.40	Report/Final negotiated Offer Detailed Project
land Charges		6.30	Report/Final negotiated Offer Detailed Project
MEDA Infrastructure Charges [Refundable]	44.10		Report/Final negotiated Offer
Sub-Total	**79.80**		
Other Cost	**42.56**		**As envisaged in DPR/ Cross-checked as per actual**
Total Project Cost	**894.11**		**Computed**

Means of Finance		INR Million	
Own Source	35%	313	Equity component
Term Loan	65%	581	Letter from HSBC
Total Source		**894**	
Terms of Loan			
Interest Rate	12.50%		Letter from HSBC
Tenure	11	Years	Letter from HSBC
Moratorium	6	Months	Letter from HSBC

Income Tax Depreciation Rate (Written Down Value basis)		
on Wind Energy Generators	80%	IT depreciation allowed for green field infrastructure
Book Depreciation Rate (Straight Line Method basis)		
On all assets	4.50%	Straight line Assumed
Book Depreciation up to (% of asset value)	90%	MERC Order

Income Tax		
Income Tax rate	30%	IT Act
Minimum Alternate Tax	10%	IT Act
Surcharge	10%	IT Act
Cess	3%	IT Act

The Maharashtra Electricity Regulation commission tariff order dated 24 November 2003, considered for electricity tariff for investment analysis for the project activity is still valid and applicable for all wind power projects in Maharashtra that have been commissioned after November 2003. The electricity tariff applicable for the project activity is INR 3.50/kWh with annual escalation of INR 0.15/kWh till 13th year of operation. VAT is not applicable for sale of electricity and can be verified from sales invoice raised on Maharashtra State Electricity Distribution Company Limited. Therefore electricity tariff stated in the tariff order dated 24 November 2003 is appropriate for the investment analysis.

This can also be crosschecked from actual power purchase agreement signed with the Maharashtra State Electricity Distribution Company Limited and sales invoices raised.

The post tax project IRR for the Project without CDM revenues is 8.87% i.e. less than the benchmark post tax project IRR of 12.5%.

Sub-step 2d: Sensitivity analysis (only applicable to Options II and III):

9. Include a sensitivity analysis that shows whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favour of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be the most financially/economically attractive (as per Step 2c para 11a) or is unlikely to be financially/economically attractive (as per Step 2c para 11b).

Sensitivity Analysis

The investment in wind power project shall be tested based on three parameters:

- Capital Cost
- Tariff
- Plant Load Factor
- O&M cost

Capital Cost

In accordance with the investment guidance, the additionality for the project activity is demonstrated at the time of decision making. The price is taken from the detailed project report that is based on the final negotiated offer from Enercon. The price bid was final price given by Enercon. The price given in the detailed project report can be crosschecked from the purchase order for verification. Therefore, it is considered appropriate not to conduct sensitivity on the project cost.

Tariff

Maharashtra state electricity commission has fixed the tariff for the period of 13 years. The tariff schedule for the period of 13 years is as follows.

Years (**)												
1	2	3	4	5	6	7	8	9	10	11	12	13
3.50	3.65	3.80	3.95	4.10	4.25	4.40	4.55	4.70	4.85	5.00	5.15	5.30
*** the year commences from date of commissioning*												

The tariff is subject to change at the end of the term of PPA. The tariff order states that the consumer will be eligible for the lower tariff after the debt obligation of the project is fulfilled. The excerpts from the tariff order are as follows:

"The Commission notes that in Cost Plus Approach, which the Commission has adopted for tariff proposal, rate per unit charged by such projects during initial period of 10 years is bound to be higher as during this period the project has various debt related obligations. However, it is essential that the consumer is able to enjoy the benefit of cheaper power once all debt related obligations are paid off and project has virtually no variable costs"

The sale income needed and sale income approved by the commission have a differential amount of 6.317 Million which is required to be adjusted in the latter year to keep it consistent with the fixed return provided by the commission. Therefore to arrive at the tariff that may be applied by the commission at the end of the 13th year will be computed after adjusting the surplus provided by the commission. The tariff from the 13th year onwards therefore shall be adjusted for the surplus provided by the regulator in the initial years.

On computation the average tariff after 13th year onwards based on MERC assumptions works out to be INR 1.80 per unit. On the upside if MERC does not consider adjustment of the surplus gained which is extremely unrealistic, the average tariff will be INR 2.34 per Unit. For the purpose of substantiating additionality, we have considered the base case tariff of INR 2.34 per unit which is on the higher side and very unlikely to be approved by the commission. The Project IRR with tariff of INR 2.34 per unit is 8.87% which is lower than the benchmark. Further we have also considered the fixed tariff of INR 3.50 per unit after 13th year for sensitivity analysis which is highly unlikely. The Project IRR is 9.61% with tariff of INR 3.5 per unit which is not likely to be approved by the commission.

Plant Load Factor

Plant Load Factor is the key variable encompassing variation in wind profile, variation in off-take (including grid availability) including machine downtime. The project activity is located in the district of Ahmednagar in Maharashtra. The observed historical PLF of the project activities that are operating in the district of Ahmednagar is 19.07% in 2004-05.

Maharashtra State Electricity Commission has set the 20% PLF for the state of Maharashtra. Historically, maximum observed PLF for region of Ahmednagar is 19.62%. Plant load factor for the project activity provided by Enercon India Limited is 21.07%. Sensitivity analysis of the Project IRR is therefore carried out at 23.50% (P-25 level) which is very unlikely to be achieved considering maximum of the highest observed PLF in the district of Ahmednagar, 10% increase over the PLF given by MERC in tariff order dated 23-Nov-2003 and generation estimate given by Enercon India Limited at P-25 level [Max (19.62%, 22%, 23.5%)]. The return that the project is expected to generate at PLF of 23.50 % is 10.57%, which is less than the benchmark.

Sensitivity is summarized in below table:

	Benchmark Rate	PLF @ 18.80%	PLF @ 21.07%	PLF @ 23.50%
Post tax Project IRR	12.5 %	7.16 %	8.87 %	10.57 %

The sensitivity analysis clearly shows even with a higher PLF, the project is not able to generate sufficient returns. It can therefore be concluded that the project is financially not viable without CDM benefits.

O&M Cost

The Sensitivity in O&M maintenance cost is conducted after taking to consideration +/-10% decrease in O&M Cost.

	Benchmark Rate	10% decrease in O&M cost	Base O&M Cost	10% Increase In O&M cost
Post tax Project IRR	12.5 %	9.07 %	8.87 %	8.68 %

Outcome of Step 2: If after the sensitivity analysis it is concluded that: (1) the proposed CDM project activity is unlikely to be the most financially/economically attractive (as per Step 2c para 11a) or is unlikely

to be financially/economically attractive (as per Step 2c para 11b), then proceed to Step 4 (Common practice analysis).

Step 3: Barrier analysis

Not Opted for.

