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

CONTENTS

SECTION A. General description of project activity

A.1 Title of the project activity:

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GREEN ENERGY TO GRID at Dhule, Maharashtra

Version 3.1

03/01/2008

A.2. Description of the project activity:

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Purpose

The project activity aims at bringing in greenhouse gas emission reductions through export of clean energy to the grid. Green energy from the project is generated by utilising wind as the resource, which is emission free and renewable. The project activity employs seventeen numbers of 1250kW wind energy generators (WEG's) for achieving the purpose of green power generation. The project generates green electricity to a tune of 42.81 Million Units every year and exports it to the Maharashtra State Electricity Distribution Company Limited (MSEDCL). An estimated quantity of 380,980 tonnes of carbon dioxide would be reduced by the project activity, during the course of the identified crediting period.

Out of the seventeen WEG's comprising project activity, sixteen belong to M/s. MSPL Limited and one to M/s. Betul Oils & Flour Mills Ltd. As per the agreement between MSPL & Betul Oils & Flour Mills Ltd, MSPL would be the sole transaction entity with the Executive Board of the United Nations Framework Convention on Climate Change.

Project activity's contribution to sustainable development

The project activity by its inherent nature of green electricity generation stimulates sustainable development of India in several ways and means described as under:

- Reduction in greenhouse gases, mainly carbon dioxide
- Reduction in energy demand (marginally) in the state grid
- Capacity building and employment generation in rural areas
- Reducing pollution load on the atmosphere (SOx, NOx)
- Conserving fossil fuel and making them available for other useful purposes
- Helps increasing the penetration of renewable power composition in the grid
- Promoting renewable based grid connected electricity generation in developing countries like India

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
India (Host Country)	MSPL Limited (Private Entity)	No

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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Maharashtra

A.4.1.3. City/Town/Community etc:

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Tilali and Mandal Villages, Nandurbar district, Northern Maharashtra

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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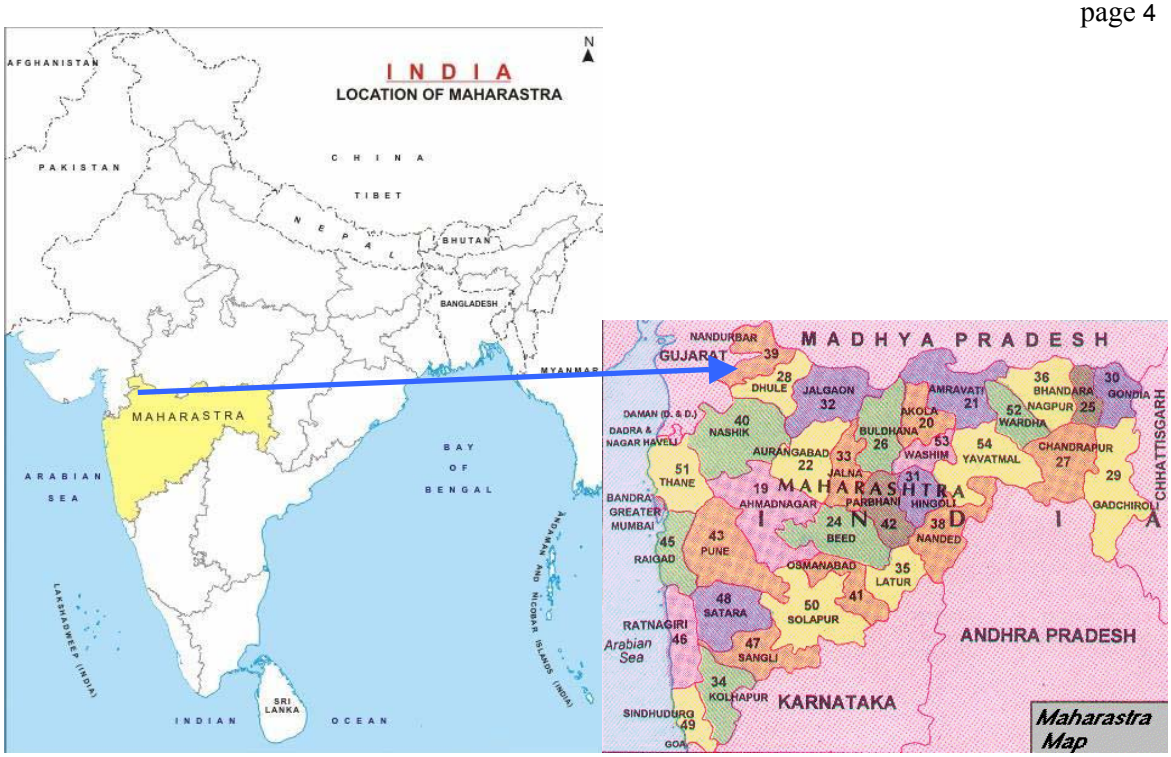
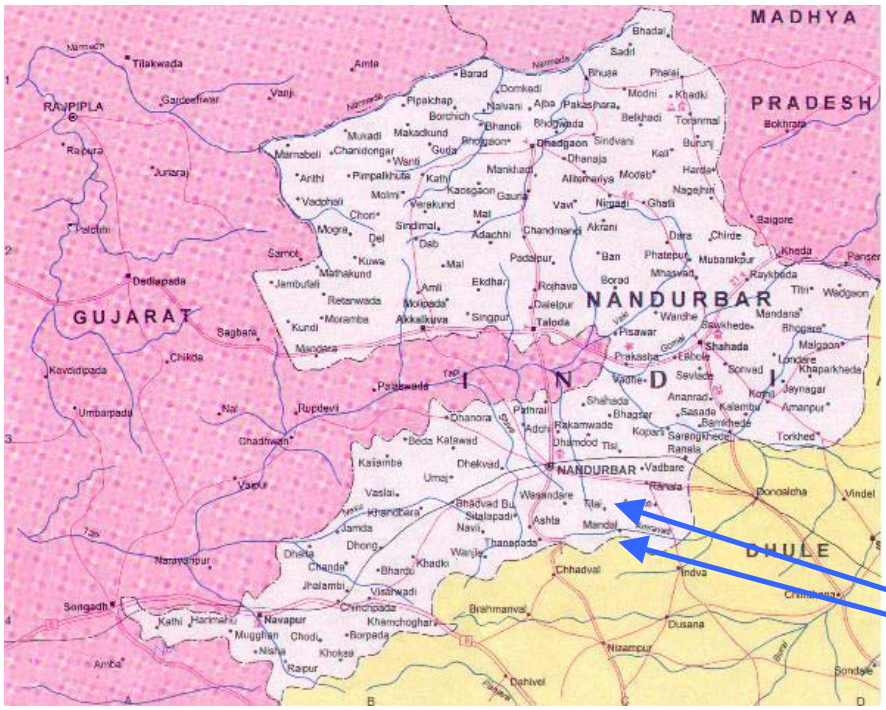
The project activity is located at Tilali and Mandal villages of Nandurbar district in Northern Maharashtra. The wind regime in Northern Maharasthra encompasses the districts of Dhule and Nandurbar and the region is popularly known as Dhule. Nandurbar district is located at Latitude $+21.23^0$N and Longitude $+74.19^0$E. The approximate road distance of the site from Mumbai is around 330 km. The nearest city is Nandurbar city at a distance of around 15 km from the project site. The nearest railway station is at Nandurbar city and the nearest major airport is at Mumbai. The major rivers passing through the area are Tapi and Narmada.





