CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (VER-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:

17.45 MW Bundled Wind Power Project in India
Version : 1
Date: 13/ 10/ 2007

A.2. Description of the project activity:

Renewable sources of energy have a vital significance in the context of growing concern about sustainable energy supplies and protection of the environment from adverse effects of fossil fuel utilization. The wind-generated energy is supplied to the state grid of Karnataka, Tamilnadu, Rajasthan and Maharashtra. The wind power produced; being GHG neutral will not only displaces thermal power but will reduce the associated emissions with thermal power generation in the Southern, Northern and Western regional grid of India.

The capacity of the project and other details has been furnished in the table below. This is a VER bundled project activity bringing together various small-scale project activities, to form a single project where the distinctive characteristic of each project has been retained. The bundled project activity consists of the following sub-bundles:

Table 1; Details of WTG sponsors

Ref. No.	Name of the Sponsor	No. of WEG	Capacity /WEG (MW)	Installed Capacity (MW)	Technology Used	WEG Location District / State
Mit/WP/01	VSMPL	1	0.5	0.5	Vestas	Tirunelveli Tamilnadu
		1	0.6	0.6	Vestas	Tirunelveli Tamilnadu
Mit/WP/02	RHR	1	1.25	1.25	Suzlon	Gadag, Karnataka
Mit/WP/03	PPEPL	2	0.25	0.50	Chirajjeevi Wind Energy Ltd.	Tirunelveli Tamilnadu
		2	0.25	0.50		
		1	0.25	0.25		
Mit/WP/04	RDCPL	1	0.6	0.6	Suzlon	Sangli, Maharashtra
Mit/WP/05	SSM	1	0.6	0.6	Enercon	Tirunelveli, Tamilnadu
Mit/WP/06	KTL	1	0.8	0.8	Enercon	Tirunelveli, Tamilnadu
Mit/WP/07	CJPC	1	1.5	1.5	Suzlon	Nandurbar, Maharashtra

Mit/WP/08	VSL	1	0.6	0.6	Suzlon	Nandurbar, Maharashtra
Mit/WP/09	MJA	1	0.350	0.350	Suzlon	Jaisalmer, Rajasthan
Mit/WP/10	AGGU	1	0.350	0.350	Suzlon	Jaisalmer Rajasthan
Mit/WP/11	AA	1	1.25	1.25	Suzlon	Nandurbar, Maharashtra
Mit/WP/12	HEPL	1	1.25	1.25	Suzlon	Dhule Maharashtra
Mit/WP/13	RID	1	1.25	1.25	Suzlon	Dhule Maharashtra
Mit/WP/14	HS	1	1.25	1.25	Suzlon	Nandurbar Maharashtra
Mit/WP/15	PRP	2	1.25	2.5	Suzlon	Nandurbar Maharashtra
Mit/WP/16	PE	1	0.6	0.6	Suzlon	Sangli, Maharashtra
Mit/WP/17	SPAIPL	1	0.6	0.6	Suzlon	Sangli, Maharashtra
Mit/WP/18	FAPL	1	0.35	0.35	Suzlon	Jaisalmer Rajasthan
	Total	**24**		**17.45**		

Purpose of the project activity

The main purpose of the project activity is to generate electrical energy through sustainable means using wind power resources, to utilize the generated output for selling it to the state electricity utility and to contribute to climate change mitigation efforts. Apart from generation of renewable electricity, the project has also been conceived for the following:

- To enhance the propagation of commercialisation of wind turbines in the region
- To contribute to the sustainable development of the region, socially, environmentally and economically
- To reduce the prevalent regulatory risks for this project through revenues from emission trade

Contribution of project activity to sustainable development

Government of India has stipulated following indicators for sustainable development in the interim approval guidelines[1] for VER projects.

1. Social well-being
2. Economic well-being

[1] Ministry of Environment and Forest web site: http://envfor.nic.in:80/divisions/ccd/VER_iac.html

3. Environmental well-being
4. Technological well-being

1. Social well being:

- The project would lead to the development of the region.
- During civil work, the project is expected to generate considerable employment opportunities for local population.
- Other than these, there are various kinds of mechanical work, which would generate employment opportunity on regular and permanent basis.

2. Economic well being:

- The project activity generates employment in the local area.
- The project activity leads to a good investment to a developing region which otherwise would not have happened in the absence of project activity.
- The generated electricity is fed into the 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.
- The project activity also leads to diversification of the national energy supply, which is dominated by conventional fuel based generating units.
- The project contributes to the economic sustainability around the plant site, which is promotion of decentralization of economic power.

3. Environmental well being:

- The project utilizes wind energy for generating electricity which otherwise would have been generated through alternate fuels (fossil fuel) based power plants, contributing to reduction in specific emissions (emissions of pollutant/unit of energy generated) including GHG emissions.
- As wind power projects produce no end products in the form of solid waste (ash etc.), they address the problem of solid waste disposal encountered by most other sources of power.
- 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.

4. Technological well being:

- There is continuous research and development on the geometry of the wind blades, height of towers, diameters of towers, etc., which augurs well for the technological well being in the development of wind energy to produce clean electricity.
- Advancement in wind power production encourages research on improved performance of turbines at low to medium wind speeds and improved capacity utilisation, cost reduction and high reliability, and increased life of turbines.

In view of the above, the project participants consider that the project activity profoundly contributes to the sustainable development.