Step 4: Common practice analysis

Unless the proposed project type has demonstrated to be first-of-its kind (according to Sub-step 3a), the above generic additionality tests shall be complemented with an analysis of the extent to which the proposed project type (e.g. technology or practice) has already diffused in the relevant sector and region. This test is a **credibility check** to complement the investment analysis (Step 2) or barrier analysis (Step 3). Identify and discuss the existing common practice through the following Sub-steps:

Sub-step 4a: Analyze other activities similar to the proposed project activity:

1. Provide an analysis of any other activities that are operational and that are similar to the proposed project activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc. Other CDM project activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis. Provide documented evidence and, where relevant, quantitative information. On the basis of that analysis, describe whether and to which extent similar activities have already diffused in the relevant region.

The investment decision for the project was taken in March 2007 and purchase order was placed in April 2007. At the time of investment decision the total installed wind power capacity in Maharashtra was 1,001 MW and at the time of commissioning the installed capacity in Maharashtra was 1756.38 MW. We want to submit that even at the time of commissioning our project was not part of the common practice. We present the following analysis to clarify this:

The table below presents the year wise capacity addition of wind installations in the state of Maharashtra.

S. No.	Year	Wind Project Installation (MW)
1	Up to 1992	1.10
2	During 1992-93	-
3	During 1993-94	-
4	During 1994-95	1.50
5	During 1995-96	-
6	During 1996-97	2.77
7	During 1997-98	0.23
8	During 1998-99	23.34

9	During 1999-00	50.35
10	During 2000-01	118.67
11	During 2001-02	196.54
12	During 2002-03	2.00
13	During 2003-04	6.30
14	During 2004-05	48.80
15	During 2005-06	545.10
16	During 2006-07	483.6
17	During 2007-08	276.075

(Source: *http://www.windpowerindia.com/statyear.html).*

Paragraph 4(a) above states that projects are considered similar they take place in a comparable environment. Till the year 2002-03, wind power developers in Maharashtra enjoyed sales tax benefits of Rs. 10 million per MW per year for a period of 5 years from the date of commissioning (Source: Maharashtra wind power policy 1998, MERC order dated 23 November 2003; page-5 (2.3.1)), making investment in wind attractive on a stand alone basis. The sales tax benefits were withdrawn in March-2002. Therefore wind capacity additions before March 2002 have not been considered.

Paragraph 4(a) also states that projects can be considered similar if they rely on a broadly similar technology and are of a similar scale. The roaring 40s wind farms (Khandke) private limited has a total capacity of 50.4 MW and is designed to be installed in three phases and hence the project is categorized as large scale project activity (>15MW). The proposed Roaring 40s Wind Farms (Khandke) Private Limited – Phase I wind power project involves the installation of 21 wind turbines, each of which has rated output of 800 kV, providing a total capacity of 16.8 MW. Therefore in accordance with Paragraph 4(a), we have analysed wind projects of more than 15 MW capacities. During the period 2003-2008 a total of 476 MW was added from wind projects with more than 15 MW size. We would like to submit that the entire 476 MW is under CDM. We have provided the spreadsheet with CDM links of all these projects to the DoE.

As can be seen, all comparable projects have come up only with the benefit of CDM. Hence our project is without CDM benefits is not a common practice.

Sub-steps 4a are satisfied and 4b is not required as no similar activities are observed.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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According to the approved methodology ACM0002 (Version 10) Emission Reductions are calculated as

$$ER_y = BE_y - PE_y - L_y$$

Where:

BE_y	Baseline Emissions in year *y* (t CO2e/yr)
PE_y	Project Emissions in year *y* (t CO2e/yr)

L_y Leakage Emissions in year *y* (t CO2e/yr)

Estimation of Baseline Emissions
Baseline emissions (BEy in tCO2) due to displacement of grid-electricity is calculated as the product of the Baseline Emissions Factor (EFy in tCO2/MWh) calculated as described below, times the electricity supplied by the project activity to the grid (EG_y - $EG_{baseline}$ in MWh), over the crediting period.

$$\mathbf{BE_y = (EG_y – EG_{baseline}) X EF_y}$$

Where:

BE_y	Baseline emissions in year y (tCO2/yr)
EG_y	Electricity supplied by the project activity to the grid (MWh)
$EG_{baseline}$	Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero. As this is a new power plant this is zero for the project
EF_y	Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"

According to the tool the baseline emission coefficient will be determined using the following steps:

STEP 1. Identifying the relevant electric power system

The Indian electricity system is divided into five regional grids, viz. Northern, Eastern, Western, Southern, and North-Eastern. Each grid covers several states. As the regional grids are interconnected, there is inter-state and inter-regional exchange. A small power exchange also takes place with neighboring countries like Bhutan and Nepal.

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 regional problems relating to the grid. Each state in a regional grid meets its demand with its own generation facilities and also with allocation from power plants owned by the Central Sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the Central Sector power plants. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The regional grid thus represents the largest electricity grid where power plants can be dispatched without significant constraints and thus, represents the "project electricity system" for the Project. As the Project is connected to the Western regional electricity grid, the Western grid is the "project electricity system".

STEP 2. Select an operating margin (OM) method
According to the tool the calculation of the operating margin emission factor is based on one of the following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

Any of the four methods can be used, however, the simple OM method (option a) can only be used if low cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

The Share of Low Cost / Must-Run (% of Net Generation) in the generation profile of the different grids in India in the last five years is as follows:

Generation in GWh	2004-05	2003-04	2002-03	2001-02	2000-01
Low cost/must run sources					
Hydro	10,610	9,282	8,172	7,928	7,174
Wind & Renewables	884	1,522	879	610	314
Nuclear	5,100	5,700	6,200	6,073	5,903
Other sources					
Coal	141,964	136,063	137,392	133,628	128,561
Diesel	-	-	-	-	-
Gas	25,526	21,508	18,713	16,072	21,280
Total Generation	**184,084**	**174,075**	**171,356**	**164,311**	**163,232**
Low cost/must run sources	16,594	16,504	15,251	14,611	13,391
Low cost/must run sources	9%	9%	9%	9%	8%

Source: CO_2 Baseline Database for the Indian Power Sector – Central Electricity Authority

The above data clearly shows that the percentage of total grid generation by low cost/must run plants (on the basis of average of five most recent years) for the western regional grid is less than 50 % of the total generation. Hence the Simple OM method can be used to calculate the Operating Margin Emission factor.

The project proponents choose an ex ante option for calculation of the OM with a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.

STEP 3. Calculate the operating margin emission factor according to the selected method
The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

- Based on data on fuel consumption and net electricity generation of each power plant / unit (Option A), or
- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or
- Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C)

The Central Electricity Authority, Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database i.e. The CO2 Baseline Database provides information about the Combined Margin Emission Factors of all the regional electricity grids in India. The Combined Margin in the CEA database is calculated ex ante using the guidelines provided by the UNFCCC in the "Tool to calculate the emission factor for an electricity

system". We have, therefore, used the Combined Margin data published in the CEA database, for calculating the Baseline Emission Factor.