Location of project activity

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

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As per the scope of the project activity enlisted in the 'list of sectoral scopes and related approved baseline and monitoring methodologies' (version 06, 19 May 2006), the project activity is categorized under Scope Number: 1 – Energy industries (renewable/non-renewable sources) and applies the methodology ACM0002 (Ver 06, May 19, 2006).

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

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Power generation using wind is achieved by deploying wind electric generators (WEG's) intended for the same purpose. Wind activates the blades of the WEG's which causes rotational motion of the blades and this in turn coupled with the generators produces electrical energy. The project activity employs world class Wind Energy Generators for producing green energy which is one of the unique features of this project activity. The WEG's used in this project activity possess significant features as detailed below:

- High co-efficient of power for maximum harnessing of wind power by a rotor fitted with high performance blades
- Increased efficiency
- Advance hydrodynamic fluid coupling to absorb peak loads and vibrations
- Carefully devised electrical system to withstand erratic grid conditions and produce harmonics free pure sinusoidal power
- Epoxy coated tubular tower
- Integrated power transmission mechanism
- High speed asynchronous generator with a multi stage intelligent switching system for a higher power factor
- Microprocessor based fully automatic control system with an option of Central Monitoring System
- Well-designed four level safety systems ensuring maximum protection against damages
- Active Yaw gear drive with polyamide slide bearings incorporating hydraulic yaw brakes
- Hermetically sheltered, advanced over voltage and lightning system
- Low gestation period

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

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Year	Annual estimation of emission reductions in tonnes of tCO_2e
2008 – 2009	38,098
2009 – 2010	38,098
2010 – 2011	38,098
2011 – 2012	38,098
2012 – 2013	38,098
2013 – 2014	38,098
2014 – 2015	38,098
2015 – 2016	38,098
2016 – 2017	38,098
2017 – 2018	38,098
Total estimated reductions (Tonnes of CO_2e)	**380,980**
Total number of crediting years	Ten
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**38,098**

A.4.5. Public funding of the project activity:

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There is no public funding from Annex 1 parties for this project activity

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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ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

Reference is taken from the available UNFCCC document available for approved consolidated baseline methodology ACM0002, Version 06, May 19, 2006

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

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ACM0002	Project Activity
➢ This methodology is applicable to grid-connected renewable power generation project under the following conditions.	✓ The project activity is a renewable power generation project using wind electric generators (WEG's) and supplies green electricity to the grid.
➢ Applies to electricity capacity additions from: • Run-of-river hydro power plants; hydro power projects with existing reservoirs where volume of the reservoir is not increased • New hydro electric power projects with reservoirs having power densities greater than $4W/m^2$ • ***Wind sources*** • Geothermal sources • Solar sources • Wave and tidal sources	
➢ Geographic and system boundaries for the relevant electricity grid can be clearly identified and information on characteristics of the grid are available.	✓ Geographic and system boundaries for the relevant electricity grid are clearly identified and documented information on characteristics of the grid is utilized in arriving at the baseline emission factor calculations.

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

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The project activity uses air (renewable and emission free) as fuel for wind electricity generation. Hence there are no emissions at source. There is also no leakage associated with this project activity.

This project activity mitigates greenhouse gas emissions (mainly carbon dioxide) by supplementing the grid with renewable wind electricity as against capacity addition fossil fuel based electricity, which is the common practice in India.

Emission reductions due to the project activity ERy in a given year *y* is calculated as the difference between baseline emissions (BEy), project emissions (PEy) and emissions due to leakage (Ly), as per the formulae found under:

$ER_y = BE_y – PE_y - L_y$

where

BEy = Baseline emissions (explained in section B)

PEy = Project emissions (PEy = 0 in this case)

Ly = Emissions due to Leakage (Ly = 0 in this case)

In this case, anthropogenic emissions of the baseline are 38,098 tCO_2e per year and 380,980 tCO_2e over the crediting period.

	Source	Gas		Justification/Explanation
Baseline	Grid electricity generation	CO_2	Included	Main emission source.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project Activity		CO_2	Excluded	Renewable energy project activity. Hence no GHG emissions.
		CH_4	Excluded	Renewable energy project activity. Hence no GHG emissions.
		N_2O	Excluded	Renewable energy project activity. Hence no GHG emissions.