The CEA database uses the option B i.e. data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit, to calculate the OM of the different regional grids.
The simple OM emission factor is calculated based on the electricity generation of each power unit and an emission factor for each power unit, as follows:

$$\mathbf{EF_{grid,OMsimple,y} = \Sigma\ (EG_{m,y} \times EF_{EL,m,y}) / \Sigma EG_{m,y}}$$

Where:

$EF_{grid,OMsimple,y}$	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m	All power units serving the grid in year y except low-cost / must-run power units
y	Either the three most recent years for which data is available at the time of submission of the CDM PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

The emission factor of each power unit m has been determined using Option B1

$$\mathbf{EF_{EL,m,y} = (\Sigma\ FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,I,y}) / EG_{m,y}}$$

Where:

$EF_{EL,m,y}$	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,m,y}$	Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,I,y}$	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
m	All power units serving the grid in year y except low-cost / must-run power units
i	All fossil fuel types combusted in power unit m in year y
y	Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

STEP 4. Identify the cohort of power units to be included in the build margin
The sample group of power units m used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use the set of power units that comprises the larger annual generation.
Accordingly, the CEA database calculates the build margin as the average emissions intensity of the 20% most recent capacity additions in the grid based on net generation.

The build margin emission factor has been calculated ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. This option does not require monitoring the emission factor during the crediting period.

STEP 5. Calculate the build margin emission factor
The build margin emissions factor is the generation-weighted average emission factor of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$\mathbf{EF_{grid,BM,y} = (\Sigma\ EG_{m,y}\ x\ EF_{EL,m,}) / \Sigma\ EG_{m,y}}$$

Where:

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

The CO2 emission factor of each power unit m ($EF_{EL,m,y}$) is determined as per the procedures given in step 3 (a) for the simple OM, using options B1 using for *y* the most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

STEP 6. Calculate the combined margin emissions factor
The emission factor *EFy* of the grid is represented as a combination of the Operating Margin (OM) and the Build Margin (BM). Considering the emission factors for these two margins as $EF_{OM,y}$ and $EF_{BM,y}$, then the *EFy* is given by:

$$\mathbf{EF}y = w_{OM} * \mathbf{EF_{grid,OM,}}_y + w_{BM} * \mathbf{EF_{grid,BM,}}_y$$

Where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
w_{BM}	Weighting of build margin emissions factor (%)

(where $w_{OM} + w_{BM} = 1$).

According to ACM0002 the weights for OM and BM are 0.75 and 0.25 respectively.
Using the values for operating and build margin emission factor provided in the CEA database and their respective weights for calculation of combined margin emission factor, the baseline carbon emission factor (CM) is 940.22 tCO_2e/GWh or 0.94022 tCO_2e/MWh.

Details of Baseline data:

Data of Operating and Build Margin for the three financial years from 2004-05 to 2006-07 has been obtained from -

The CO2 Baseline Database for the Indian Power Sector
Ministry of Power: Central Electricity Authority (CEA)
Version 1.1

Key baseline information is reproduced in annexure 3.
The detailed excel sheet is available at:
http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Estimation of Project Emissions
The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 10, there will be no project emissions in the project activity (PEy = 0).

Estimation of Leakage Emissions
As per ACM0002 Version 10, no leakage has been considered for the calculation of emission factor (LEy = 0).

The details on OM, BM and CM estimates as provided by the CEA are shown in Annex-3.

B.6.2. Data and parameters that are available at validation:

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Data / Parameter:	$EF_{OM,y}$
Data unit:	tCO2e/MWh
Description:	Operating Margin Emission Factor of Western Regional Electricity Grid
Source of data used:	"CO2 Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.99455
Justification of the choice of data or description of measurement methods and procedures actually applied:	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002.

Data / Parameter:	$EF_{BM,y}$
Data unit:	tCO2e/MWh
Description:	Build Margin Emission Factor of Western Regional Electricity Grid
Source of data used:	"CO2 Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.77722
Justification of the choice of data or description of measurement methods and procedures actually	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002.

applied:	

Data / Parameter:	***EFy*** or $EF_{CM,y}$
Data unit:	tCO2e/MWh
Description:	Combined Margin Emission Factor of Western Regional Electricity Grid
Source of data used:	Combined Margin Emission Factor ($EF_{CM,y}$) is calculated as the weighted average of Operating Margin Emission Factor ($EF_{OM,y}$) and Build Margin Emission Factor ($EF_{BM,y}$). The "CO2 Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	In case of wind power projects default weights of 0.75 for EF_{OM} and 0.25 for EF_{BM} are applicable as per ACM0002. Combined Margin Emission Factor (EFy or $EF_{CM,y}$) : 0.94022 Refer Annex – 3 for comprehensive calculation of Combined Margin Emission Factor.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002, and Tool to Calculate the emission Factor for an Electricity System.

B.6.3 Ex-ante calculation of emission reductions:

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Ex-ante calculation of emission reductions is equal to ex-ante calculation of baseline emissions as project emissions and leakage are nil.

Baseline emission factor (Combined Margin) (EFy)
= 940.22 tCO_2e/GWh

Annual electricity supplied to the grid by the Project (EGy)
= 16.8 MW (Capacity) x 21.07% (PLF) x 8,760 (hours) / 1,000 GWh
= 31.008 GWh

Annual Baseline Emissions Reduction: ERy = EFy * EGy
= 940.22 tCO_2e/GWh x 31.008 GWh
= 29,154 tCO_2e

B.6.4 Summary of the ex-ante estimation of emission reductions:

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Year	Estimation of project activity emissions (tonnes of CO2e)	Estimation of baseline emissions (tonnes of CO2e)	Estimation of leakage (tonnes of CO2e)	Estimation of overall emission reductions (tonnes of CO2e)
1st year*	0	29,154	0	29,154
2nd year	0	29,154	0	29,154
3rd year	0	29,154	0	29,154
4th year	0	29,154	0	29,154
5th year	0	29,154	0	29,154
6th year	0	29,154	0	29,154
7th year	0	29,154	0	29,154
8th year	0	29,154	0	29,154
9th year	0	29,154	0	29,154
10th year	0	29,154	0	29,154
Total (tonnes of CO2e)	0	291,540	0	291,540

*1st year begins from the date of registration or 31/01/2010 whichever is later, and each year extends for 12 months.

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

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Data / Parameter:	$EG_{f2,JMR,export}$ and $EG_{f3,JMR,export}$
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity exported by all the Turbines connected to feeder 2 and feeder 3(Turbines included in the project activity and Turbines that are not part of the project activity) at main (04880814-feeder 2 and 04880816- feeder 3) and the check meter (04880815- feeder 2 and 04880817- feeder 3) at 33 kV.
Source of data to be used:	Joint meter reading records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will not be directly used for estimation of emission reduction.

Description of measurement methods and procedures to be applied:	Measured through 0.2 accuracy class main and check meters installed at the 33kV side of the Substation.
QA/QC procedures to be applied:	Joint Meter Reading (JMR) of the main and check meter is carried out on first day of every month in presence of the representatives of the Enercon (the O&M contractor) & MSEDCL (distribution wing of Maharashtra state electricity board). Can be cross checked against sales invoices raised to state electricity utility. Electricity meters will be calibrated by MSEDCL (distribution wing of Maharashtra state electricity board) on annual basis.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$EG_{f2,JMR,Import}$ and $EG_{f3,JMR,Import}$
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity imported by all the Turbines (Turbines included in the project activity and Turbines that are not part of the project activity) connected to feeder 2 & feeder 3 at main (04880814-feeder 2 and 04880816- feeder 3) and the check meter (04880815- feeder 2 and 04880817- feeder 3) at 33 kV.
Source of data to be used:	Joint meter reading records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will not be directly used for estimation of emission reduction.
Description of measurement methods and procedures to be applied:	Measured through 0.2 accuracy class main and check meters installed at the 33kV side of the Substation.
QA/QC procedures to be applied:	Joint Meter Reading (JMR) of the main and check meter is carried out on first day of every month in presence of the representatives of the Enercon (the O&M contractor) & MSEDCL (distribution wing of Maharashtra state electricity board). Can be cross checked against sales invoices raised to state electricity utility. Electricity meters will be calibrated by MSEDCL (distribution wing of Maharashtra state electricity board) on annual basis.

Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$EG_{f2,y}$ and $EG_{f3,y}$
Data unit:	MWh (Mega-watt hour)
Description:	Net Electricity supplied to the grid by the WTGs of the project activity connected to feeder 2 & feeder 3.
Source of data to be used:	This value will be directly applied from **Energy Breakup Report** certified by MSEDCL.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be directly applied from **Energy Breakup Report** certified by MSEDCL.
Description of measurement methods and procedures to be applied:	The main and the check meters are connected to the machines of the project activity and other WTGs that are not part of project activity but connected to feeder 2 & feeder 3. The net electricity exported by the project activity is determined by system of apportioning wherein the aggregate electricity exports and imports (recorded by the main or check meter, as applicable) are allocated to project and non-project WEGs in proportion to their generated electricity by MSEDCL. The apportioning will be done based on LCS meters readings of all WTGs connected to feeder 2 and 3. 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 WEGs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report. The project proponent does not have any control over the LCS meter readings of other project developers and therefore the values certified by the MSEDCL will be directly used for the purpose of calculating the electricity exports to the grid.
QA/QC procedures to be applied:	NA
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	**EG_y**
Data unit:	MWh (Mega-watt hour)

Description:	Net electricity supplied to the grid by the WTGs of the project activity
Source of data to be used:	Net Electricity supplied to the grid is summation of net electricity supplied to the grid by the Turbines of the project activity connected to feeder 2 ($EG_{f2,y}$) and net electricity supplied to the grid by the Turbines of the project activity connected to feeder 3 ($EG_{f3,y}$).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Annual electricity supplied to the grid by the Project = 16.8 MW (Capacity) x 21.07% (PLF) x 8,760 (hours) / 1,000 GWh = 31.008 GWh
Description of measurement methods and procedures to be applied:	The net electricity exported by the project activity is determined by apportioning of aggregate electricity exports and imports (recorded by the main or check meter, as applicable). The allocation is done by O&M contractor (Enercon) and apportioned values for energy export and import are certified by the MSEDCL in the Energy Breakup Report.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by MSEDCL pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD.
Any comment:	The data will be stored in hard formula and values will be taken from JMR.

Apportioning Procedure Implemented by Enercon (O & M contractor) is certified by MSEDCL and is attached as Appendix 3.

The data will be stored in hard format. Joint meter report is taken in the presence of the persons representing Enercon [Operation and Maintenance Contractor]. The copies of the joint meter report will be presented to the validator during the verification exercise. The archive will be kept for the period up to two years after the completion of the crediting period.

B.7.2 Description of the monitoring plan:

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Approved monitoring methodology ACM0002 Version 10 Sectoral Scope: 1, "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources", by CDM - Meth Panel is proposed to be used to monitor the emission reductions.

This approved monitoring methodology requires monitoring of the following:

- Electricity generation from the project activity; and
- Operating margin emission factor and build margin emission factor of the grid, where *ex post* determination of grid emission factor has been chosen

Since the baseline methodology is based on ex ante determination of the baseline, the monitoring of operating margin emission factor and build margin emission factor is not required. Further, wind based electricity generation is not associated with any kind of leakages.

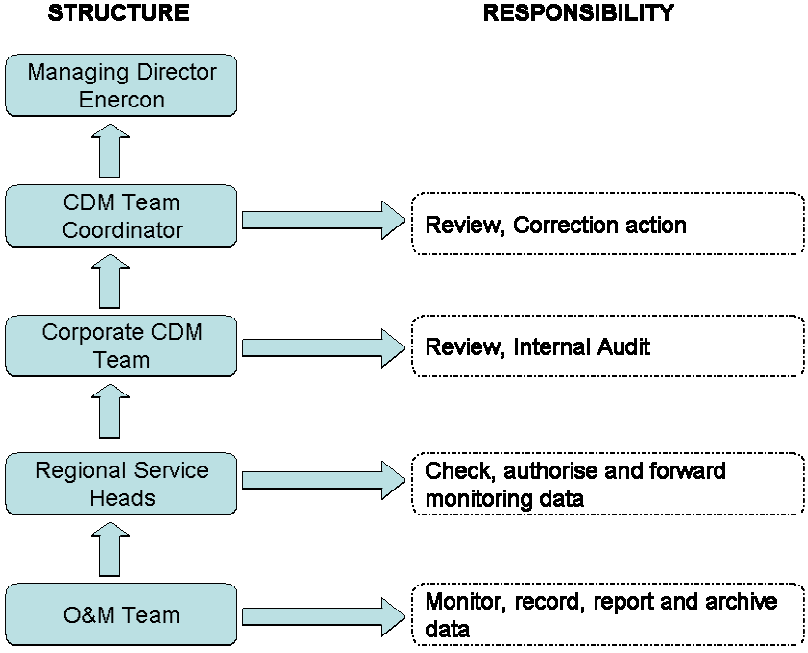
The Project is operated and managed by Roaring 40s. The operational and maintenance contract for the project is with Enercon. Enercon is an ISO 9001:2000 certified Quality Management system from Germanischer Lloyd. Enercon follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, finance, construction, commissioning and operation of the wind power project.

The accuracy of monitoring parameter is ensured by adhering to the calibration and testing procedure. The project will adhere to all the mandatory regulatory and statutory requirements at the state as well as national level. Enercon is Operation and Maintenance contractor for the project activity and provides the daily generation report to the Project proponent. The project proponent also maintains the records of daily generation report and joint meter report.

Training and maintenance requirements:

Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the Wind Energy Converters (WECs), it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that Enercon's service staffs is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. The Enercon Training Academy provides need-based training to meet the training requirements of Enercon projects. The training is contemporary, which results in imparting focused knowledge leading to value addition to the attitude and skills of all trainees. This ultimately leads to creativity in problem solving.

The operational and management structure implemented is as follows:



B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

Date of completion: 15/02/2008

Name of responsible person/entity: Roaring 40s Wind Farm (Khandke) Pvt Ltd (Project Participant)

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
19/04/2007, being the date of placement of purchase order for the wind energy generators.

C.1.2. Expected operational lifetime of the project activity:

>>
20 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
31/01/2010 or date of registration of the project whichever is later.

C.2.2.2. Length:

>>
10 Years

SECTION D. Environmental impacts

>>

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>
Roaring 40s gave the responsibility to Enercon for conducting EIA for its projects. Enercon appointed Care Sustainability to conduct rapid environmental impact assessment study for the wind power project of Roaring 40s to assess the impact of the project on the local environment.

Environmental Impact Assessment (EIA) of this project is not an essential regulatory requirement, as it is not covered under the categories as described in EIA Notification of 1994 or the Amended Notification of 2006. However, EIA was conducted to study impacts on the environment resulting from the project activity.

The EIA study included identification, prediction and evaluation of potential impacts of the project activity on air, water, noise, land, biological and socioeconomic environment within the study area. The ambient air concentrations of Suspended Particulate Matter, Respirable Particulate Matter, Oxides of Nitrogen, Sulphur dioxide and Carbon Monoxide were monitored and were found under limits as specified by CPCB. The noise levels were observed through out the study period and were found to be in the permissible range as specified by the state pollution control board and National Ambient Air Quality Standards. Water quality monitoring studies were carried out for determination of physico-chemical characteristics of bore wells. The ph level of water was found to be under the specified limits.

The project area does not have any housing structures/dwelling units hence Rehabilitation and Resettlement would not be an issue. The project has provided job opportunities by way of casual labour, skilled labour and office staff not only in the construction and operation of project activity. Adverse impact on the health and culture of local residents is not anticipated. The site does not involve any sensitive archaeological monuments as per the Archaeological Survey of India. No Historical and Cultural Monuments have been affected due to project location. The project site and immediate neighbourhood areas with pleasing architectural design that blends with the landscape does have a positive impact on the aesthetics of the present surrounding of the site.

The operation of the Roaring 40s Wind Farms has brought certain changes in the socio-economic and cultural environment by providing certain employment and livelihood opportunities improved the quality of life of the people in the surrounding habitations and also by providing cleaner environment and better health conditions to the people in the neighbouring villages. The generation of electricity from such clean process would contribute towards meeting the states deficit in electricity requirements.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

EIA demonstrated that there is no major impact on the environment due to the installation and operation of the windmills. The ecology is not likely to get impacted by this type of project activity. The local population confirmed that there is no noise or dust nuisance due to windmills. The EIA also ruled out any adverse impacts due to the project activity.

SECTION E. Stakeholders' comments

>>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

The comments from local stakeholders were invited through a local stakeholder meeting conducted in Ahmednagar District on 15 November-2006. Roaring 40s identified local communities, farmers, officials of Gram Panchayat and Enercon, O & M contractor as the most important stakeholders. A local newspaper advertisement was placed in Sarvmat on 29 October 2006 inviting the local stakeholders for the meeting by Enercon (India) limited. Enercon (India) Limited is the equipment supplier and operation and maintenance contractor for the project activity. Enercon has placed the advertisement in the newspaper to invite the stakeholders for comments on the proposed wind farms that are to be implemented at Panchpatta and Khandke site. The local stakeholder consultation meeting had representatives from the nearby villages and representatives of Enercon. The minutes of the meeting are set out in Appendix 2.

E.2. Summary of the comments received:

>>

The comments from local villagers included:

- Effect on the rainfall
- Noise Disturbance
- The nature of benefits that local stakeholders will get
- Impact on the grazing of local cattle
- Effect on the yield of grains

E.3. Report on how due account was taken of any comments received:

>>

Following responses were given in relation to the comments received from the local stakeholders:

- There is no relation between Wind Energy Machine and rainfall. Rain is natural phenomenon and is not affected.
- There is no noise because of the wind turbines on the account of the gearless technology of Enercon.
- The benefits to the local stakeholders will be through employment opportunities provided by the project in terms of construction workers. It will also lead to better connectivity to nearby towns.
- The project does not affect the grazing by the cattle. The project does not use any kind for boundary wall to protect their machines and hence the accessibility of cattle to areas for grazing and drinking water is not affected.
- There is no impact on the yield of the food grains due to the project activity

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	ROARING 40s WIND FARMS (KHANDAKE) PRIVATE LIMITED
Street/P.O.Box:	SUREN ROAD, CTS NO. 260/261,
Building:	302, 3RD FLOOR, BOSTON HOUSE
City:	ANDHERI (EAST), MUMBAI
State/Region:	MAHARASHTRA.
Postfix/ZIP:	400093
Country:	INDIA
Telephone:	+91 22 6758 8888 / +91 22 6758 8841
FAX:	+91 22 6758 8811 / +91 22 6758 8833
E-Mail:	Mahesh.Makhija@roaring40s.com.au
URL:	roaring40s.com.au
Represented by:	Mahesh Makhija
Title:	Business Head – India
Salutation:	Mr.
Last Name:	Makhija
Middle Name:	
First Name:	Mahesh
Department:	
Mobile:	+91-98204 51762
Direct FAX:	+91 22 6758 8811
Direct tel:	+91 22 6758 8841
Personal E-Mail:	Mahesh.Makhija@roaring40s.com.au

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project activity does not involve any public funding.

Annex 3

BASELINE INFORMATION

The Operating Margin data for the most recent three years and the Build Margin data for the Western Region Electricity Grid as published in the CEA database are as follows:

Simple Operating Margin

	Western Grid (tCO_2e/GWh)
Simple Operating Margin – 2002-03	981.41
Simple Operating Margin - 2003-04	990.31
Simple Operating Margin - 2004-05	1011.94
Average Operating Margin of last three years	994.55

Build Margin

	Western Grid (tCO_2e/GWh)
Build Margin- 2006-07	777.22

Combined Margin Calculations

	Weights	**Western Grid (tCO_2e/GWh)**
Operating Margin	0.75	994.55
Build Margin	0.25	777.22
Combined Margin		940.22

Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at www.cea.nic.in.

Annex 4

MONITORING INFORMATION

- **Metering:** Electricity supplied to the grid is metered by MSEDCL in the presence of representatives of Enercon (O&M Contractor for the project activity) and MSEDCL.

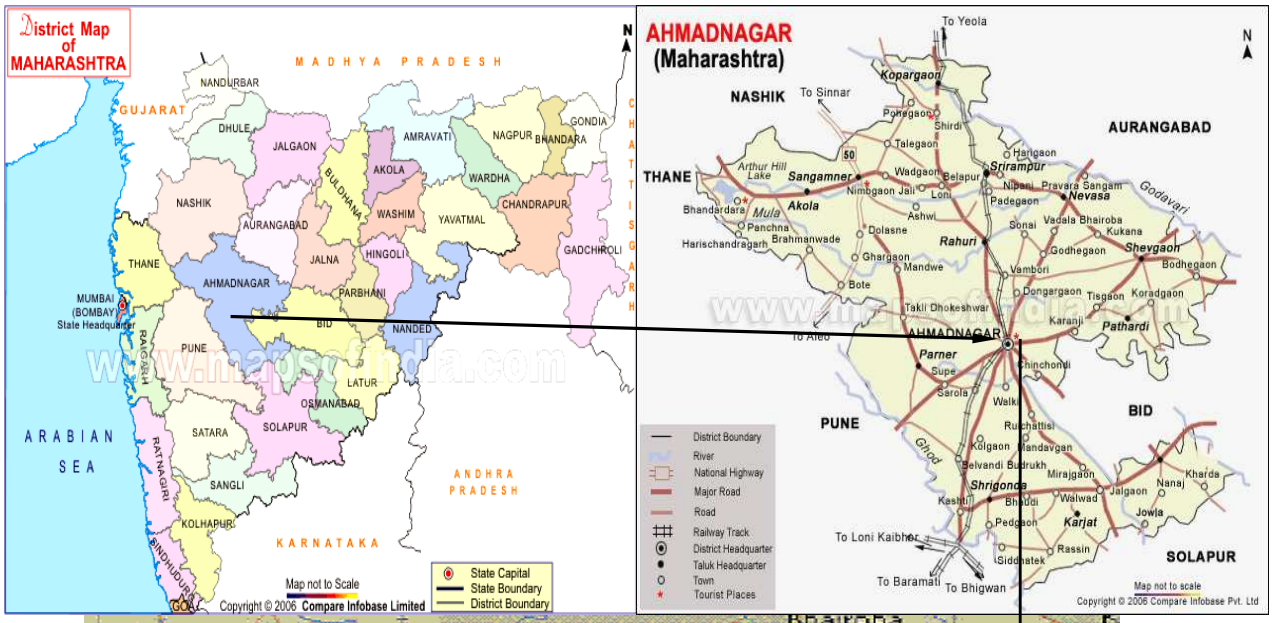
- **Metering Equipment:** Metering system for the project activity consists of main and check meter. Both the meters are two-way trivector meters capable of recording import and export of electricity and provide output in the form of net electricity supplied to the grid. The metering equipment is maintained in accordance with electricity standards prevalent in Maharashtra.