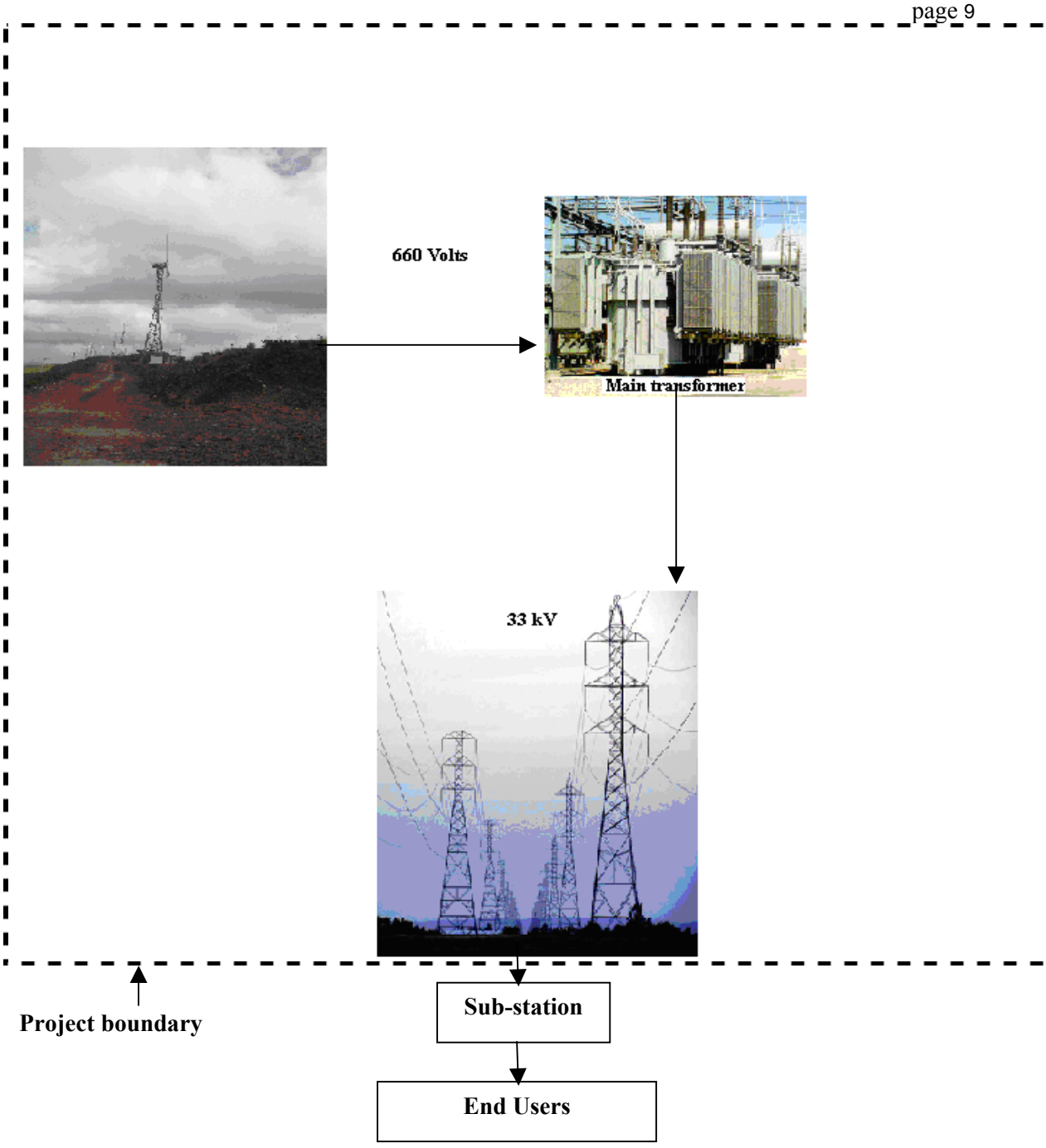

Illustration of the CDM Project Activity Boundary

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

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Identification of alternate baseline scenarios consistent with current laws and regulations:

As highlighted in the baseline methodology, determination of baseline scenario requires consideration of the following potential alternatives:

a) The proposed project activity not undertaken as a CDM project activity;

b) Continuation of current situation.

a) The project activity not undertaken as a CDM project activity;

In the absence of CDM considerations, MSPL may inevitably generate electricity equivalent to that of the project activity. This alternative is in compliance with all applicable legal and regulatory requirements, though it faces several barriers in successful implementation of the project activity. It has also considered risks and barriers associated with successful implementation and running of the project. However, MSPL took into consideration the CDM benefits before undertaking the project activity, which would help improving sustainability aspects of the project activity. Though participation in CDM is voluntary, it is not a credible alternative for the project promoter to implement the project activity without CDM revenues.

b) Continuation of current situation.

In the absence of project activity there shall be no energy generated from the project activity and supplied to the regional grid. Options (a) and (b) as explained above, validates the unsuitability of the alternatives for the CDM project activity at hand for electric power generation. Thus the electricity equivalent which would have been generated by the CDM Project activity, by default, will be substituted by electricity equivalent generated from the regional grid. The grid mix (in India) has been established to be largely constituted of a mix of non-renewable resources.

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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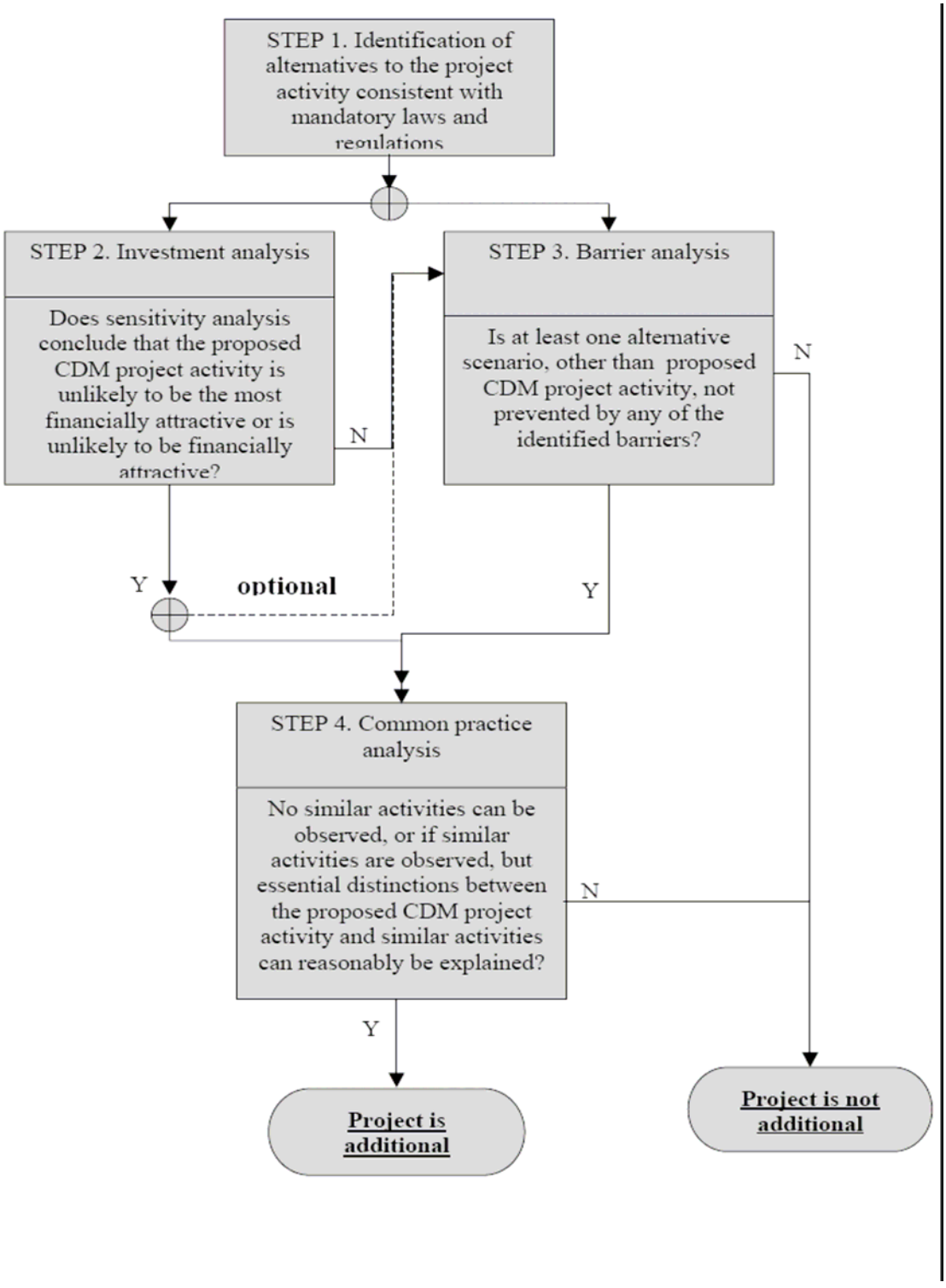
As per the decision 17/cp.7 para 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.

As per the selected methodology ACM0002, the 'Tool for the demonstration and assessment of additionality, Version 04 has been used to justify the additionality of the project which is discussed in this section.

The flowchart presented below provides a step-by-step approach to establishing additionality of the project activity as per the CDM consolidated tool for demonstration of additionality:



The project proponent proceeds to demonstrate the additionality of the project activity as follows:

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

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

As discussed above in Section B.3 of this project design document, the project activity with CDM revenues is the most realistic and credible alternative available among the other alternatives that provide output or services comparable with that of the MSPL project activity.

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

All possible alternatives and the identified baseline scenario are in compliance with all applicable legal and regulatory requirements. Moreover, there is no legal binding on MSPL to implement the project activity, which reinstates that the project is clearly additional.

Step 2 Investment analysis OR Step 3 Barrier analysis

MSPL is required to undertake a step wise approach in applying Investment or Barrier analysis to prove that their project activity additional. As the project is capital intensive, MSPL wishes to adopt the Investment analysis method to prove the additionality of their project activity.

Sub-step 2a Determine appropriate analysis method

Option 1 Simple Cost Analysis would not be an appropriate analysis method as the project incurs revenue from sale of electricity (export of power to MSEDCL grid). Amongst the other two available options, MSPL chooses to adopt the Benchmark analysis wherein the Equity Internal Rate of Return serves as a benchmark to assess the financial attractiveness of the project activity.

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

MSPL has sourced finance partly from internal accruals and by means of loans from financial institutions. As this project involves a huge capital outlay (INR 10,746 Lakhs), MSPL conducted an investment analysis with the Internal Rate of Return as the financial indicator. Internal Rate of Return is one of the known financial indicators used by banks, financial institutions and project developers for making investment decisions.

The project promoters have invested in the wind project as part of their efforts to curb greenhouse gas emissions and promote sustainable development. However, in the normal course of business the decision to allocate funds to various business lines is primarily based on the returns on investment. For this reason, equity IRR was chosen as the appropriate financial indicator and the benchmark applied was the required rate of return as specified by MERC for wind power projects. MSPL did not consider weighted average cost of capital as a benchmark as fund allocation for any investment is feasible when the expected returns are above the capital costs incurred. Also, the industrial benchmark for return on equity can be uniformly applied to different project promoters (MSPL Limited and Betul Oils & Flour Mills Ltd. are both project promoters). The investment analysis for the wind project showed that the returns on investment were below that of the benchmark when equity IRR was calculated without consideration of CDM revenues.

Sub-step 2c – Calculation and comparison of financial indicators

MSPL calculated the Equity Internal Rate of Return (IRR) for the project activity and compared this against the industrial benchmark or required rate of return (RRR). The equity internal rate of return of the project activity without CDM revenues is 14.13% which is not an attractive rate of return and is less than the Required Rate of Return (RRR) on equity of 16.00% for the project activity. The financial internal rate of return of the MSPL project activity without CDM revenues was calculated based on the annual export to MSEDCL (42.81 MU) and power purchase rate of MSEDCL (INR 3.50 per unit with an annual escalation rate of INR 0.15 up to thirteenth year).

The internal rate of return of the project activity with CDM revenues was calculated based on annual export to MSEDCL (42.81 MU), power purchase rate of MSEDCL (INR 3.50 per unit with an annual escalation rate of INR 0.15 up to thirteenth year), CER generation (380,980 tCO_2), and estimated carbon revenues (14 Euros @ INR 57.00). The equity internal rate of return of the project activity with CDM revenues improves to 18.26%. All financial data used to arrive at the equity internal rate of return of the project activity with and without CDM revenues would be provided to the DOE during the process of validation. The list of parameters used for the IRR computation of MSPL Limited and Betul Oils & Flours Ltd. are given in Appendix III.

The IRR for a wind power project is dependant on a number of factors including but not limited to tariff for electricity export. MERC has proposed tariff applicable to wind power projects taking into consideration 16% return on equity for investors. However, certain assumptions made for tariff computation such as capital expenditure, debt-equity ratio, and loan repayment period are likely to vary from project to project. For the project activity the capital expenditure per WEG is about INR 6.3 crores.

The debt-equity ratio is 75.9:24.1 for MSPL and 74.8:25.2 for Betul Oils & Flour Mills. The loan repayment period is 5 years for MSPL and 7 years for Betul Oils & Flour Mills. Assumptions made by MERC for tariff computation include project costs of INR 4 crores per WEG, debt equity ratio of 70:30, and a loan repayment period of 10 years. Therefore although the tariff for wind power projects proposed by MERC was computed assuming 16% return on equity, the actual returns computed for the project activity are lower in comparison.

Sub-step 2d. Sensitivity analysis

A sensitivity analysis was conducted for different scenarios including variations in O&M expenses and electricity export to grid. IRR was determined for variations in each one of the above-mentioned factors and for scenarios with variations in all the above-mentioned factors simultaneously in order to assess the financial attractiveness of the project activity under such circumstances.