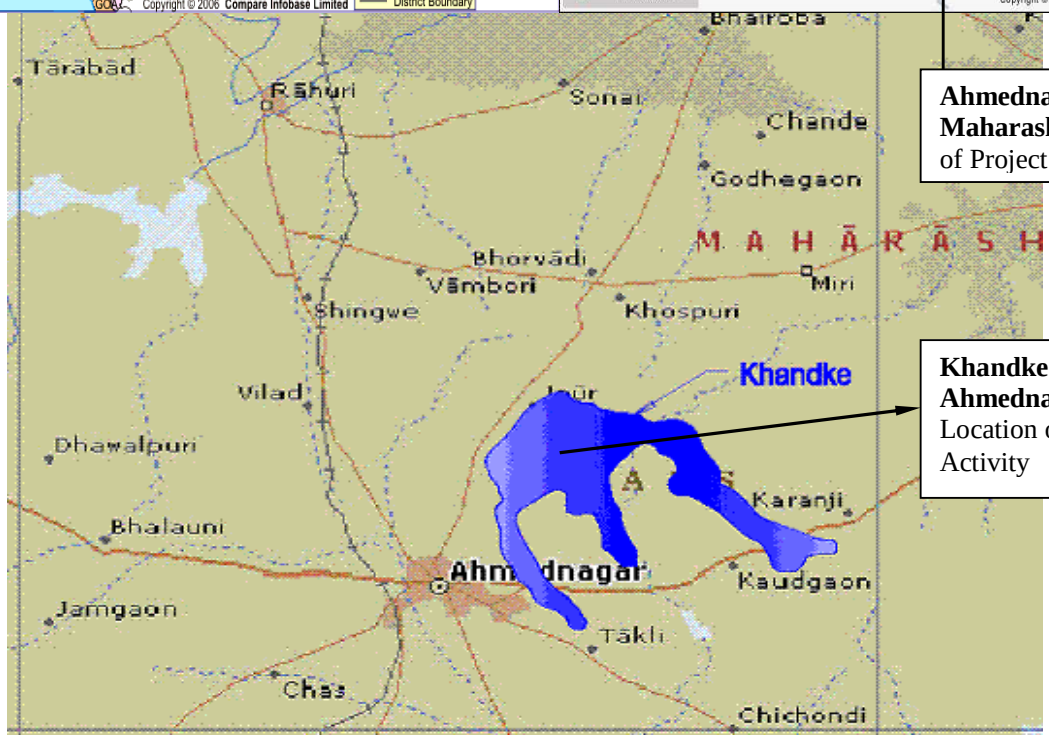
- **Meter Readings:** The Net electricity supplied to the grid is recorded by taking a Joint Meter Reading (JMR) in the presence of Officials from off-taking Utility and Enercon, O&M contractor, on behalf of project owner. The Joint meter reading contains the value of energy imported and exported and the net export to the grid during the recording period. This Joint meter reading is certified by the Executive engineer of the utility and by Enercon Officials. These certified readings are then used by the Discom officials to prepare the tariff invoices. The procedure for calculating net electricity supplied to the grid is described under B.7.2. The net electricity supplied to the grid can be cross verified from the Energy Breakup Report certified by MSEDCL.

- **Inspection of Energy Meters:** The main and check energy meters (export and import) and all associated instruments, transformers installed at the Project are of 0.5% accuracy class. Each meter is jointly inspected and sealed on behalf of the Parties and is not to be interfered with by either Party except in the presence of the other Party or its accredited representatives.

- **Meter Test Checking**: There is a separate check and main meter for each 33 kV bay. The Main and Check Meters are close to each other and will be tested for accuracy, with a portable standard meter, by the MSEDCL's Testing Division; The MSEDCL will carry out the calibration, periodical testing, sealing and maintenance of meters. All the meters will be tested at the Metering Point. The MSEDCL will provide a copy of the test reports .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 will be re-tested and calibrated immediately by MSEDCL.

Appendix 1 – Location Map





Ahmednagar District, Maharashtra: Location of Project Activity

Khandke Taluka, Ahmednagar District: Location of Project Activity

Appendix 2- Minutes of Local Stakeholder Consultation Meeting

Public Stake Holder Consultation Meeting – District Ahmednagar, Maharashtra

Venue: Ahmednagar, Enercon Site Office
Date: 15.11.06
Time: 2 pm to 4 pm

Participants of the Meeting:

A meeting and discussions were held in connection with Environment / Renewable Energy Projects on 15.11.06 in the afternoon from 2 to 4 pm at Enercon Site office, Sata Colony, Ahmednagar between Ahmednagar Villagers and Enercon. More than 20 persons from nearby villages were present to attend the meeting. Enercon was represented by Shri Mahesh Bag (Admin), Mr. Vivek Sen (Corporate) Mumbai, Mr. Sandeep Bhinde Enercon Ahmednagar, Mr. Shridhar Golambe Enercon Ahmednagar.

Stakeholders present for the meeting:

1. *Bhausaheb Gade*
2. *Kashikale Khumaji Karale*
3. *Gangadhar Sakat*
4. *Ramdas Keshav Shinde*
5. *Shivaji Mohan Shinde*
6. *Gayn Dev Laxman Vaman*
7. *Ashok Mohan Shinde*
8. *Tukaram Vitthal Karale*
9. *Bhausaheb Gangadhar Sakat*
10. *Adinath Laxman Shinde*
11. *Mohan Laxman Shinde*
12. *Radhaji Gundu Shinde*
13. *Thakaji Khumaji Karale*
14. *Popat Ambadas Karale*
15. *Jagannath Namdev Gayakwad*
16. *Ramesh Bhakuji Karale*
17. *Hanmant Karbhari Karale*
18. *Balasaheb Ranganath Gayakawad*
19. *S. G. Kulkarni*
20. *Shivaji Punja Karale*

21. Tukaram Baburao Vagule

Welcome Address:

The meeting began at the stipulated time and Mr. Mahesh Bag on behalf of Enercon welcomed all Villagers from Ahmednagar and nearby villages who devoted their time and effort to attend the meeting.
The main objective of this meeting was to discuss the doubts related to Wind Energy and its effects on the Environment. Several points were discussed in details between the participants of the meeting were discussed and cleared to villagers of Ahmednagar.