Sl	Parameters	Variation	IRR	Comments
1.	OM Expenses	+10%	13.88%	The equity IRR of the project activity is lower than the Required Rate of Return on Equity of 16.00%
		-10%	14.39%	The equity IRR of the project activity is still lower than the Required Rate of Return on Equity of 16.00%. However it is unlikely that the OM expenses are reduced by 10% and this option may be discarded.
2.	Annual Export to MSEDCL	+10%	17.27%	The probability of a 10% increase in annual export to MSEDCL is not probable. It is unlikely that the meteorological & wind conditions that are available in the MSPL project activity are able to sustain a 10% increase in the annual power generation. The equity IRR of the MSPL project activity in this scenario is slightly higher than the Required Rate of Return on Equity of 16.00%

		-10%	11.08%	The equity IRR of the project activity is much lower than the Required Rate of Return on Equity of 16.00%
3.	Combinations	1→+10% 2→-10%;	17.50%	The equity IRR of the project activity is slightly greater than the Required Rate of Return on Equity of 16.00%. However the probability of a 10% increase in annual export to MSEDCL and a 10% reduction in OM expenses is not probable. It is unlikely that the meteorological conditions that are available in the MSPL project activity are able to sustain a 10% increase in the annual power generation. Also it is unlikely that the OM expenses are reduced by 10%.
		1→-10% 2→+10%	10.79%	The equity IRR of the project activity is very much lower than the Required Rate of Return on Equity of 16.00%

The results of the sensitivity analysis conducted confirm that the equity internal rate of return of the project activity without CDM revenues is lower than the Required Rate of Return (RRR) on equity of 16.00%. Hence, the conclusion that 'the project activity is financially non viable' is robust to reasonable variations in the critical assumption and the CDM revenue the MSPL project activity would obtain through sale of the emission reductions is very crucial to sustain the operations of the project activity.

Following the findings of the financial analysis for the project activity, the resolution for taking the project ahead as a CDM project activity was passed by the Board of Directors (by both companies M/s. MSPL Limited and M/S. Betul Oils & Flours Ltd). Copies of the meeting minutes (in both cases) are available as documentary evidence for CDM consideration before project start and have been handed over to the DOE at the time of validation.

Step 4. Common Practice Analysis

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

India suffers from energy scarcity due to rapid industrialisation and economic boom which increased energy consumption by 5.5% a year in the 1990's. The Ministry of Power (GoI) in 2002 -03 reported a drastic power shortage of 9.1% under normal conditions and 20% under peak load conditions. As shown in the table below, Ministry of Non Conventional Energy Sources (MNES) gets a fraction of annual financial budget when compared to Ministry of Power which is based on conventional non-renewable resources of power generation.

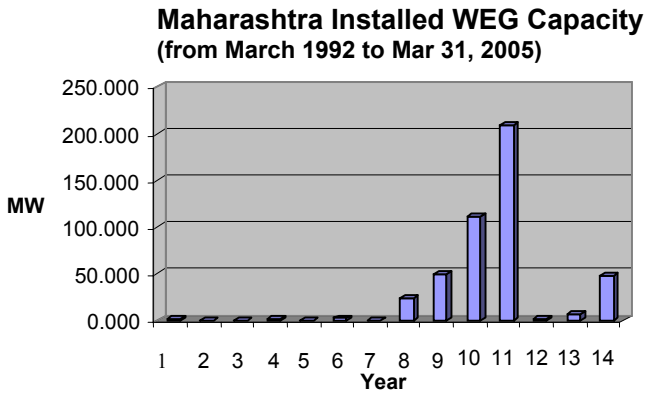
	Budget Estimates (2004 – 05) (In million Indian Rupees	Revised Estimates (2004 – 05) (In million Indian Rupees	Budget Estimates (2005 – 06) (In million Indian Rupees	Revised Estimates (2005 – 06) (In million Indian Rupees
Ministry of Non-Conventional Sources	10,880	8,000	8,650	NA
Ministry of Power	156,300	140,410	219,140	NA

Source: India budget (URL: http://indiabudget.nic.in/ub2005-06/bag/bag4-2.pdf)

Due to the substantially lower budget allocation and funding for MNES in the Indian government, contribution to wind energy generation by the Indian private sector stands close to 99% of the installed capacity. It is also worthwhile to mention here that despite the investment scenario, we have achieved only about 12% of the Gross Wind Capacity Potential on a national level. Or, in other words, of the Gross Potential of 49,150 MW, only about 5900 MW has been realised. This capacity addition has been in the face of the fact that this capacity addition has been on 1% of land available for wind power generation in potential sites.

Wind power generation is only available in 10 states in India due to prevailing natural factors, of which the state of Maharashtra has an estimated wind energy generation potential of 3650 MW[1].

1 Source : http://www.mahaurja.com/WindComm.xlstml



Source: Centre for Wind Energy Technology / (Url: http://www.cwet.tn.nic.in/html/information_yw.html)

The Western regional grid has a regional power demand of 25788 MW. But the supply of power to the grid stands at 25037MW. Five states namely, Gujarat, Maharashtra, Madhya Pradesh, Chattishgarh and Goa constitute the grid. Of these the state Maharashtra

As shown in graph above, the state of Maharashtra has a cumulative installed capacity of 456.2 MW or 12.5% of the estimated potential available to the state of Maharashtra, according to data available till March 31, 2005. Almost half of this installed capacity was during the year 2001 – 02, followed by a severe dip in installed capacity for the next two years from 2002 – 04. This fluctuation resulted in creating unfavourable investment climate and availability of large investors. It is this scenario, the project promoter initiated discussions on investment in wind energy power generation project, and in mid 2005 took a strategic business decision of investing in wind power generation.

Sub-step 4b: Discuss any similar options that are occurring:

The prevalence of private equity sector in wind power generation has already been established in the previous section. Due to widespread private investment climate, there exists a possibility of other projects to be found similar to that of the project promoter. Furthermore, a number of projects on wind power generation have manifested after this project activity. Many of such projects have gone along the CDM cycle in the state of Maharashtra. This substantiates the existence of other similar options. Till date, there have been 6 other large scale wind power projects in Maharashtra that have gone along the CDM path out of which 3 have been registered, another 2 have been rejected and 1 under review for registration with the UNFCCC as a CDM project. However, it is pertinent to note that the 21.25 MW wind power generation installed by the project promoter is one amongst the large scale wind projects currently underway in Maharashtra taken under the CDM cycle.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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"The baseline emission is the kWh produced by the renewable generating unit multiplied by an emission coefficient measured in (kg CO_2e/kWh)".

The emission reductions (ER_y) by the project activity during a given year y is

$ER_y = EG_y * EF_y$……..(1)

Where EG_y is the electricity supplied to the grid, EF_y is the CO_2 emission factor of the grid as calculated below:

The emission factor EF_y of the grid is represented as a combination of the Operating Margin and the Build Margin. Considering the emission factors for these two margins as $EF_{OM,y}$ and $EF_{BM,y}$.

Then, EFy is given by

$EFy = W_{OM} * EF_{OM,y} + W_{BM} * EF_{BM,y}$ ……..(2)

Where,

w_{OM}	Weight of the operating margin emission factor (0.75 for wind power projects as per ACM0002, Ref: Version 06, 19th May, 2006 Pg No. 10)
$EF_{OM, y}$	Operating margin emission factor calculated as per ACM0002
w_{BM}	Weight of the build margin emission factor (0.25 for wind power projects as per ACM0002, Ref: Version 06, 19th May, 2006 Pg No. 10)
$EF_{BM,y}$	Build margin emission factor calculated as per ACM0002

The Operating Margin emission factor $EF_{OM,y}$ is defined as the generation—weighted average emissions per electricity unit generated (tCO_2/GWh) for all sources serving the Western grid, excluding zero- or low-operating cost power (hydro, wind and nuclear) , based on the average of the three years most recent data and using the following equation

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \, x \, COEF_{i,j}}{\sum_{j} GEN_{j,y}} \quad \text{.....(3)}$$

Where,

$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources *j* in year(s) y,

j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid.