Proceedings:

Mr. Vivek Sen from Enercon explained regarding development of Wind Energy and Advantages of Renewable Energy and Clean Development Mechanism and answered the questions asked by Villagers to their satisfaction.

Address By the Chief Guests:

Chief Guest Shri. Tukaramji Vaghule, Sarpanch of Ratalgaon Village explained the advantages of Wind Energy to the participants. He continued by emphasizing on the need for development of alternative and clean sources of energy due to shortage of energy in the future and development of villages due to the installation of wind energy. Shri. Shivajirao Karale, Sarpanch of Aagadgaon also in his speech explained about the Wind Energy and its advantages and answered the question asked by villagers to their satisfaction.

Shri. Sanddeep Bhinde, Vivek Sen, Shridhar Golambe were present during the meting and discussions.

QUESTIONS ASKED BY VILLAGERS:

1. Does Wind Energy Machines affects the rainfall?

   Ans. Enercon official stated that there is lot of difference between the height of installed Wind Energy Machines and Clouds. There is no relation between Wind Energy Machine and rainfall. Rain is natural phenomenon and is not affected or stopped by windmills.

2. Does the blades of Wind Energy Machines and its sound disturbs animals or people?

   Ans. The blades will not make any noise and they are at 56 m height and it will not disturb animals or people while crossing the Project Area.

OTHER QUESTIONS (QUESTIONS ASKED TO THE VILLAGERS):

1. What developments took place due to Wind Energy projects?
   Ans. There are number of developments like Road, Transportation, Employment, running of State Buses etc.,

2. Should we promote such Projects?
   Ans. Yes. We should promote wind energy projects, which will develop roads, transportation, employment etc.,

3. As per your views, how does this project affect Environment?
   Ans. This project will not have any impact on the rainfall as the project do not change the natural conditions.

4. While developing Wind Energy Project what kind of help can we (Enercon) expect from the villagers?
   Ans. We can provide the project persons with Drinking water, Eatables etc., on time.

5. Do you maintain good relation with personnel and authorities of this project?
   Ans. Yes, we do have very good relations with competent authorities of this project.

6. Does this project have employment opportunities?
   Ans. Yes, the employment opportunities has improved as the result of the project activity

7. Does this project has developed Transportation / road developments etc.,
   Ans. Yes, Road and Transportation has developed and hence the accessibility has also improved to the near by areas.

8. How do projects relate to your life?
   Ans. We use the roads constructed at the site. Also we do take our domestic animals near the constructed site area where our domestic animals eat the grass.

9. Does sound of blades disturbs your lives?
   Ans. No.

10. If the field / land got damaged due to water drainage caused by the construction of the project?
    Ans. No such nuisance has occurred.

11. Is there any difficulty (prohibition by the project officials) to take the domestic animals for grazing?
    Ans. No, there is no difficulty in taking the domestic animals to the site.

12. Is there any affect on the yield of the grains from your fields?
    Ans. No.

13. Did you find the Project officials cutting the trees on the forestland?

    Ans. No. We haven't found any project officer cutting down forest trees.

14. Is there any dust related problem from the project? If any dust arises, how does it affect?

Ans. No, there is no problem related to the dust from the project activity.

Ending Note:

The meeting ended on a positive note with Mr. Mahesh Bag thanking all the participants who devoted their time and effort to make this meeting possible. The villagers expressed their satisfaction and gratitude for making them a part of the project.

Appendix 3: Apportioning procedure implemented by Enercon and Certified by MSEDCL

ENERCON
INDIA

GERMANISCHER LLOYD CERTIFICATION GLC QUALITY MANAGEMENT SYSTEMS ISO 9001 : 2000
MGMT. SYS RvA C 039

APPORTIONING PROCEDURE IMPLEMENTED BY ENERCON AND CERTIFIED BY MSEDCL IS AS FOLLOWS:

STEP 1: MEASURING ELECTRICITY GENERATION FOR EACH WEG

Electricity generation readings of the LCS meters on each WEG are recorded on continuous basis and fed to the central monitoring system. Data on generation for each WEG within the wind farm are accessed and archived electronically in the central monitoring system database.

Electricity generation from the project during a monitoring period connected to feeder 2 ($EG_{f2,gross,y}$) and feeder 3 ($EG_{f3,gross,y}$) is noted from central monitoring system database by Enercon as:

$$\sum_{y=0}^{N_{f2}} EG_{f2,gross,y}$$

$$\sum_{y=0}^{N_{f3}} EG_{f3,gross,y}$$

Where N_{f2} = number of WEGs comprising the Project activity connected to the feeder 2

Where N_{f3} = number of WEGs comprising the Project activity connected to the feeder 3

Electricity generation from other WEGs connected to feeder 2 ($EG_{f2,gross,y}$) and feeder 3 ($EG_{f3,gross,y}$) is noted from central monitoring system database by Enercon as:

$$\sum_{y=0}^{M_{f2}} EG_{f2,gross,x}$$

$$\sum_{y=0}^{M_{f3}} EG_{f3,gross,x}$$

Where M_{f2} = number of WEGs that are not part of the project activity but are connected to the feeder 2.

Where M_{f3} = number of WEGs that are not part of the project activity but are connected to the feeder 3.

STEP 2: DETERMINING ELECTRICITY EXPORTS FROM THE TURBINES

ENERCON (INDIA) LIMITED

Corporate Office : Enercon Tower, A-9, Veera Industrial Estate, Veera Desai Road, Andheri (West), Mumbai - 400 053.
Phone : 91-22-66924848 **Fax :** 91-22-67040473
Regd. Office & Plant : Plot No. 33, Daman Patalia Road, Bhimpore, Daman - 396 210. India.
Phone : 0260 / 2220624 + 2220628 Fax : 0260-2221508

ENERCON INDIA

2.1 MEASURING AGGREGATE ELECTRICITY EXPORTS FROM THE FEEDER

Aggregate electricity exports, to the grid, from the turbines connected to feeder 2 and feeder 3 is measured through the main and check meters installed at the 33kV side of the Substation. There are one set of main and check meter at each feeder. Joint Meter Reading (JMR) of the main and check meter is carried out on first day of every month in presence of the representatives of the Enercon (the O&M contractor) & the state electricity utility (MSETCL). The JMR gives both the "export" and "import" of the electricity to/ from the grid, which forms the basis on which the utility makes the payment to the project proponent. Electricity export and import for feeder 2 and feeder 3 is denoted as:

Electricity Export from feeder 2: $EG_{f2,JMR,export}$

Electricity Import from feeder 2: $EG_{f2,JMR,import}$

Electricity Export from feeder 3: $EG_{f3,JMR,export}$

Electricity Import from feeder 3: $EG_{f3,JMR,import}$

2.2 DETERMINING ELECTRICITY EXPORTS FROM PROJECT ACTIVITY

Net electricity exported by individual wind turbines is determined by MSEDCL by apportioning electricity export and electricity import to the project and non-project WEGs in proportion to their generated electricity.