$COEF_{i,j,y}$ = CO_2 coefficient of the fossil fuel, (i) , (tCO_2) / mass or volume unit of the fuel) , taking into account of the carbon contents of the fuels used by relevant power plant j , and the present oxidation of the fuel in year(s) , y , and

$GEN_{j,y}$ electricity (MWh)delivered to the grid by power plant j.

$EF_{OM,y}$ = Total GHG emissions and electricity generation supplied to the grid by the power plants connected to the grid excluding zero- or low-operating cost sources.

The CO_2 emission coefficient COEF is obtained as :

$$COEF_i = NCV_i \otimes EF_{CO2,i} \otimes OXID_i \quad \text{.....(4)}$$

Where:

NCVi is the net calorific value (energy content) per mass or volume unit of a fuel i,

$OXID_i$ is the oxidation factor of the fuel

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel i :

The build margin is calculated as the weighted average emissions of recent capacity additions to the reference grid, based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of,

- The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Further, power plant capacity additions registered as CDM project activities have been excluded from the sample group *m* of Western India Regional grid mix.

The PDD has adopted *ex-ante* option for build margin calculation.

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \, x \, COEF_{i,m}}{\sum_{m} GEN_{m,y}}$$

Where $F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogus to the variables described for the simple OM method above for plants m.

Emission Reductions (ER_y):

The emission reductions from the project activity are equal to the baseline emissions minus project emissions and Leakage. Since the project activity generates electricity from wind, which is a zero emission source, there are no associated project emissions. As per ACM0002 version 06, leakage need not be considered since there is no transfer of energy generating equipment from another activity or transfer of existing equipment to another activity.

Therefore, emission reductions from the project activity directly equal the baseline emissions.

$ER_y = EF_y – PE_Y - L_y$, where

PE_y = Project Emissions in year $_y$ (nil in this case)

L_y = Leakage in y (nil in this case)

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

Data / Parameter:	***EF_y***
Data unit:	tCO_2/MWh
Description:	CO_2 emission factor of Western Regional Grid (WRG)
Source of data used:	CO_2 baseline database for Indian Power Sector provided by the Central Electricity Authority (CEA)
Value applied:	0.89
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated from data provided by the CEA in the CO_2 Baseline Database for Indian Power Sector
Any comment:	Calculated as weighted sum of OM and BM emission factor

Data / Parameter:	***$EF_{OM,y}$***
Data unit:	tCO_2/MWh
Description:	CO_2 operating margin emission factor for the Western Regional Grid (WRG)
Source of data used:	CO_2 baseline database for Indian Power Sector provided by the Central Electricity Authority (CEA)
Value applied:	0.99
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is the CO_2 operating margin emission factor for the Western Regional Grid (WRG) as provided by the CEA.
Any comment:	

Data / Parameter:	***$EF_{BM,y}$***
Data unit:	tCO_2/MWh

Description:	CO_2 build margin emission factor for the Western Regional Grid (WRG)
Source of data used:	CO_2 baseline database for Indian Power Sector provided by the Central Electricity Authority (CEA)
Value applied:	0.59
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is the CO_2 build margin emission factor for the Western Regional Grid (WRG) as provided by the CEA.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

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Ex-ante calculation of emission reductions (ER_y):

As per formula described in Section B.6.1, following

$ER_y = BE_y = (EG_y \times EF_y)$

$ER_y = (EG_y \times EF_y)$

ER_y = 42,807x 0.89 = 38,098 tCO_2e/yr

Ex-ante Estimation of Energy Generation (EGy):

Energy generation per year has been considered as 80% of the generation for each WEG estimated by the equipment suppliers. This assumption is based on actual data for wind energy generation from other WEGs operating in Maharashtra before conceptualization of this project activity and the respective generation estimates provided by the equipment suppliers. This data has been shared with the DOE in the process of validation.

Estimated generation per WEG = 31.74 million units (16 WEGs), 2.725 million units (1 WEG)

Sum of estimated generation for all WEGs = 53,509 MWh/yr

EG_y = 53,509 x 80% = 42,807 MWh/yr

Ex-ante determination of baseline emission factor (BEFy):

As per formula described in section B.6.1 above,

BEF_y = Combined margin emission factor = $w_{OM}.EF_{OM,\,y} + w_{BM}.EF_{BM\,,\,y}$

BEFy = 0.75*0.99 + 0.25*0.59 = 0.89 tCO_2e/MWh

The data for Simple Operating Margin (OM) and Build Margin (BM) has been taken from the CEA database. Refer Annex 3 for details. The Central Electricity Authority of the Government of India has published the CO_2 Baseline Database for the Indian power sector, which includes data for all regional grids in India. Version 2.0 of the CO_2 Baseline Database was initially adopted for baseline determination in accordance with ACM0002. The resulting emission factor from applying the data provided in version 2.0 of the CEA database was 0.90 tCO_2/MWh. However during the course of validation, version 3.0 of the database was published with data added for the year 2006-2007. The emission factor resulting from data in the updated database is 0.89 tCO_2/MWh. Thus, a more conservative baseline for the project activity is established using data from version 3.0. Therefore, the ex-ante values for the operating margin, build margin, and corresponding emission factor were updated as per version 3.0 of the CO_2 Baseline Database.