This apportioning activity is carried out by Enercon, the O&M contractor. Operation and maintenance personnel from Enercon prepare a monthly report on generation and consumption. This report contains details of power exported/imported to/from the grid by each of the wind turbines connected to the feeder.

$EG_{f2,export}$ the electricity supplied to the grid by the project activity is calculated as follows:

$$EG_{f2,export} = \frac{EG_{f2,JMR,export} \times \sum_{y=0}^{N} EG_{f2,gross,y}}{\left(\sum_{y=0}^{N} EG_{f2,gross,y} + \sum_{y=0}^{M} EG_{f2,gross,y}\right)}$$

$EG_{f3,import}$ the electricity drawn from the grid by the project activity is calculated as follows:

$$EG_{f2,import} = \frac{EG_{f2,JMR,import} \times \sum_{y=0}^{N} EG_{f2,gross,y}}{\left(\sum_{y=0}^{N} EG_{f2,gross,y} + \sum_{y=0}^{M} EG_{f2,gross,y}\right)}$$

$EG_{f2,y}$, the net electricity supplied to the grid by WEGs of the project activity connected to feeder 2, is calculated as follows:

$EG_{f2,y} = EG_{f2,export} - EG_{f2,import}$

Similarly for feeder 3, $EG_{f3,export}$, $EG_{f3,import}$ and $EG_{f3,y}$, is calculated as:

Similarly for feeder 3, $EG_{f3,export}$, $EG_{f3,import}$ and $EG_{f3,y}$, is calculated as:

$EG_{f3,export}$ the electricity supplied to the grid by the project activity is calculated as follows:

$$EG_{f3,export} = \frac{EG_{f3,JMR,export} \times \sum_{y=0}^{N} EG_{f3,gross,y}}{\left(\sum_{y=0}^{N} EG_{f3,gross,y} + \sum_{y=0}^{M} EG_{f3,gross,y}\right)}$$

ENERCON INDIA

$EG_{f3,import}$ the electricity drawn from the grid by the project activity is calculated as follows:

$$EG_{f3,import} = \frac{EG_{f3,MR,import} \times \sum_{y=0}^{N} EG_{f3,gross,y}}{\left(\sum_{y=0}^{N} EG_{f2,gross,y} + \sum_{y=0}^{M} EG_{f3,gross,y}\right)}$$

$EG_{f3,y}$, the net electricity supplied to the grid by WEGs of the project activity connected to feeder 3, is calculated as follows:

$EG_{f3,y} = EG_{f3,export} - EG_{f3,import}$

Net electricity exported to the grid by the project activity is calculated as:

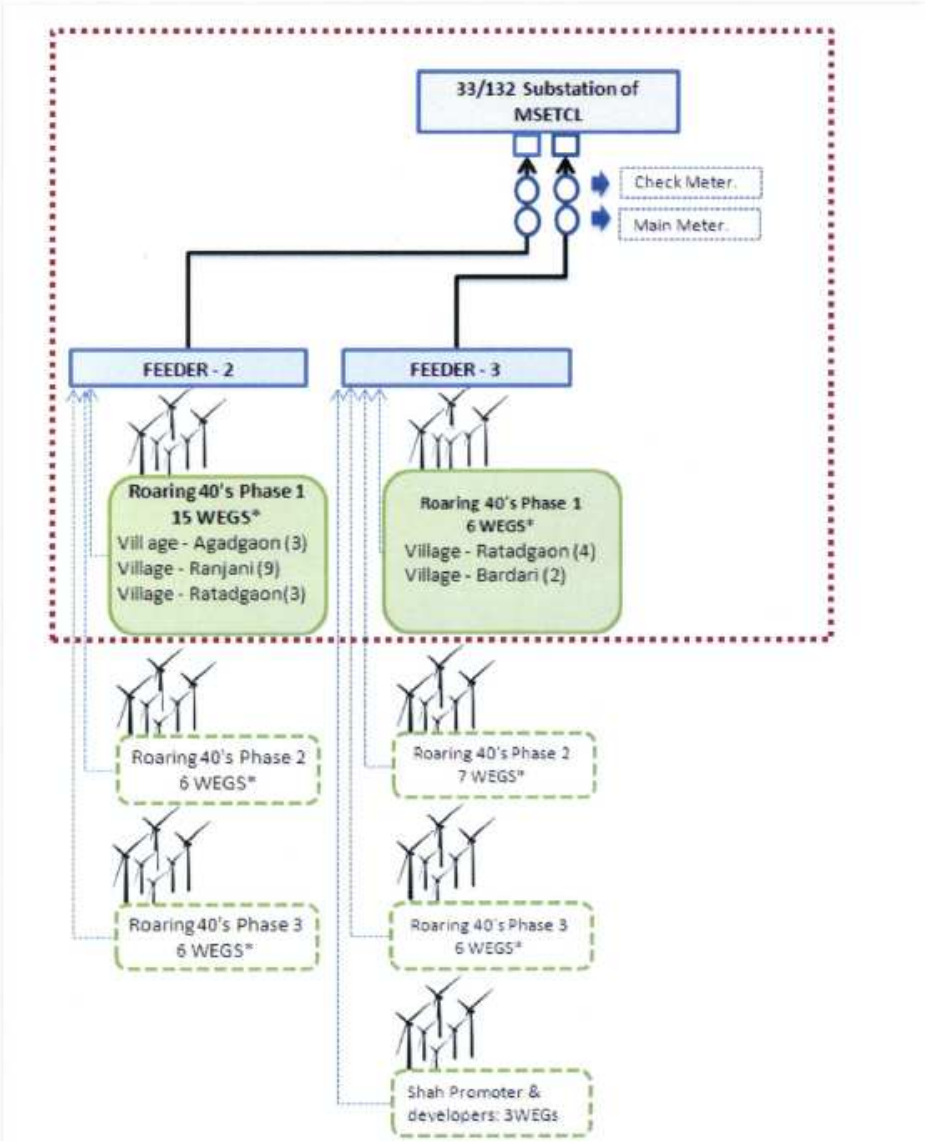
$EGy = EG_{f2,y} + EG_{f3,y}$

The meter reading from the LCS of each turbine is noted by the CMS (Central Monitoring Station) directly in the soft format. 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 WEGs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report.

Enercon is an ISO 9001:2000 certified Quality Management system from Germanischer Lloyd. Enercon follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, construction, commissioning and operation of the wind power project. The accuracy of monitoring parameter is ensured by adhering to the calibration and testing procedure. The project will adhere to all the mandatory regulatory and statutory requirements at the state as well as national level. Enercon is Operation and Maintenance contractor for the project activity and provides the daily generation report to the Project proponent. The project proponent also maintains the records of daily generation report and joint meter report.

ENERCON INDIA

Layout of the Project Activity



*The Roaring 40s project constitutes of 63 machines which are implemented under three phases and are presented in three PDDs. This PDD is developed for the phase I of the project activity which constitutes 21 machines which are connected to feeder 2 and Feeder 3. The feeder 2 connects 15 machines and Feeder 3 connects 6 machines of the project activity. The villages and the machines of the project activity that are connected to Feeder 2 and Feeder 3 are given in the above diagram. The apportioning procedure for calculating net electricity supplied to the grid will be calculated based upon the procedure as better described under B.7.2.