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

>>

Sl No.	Operating Years	Baseline Emission Factor ($kgCO_2e/kWh$)	Baseline Emissions (tCO_2e)	Project Emissions (tCO_2e)	Emission Reductions (tCO_2e)
1.	2008 – 2009	0.89	38,098	0	38,098
2.	2009 – 2010	0.89	38,098	0	38,098
3.	2010 – 2011	0.89	38,098	0	38,098
4.	2011 – 2012	0.89	38,098	0	38,098
5.	2012 – 2013	0.89	38,098	0	38,098
6.	2013 – 2014	0.89	38,098	0	38,098
7.	2014 – 2015	0.89	38,098	0	38,098
8.	2015 – 2016	0.89	38,098	0	38,098
9.	2016 – 2017	0.89	38,098	0	38,098
10.	2017 – 2018	0.89	38,098	0	38,098
		Total	**380,980**		**380,980**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	EG_y
Data unit:	MWh/yr

Description:	Net electricity supplied to the grid. This data is quantitative.
Source of data to be used:	MSEDCL records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	42,807
Description of measurement methods and procedures to be applied:	100% of the data is to be monitored and measured online. The data will be archived electronically.
QA/QC procedures to be applied:	Periodic calibration of energy meters
Any comment:	Instrument used: Energy Meter Data Type: Quantity

B.7.2 Description of the monitoring plan:

>>

The energy generated by the WEGs is monitored through energy meters and check meters. The meters are installed at the metering point and will have four quadrant, three phase, four wire, provision for online reading and time slots as required. The Multi Functional Recorder (MFR) readings are noted daily by the WEG operation & maintenance (O&M) contractor's personnel and recorded in log books which are further verified by the concerned personnel on a day to day basis. The total energy exported in a month is recorded in the O&M operator's MFR as well as in MSEDCL's main meter and check meter. Monthly generation report is prepared showing the aggregate generation of WEGs. The main meters and check meters will be tested annually and calibrated as required to ensure accurate readings (within permissible limit of error of 0.5%). The project proponent has in place, a CDM Manual that covers the management structure, roles and responsibilities, frequency of monitoring, maintenance, calibration, record keeping and emergency preparedness procedures. The project proponent has a well defined project management structure for monitoring the project activity under his control and monitoring will be in compliance with the CDM Manual.

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:

30/12/2007

Name of Entity determining baseline:

M/s. MSPL Limited

Baldota Enclave,

Abheraj Baldota Road

Hospet - 583 203

Karnataka, India

M/s. MSPL Limited (listed in Annex 1 of this document) is the 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:

>>
24/10/2005

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

>>
20 years 0 months

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

>>

The project proponent wishes to go for a one time fixed crediting period of ten years

C.2.1. Renewable crediting period

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

>>
Not Applicable

C.2.1.2. Length of the first crediting period:

>>
Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
01/06/2008 or Upon Registration with UNFCCC (whichever is later). The project proponent hereby confirms that the crediting period would not start prior to the registration of the project activity.

C.2.2.2. Length:

>>
10 years 0 months

SECTION D. Environmental impacts

>>

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

>>

As per the Environment Impact Assessment Notification S.O.60(E), dated 27/01/1994, this project activity does not fall under the purview of Environmental Impact Assessment notification of the Ministry of Environment and Forests -Government of India.

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:

>>

Not applicable

SECTION E. Stakeholders' comments

>>

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

>>

The project activity is implemented by MSPL Limited in Dhule district in Maharashtra, India. MSPL decided to invite all stakeholders identified and associated with the project activity to come together for a face-to-face meeting in accordance with CDM project activity. They include:

1) Local Panchayat
2) State Electricity Board/Transmission Corporation
3) State Pollution Control Board
4) Non Governmental Organisations
5) Equipment Suppliers
6) Consultants

The meeting took place on August 2, 2006 in Dhule district, Maharashtra. All the stakeholder communities stated above were invited formally and had full attendance with representatives from all stakeholder communities. The project proponent, MSPL had made all the necessary arrangements for the smooth running of the event, i.e. arranging for a meeting space, setting a banner, required electrical equipments etc. The meeting has been well documented by photographs and video, recording all the proceedings of the meeting. MSPL gave a presentation on the environmental benefits of the project activity, including inviting their suppliers to provide inputs of environmental effects within their available scope inside the project activity. A detailed report on the stakeholder consultation will be made available to the DOE at the time of validation and verification of the project activity.

E.2. Summary of the comments received:

>>

The meeting was very cordial and ended on a positive note. The project promoter's reputation of having invested and implemented the single largest WEG based electric power generation and receiving an award for the same from Indian government, set a platform of confidence in the discussion process from all parties involved.

It would be appropriate to state at this point that the stakeholders, particularly the local representatives left the meeting with a clear understanding of the background of the project activity and its relevance under the Clean Development Mechanism of United Nation Framework Convention on Climate Change. They were strongly supporting of the project activity and very inquisitive about the potential benefits to their local area.

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

>>

The relevant comments and important clauses mentioned in the project documents / clearances like Detailed Project Report (DPR) were considered in the preparation of the CDM project development document.

The meeting was characterised by encouraging comments and opinions from the stakeholders. No corrective actions were recorded due to the absence of negative comments established. The list of people attended the meeting and the minutes of the meeting are available with the project proponent and will be made available to the validator.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	MSPL Limited
Street/P.O. Box:	Abheraj Baldota Road
Building:	Baldota Enclave
City:	Hospet
State/Region:	Karnataka
Postfix/ZIP:	583203
Country:	India
Telephone:	08394 – 232002
FAX:	08394 – 232333
E-Mail:	
URL:	www.mspllimited.com
Represented by:	
Title:	General Manager
Salutation:	Mr
Last Name:	Shirolkar
Middle Name:	
First Name:	B.W
Department:	Operations
Mobile:	+91-99456-80159
Direct FAX:	
Direct tel:	08394 – 232002 Extn: 1286
Personal E-Mail:	shirolkar@mspllimited.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex 1 parties for this project activity

Annex 3

BASELINE INFORMATION

The CEA has published the baseline emission factors for the various electricity grids in India. The emission factors have been calculated based on UNFCCC guidelines. For further details on the calculation methods and data used, please refer the following weblink:

http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Annex 4

MONITORING INFORMATION

The project proponent has in place, a CDM Manual that covers the management structure, roles and responsibilities, frequency of monitoring, maintenance, calibration, record keeping and emergency preparedness procedures. The project proponent has a well defined project management structure for monitoring the project activity under his control and monitoring will be in compliance with the CDM Manual.

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APPENDICES

APPENDIX 1

ABBREVIATIONS

ABBREVATIONS

ACM	Approved Consolidated Methodology
BEF	Baseline Emission Factor
BM	Build Margin
CO_2	Carbon dioxide
CER	Certified Emission Reductions
CEA	Central Electricity Authority
CDM	Clean Development Mechanism
CM	Combined Margin
DNA	Designated National Authority
EIA	Environmental Impact Assessment
EB	Executive Board of the United Nations Framework Convention on Climate Change
GHG	Green House Gas
HCA	Host Country Approval
IPP	Independent Power Producer
IREDA	Indian Renewable Energy Development Agency
INR	Indian Rupees
IPCC	Inter Governmental Panel on Climate Change
IRR	Internal Rate of Return
ISO	International Standards Organisation
MSEDCL	Maharashtra State Electricity Distribution Corporation Limited
kWh	Kilowatt hour
MFR	Multi Functional Recorder
MSEDCL	Maharashtra State Electricity Distribution Company Limited
MW	Mega watt
MWh	Megawatt hour
MU	Million Units
MoEF	Ministry of Environment and Forests
MNES	Ministry of Non-conventional Energy Sources
NOx	Oxides of Nitrogen
OM	Operating Margin
PPA	Power Purchase Agreement
PCN	Project Concept Note
PDD	Project design document
SOx	Oxides of Sulphur
tCO_{2e}	Tonnes of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
WREB	Western Regional Electricity Board
WEG's	Wind Electric Generators

WPP	Wind Power Project
WTG's	Wind Turbine Generators

APPENDIX II

LIST OF REFERENCES

List of References

- http://unfccc.int
- www.mspllimited.com
- www.mapsofindia.com
- www.windpowerindia.com
- UNFCCC CDM Approved Consolidated Methodology ACM0002/Version 06
- Ministry of Non-Conventional Energy Sources, Government of India: http://mnes.nic.in
- UNFCCC document Clean Development Mechanism, Project Design Document Form (CDM-PDD), Version 03
- "Tool for the demonstration and assessment of additionality" Version 04, EB 36
- Central Electricity Authority: CO2 Baseline Database Version 3.0

APPENDIX III

ASSUMPTIONS FOR IRR

Assumptions for MSPL Limited - IRR Calculations

1 Project capacity[2]

No of WEGs	Make	Capacity per WEG (MW)	Total Capacity (MW)
16	Suzlon	1.250	20.00

2 Means of Finance[3]

	Rs Lakhs
Promoter Contribution (24.1%)	2436.75
Term Loan (75.9%)	7674.25
Total	10111

3 Term Loan Interest 8.00%[4]

4 Loan Repayment Schedule 5 years[5]
Payable in 15 quarters equally with Moratorium of 1.5 years.

5 Depreciation (Co's Act) 15.33%[6] WDV

6 Depreciation (IT Act) 80.00%[7] WDV

7 Selling Price / Unit[8]

Rs 3.50 per unit with 15 Paise escalation up to 13th year
From 14th year onwards 3.50 per unit

8 Operation & Maintenance charges[9]

First 5 years	NIL
O&M charges per WEG from 6th year onwards (including all taxes) in Rs. Lakhs	12.97

[2] Reference: Supply order dated 26th December, 2005 signed between MSPL Limited and Suzlon Energy Limited

[3] Reference: Letter from State Bank of India dated 15 May, 2006 , Reference page no: 9

[4] Reference: Letter from State Bank of India dated 15 May, 2006 , Reference page no: 13

[5] Reference: Letter from State Bank of India dated 15 May, 2006, Reference page no: 55

[6] Reference: Companies Act, Schedule XIV

[7] Reference: IT Act, Rule 5I, Appendix I

[8] Reference: Power Purchase Agreement signed between MSDECL and MSPL Limited, page no: 29, Exhibit C

[9] Reference: Operation & Maintenance contract between MSPL Limited and WEG Supplier (Suzlon Energy Limited)

Escalation @	5%
Spares consumption	NA

9 RKVAH Charges @ 0.25[10] Ps / Unit
Reactive Power 5% of Generation

10 Misc & other overheads / expenses 5% of revenue

11 Break-up for Project Cost

	(Rs. Lakhs)
Land	240.00[11]
The reference for the values stated below is the supply order dated 26th December, 2005 signed between MSPL Limited and Suzlon Energy Limited.	
Supply of WEG	7916.00
Civil works	496.00
Electricals	480.00
Power Evacuation Infrastructure	600.00
Erection and Commissioning	224.00
MEDA Processing fee	100.00
Other Charges	55.00
Total	10111.00

12 Electricity Generation[12] 80% of manufacturer's generation specifications

[10] Reference: Power Purchase Agreement signed between MSDECL and MSPL Limited, Reference page no: 13, under Section: 9.02

[11] Reference: Land purchase agreement signed between MSPL Limited and Sarjan Realities Limited

[12] Based on wind energy generation data from WEGs owned by the project proponent in the same state and references from MERC Order dated 24th November, 2003

Assumptions for Betul Oils & Flour Mills Ltd. – IRR Calculations

1 Project capacity[13]

No of WEGs	Make	Capacity per WEG (MW)	Total Capacity (MW)
1	Suzlon	1.25	1.25

2 Means of Finance

	Rs. Lakhs
Promoter Contribution 25.2%	160
Term Loan 74.8%	475[14]
Total	635

3 Term Loan Interest 10.25%[14]

4 Loan Repayment Schedule 7 years
Payable in 28 quarters equally with Moratorium of 2 quarters

5 Depreciation (Co's Act) 15.33%[15] WDV

6 Depreciation (IT Act) 80.00%[16] WDV

7 Selling Price / Unit[17]

Rs 3.50 per unit with 15 Paise escalation up to 13th year
From 14th year onwards 3.50 per unit

8 Operation & Maintenance charges[18]

First 3 years	NIL
O&M charges per WEG from 4th year onwards (including all taxes) in Rs. Lakhs	11.74
Escalation @	5%

[13] Reference: supply order dated 24th October, 2005 signed between Betul Oils & Flours Ltd. and Suzlon Energy Limited

[14] Reference: letter dated 12th January, 2006 from State Bank of India to Betul Oils & Flours Ltd.

[15] Reference: Companies Act, Schedule XIV

[16] Reference: IT Act, Rule 5I, Appendix I

[17] Reference: Power Purchase Agreement signed between MSDECL and Betul Oils & Flours Ltd, page 29 Exhibit C

[18] Reference: supply order dated 24th October, 2005 signed between Betul Oils & Flours Ltd and Suzlon Energy Limited

Spares consumption	NA

9 RKVAH Charges @ 0.25[19] Ps / Unit
Reactive Power 5% of Generation

10 Misc & other overheads / expenses 5% of revenue

11 Break-up for Project Cost

	(Rs. In lakhs)
Land	15.00[20]
The reference for the values stated below is the supply order dated 24th October, 2005 signed between Betul Oils & Flours Ltd. and Suzlon Energy Limited.	
Supply of WEG	501.25
Civil works	31.00
Electricals	30.00
Power Evacuation Infrastructure	37.50
Erection and Commissioning	14.00
MEDA Processing fee	6.25
Other Charges	0.00
Total	635.00

12 Electricity Generation[21] 80% of Manufacturer's Generation Specifications

[19] Reference: Power Purchase Agreement signed between MSEDCL and Betul Oils & Flours Ltd., Reference: Page no: 13, Section 9.02

[20] Reference: Land Purchase Agreement between Betul Oils & Flours Ltd. and Sarjan Realities Limited

[21] Based on wind energy generation data from WEGs in the same state and references from MERC Order dated 24th November, 2003