A.3. Project participants:

Name of the 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)
India (Host)	Vindhya Spinning Mills (P) Ltd	No.
	Rameshkumar Hanjarimal Rathod	
	Prima Papers & Engineering Pvt. Ltd	
	Rathi Dye Chem Pvt. Ltd	
	Sarvana spinning Mills	
	Kumaragiri Textiles Ltd	
	Chhotabhai Jethabhai Patel & Co	
	Vijay S. Lodha	
	M J Associates	
	Adarsha Gaur Gum Udyog	
	Amar Associates	
	Hermes Electronics Pvt. Ltd.	
	Raj Infrastructure Developers	
	Hotel Sheetal	
	P. R. Patil	
	Preetam Enterprises	
	Shree Panchganga Agro Impex Pvt. Ltd	
	Fashion Apparels Pvt. Ltd.	

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party (ies):

India

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

Tamilnadu, Maharashtra, Rajasthan and Karnataka

A.4.1.3. City/Town/Community etc:

As per Table 1 in A.4.1.4 of the PDD

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

Table No. 1: Detail of physical location

S. No	Project promoter	Capacity (MW)	Commissioning Date	Survey No	Unique Number	Village	District	State
1	Vindhya Spinning Mills Private Limited (VSPML)	0.5	21/07/2006	582/4,5,6(P), 7(P) & 11(P)	1955	Eladhur	Tirunelveli	Tamilnadu
		0.6	28/09/2006	58/4 (P) & 58/5 (P)	2044	Mangalam	Tirunelveli	Tamilnadu
2	Rameshkumar Hanjarimal Rathod (RHR)	1.25	31/03/2006	244/20,	K-244	Kappathguda	Gadag	Karnataka
3	Prima Papers & Engineering Pvt. Ltd (PPEPL)	0.25	30/09/2005	499/2DP	1497	Kurungulum	Tirunelveli	Tamilnadu
		0.25	30/09/2005	681/1F3, 1G	1498	Kurungulum	Tirunelveli	Tamilnadu
		0.25	31/03/2006	463/1A, 3S	1853	Pazahoor	Tirunelveli	Tamilnadu
		0.25	31/03/2006	465/1, 466	1854	Kurungulum	Tirunelveli	Tamilnadu
		0.25	29/04/2006	409/8(P), 391 (P)	1911	Kurungulum	Tirunelveli	Tamilnadu
4	Rathi Dye Chem Pvt. Ltd (RDCPL)	0.6	30/06/2006	Gut No-137/P	W-56	Garjewadi	Sangli	Maharashtra
5	Sarvana Spinning Mills (SSM)	0.6	29/12/2004	SF-503/1&2	277	Penagudi	Tirunelveli	Tamilnadu
6	Kumaragiri Textiles Ltd (KTL)	0.8	31/12/2005	SF-718/4		Chinnaputhur	Tirunelveli	Tamilnadu
7	Chhotabhai Jethabhai Patel & Co (CJPC)	1.5	23/02/2007	RS-72	K-339	Gangapur	Nandurbar	Maharashtra
8	Vijay S. Lodha (VSL)	0.6	30/09/2006	RS-55	K-315	Aichale	Nandurbar	Maharashtra
9	M J Associates (MJA)	0.35	29/03/2007	J-152		Jaisalmer	Jaisalmer	Rajasthan
10	Adarsha Gaur Gum Udyog (AGGU)	0.35	29/03/2007	J-154		Jaisalmer	Jaisalmer	Rajasthan
11	Amar Associates (AA)	1.25	11/5/2006	Gut No-27/P	K-390	Dhandane	Nandurbar	Maharashtra
12	Hermes Electronics Pvt. Ltd. (HEPL)	1.25	29/03/2006	RS - 46	J-30	Phophade	Dhule	Maharashtra
13	Raj Infrastructure Developers (RID)	1.25	13/08/2006	RS - 90	J-131	Chhadvel	Dhule	Maharashtra
14	Hotel Sheetal (HS)	1.25	29/09/2006	RS-264	K-085	Aichale	Nandurbar	Maharashtra
15	P. R. Patil (PRP)	1.25	26/09/2006	RS-170	K-389	Mandal	Nandurbar	Maharashtra
		1.25	1/11/2006	RS-120	K-384	Gangapur	Nandurbar	Maharashtra
16	Preetam Enterprises (PE)	0.6	31/07/2006	RS-54	W-14	Wagholi	Sangli	Maharashtra
17	Shree Panchganga Agro Impex Pvt. Ltd (SPAIPL)	0.6	31/03/2006	RS-97	W-13	Shelkewadi	Sangli	Maharashtra
18	Fashion Apparels Pvt. Ltd. (FAPL)	0.35	30/03/2006	J-364		Pohra	Jaisalmer	Rajasthan
	Total	17.45						

Table No. 2: Geographical Location of Each District Where WTGs are Installed

District	Latitude	Longitude	Color code
Gadag (Karnataka)	14º 14´ N	76º 24´ E	

District	Latitude	Longitude	Color code
Tirunelveli (Tamil Nadu)	08º 10´ N	77º 26´ E	
Sangli (Maharashtra)	16º 52´ N	74º 34´ E	
Dhule & Nandurbar (Maharashtra)	20º 54´ N	74º 47´ E	
Jaisalmer (Rajasthan)	26º 55´ N	70º 54´ E	

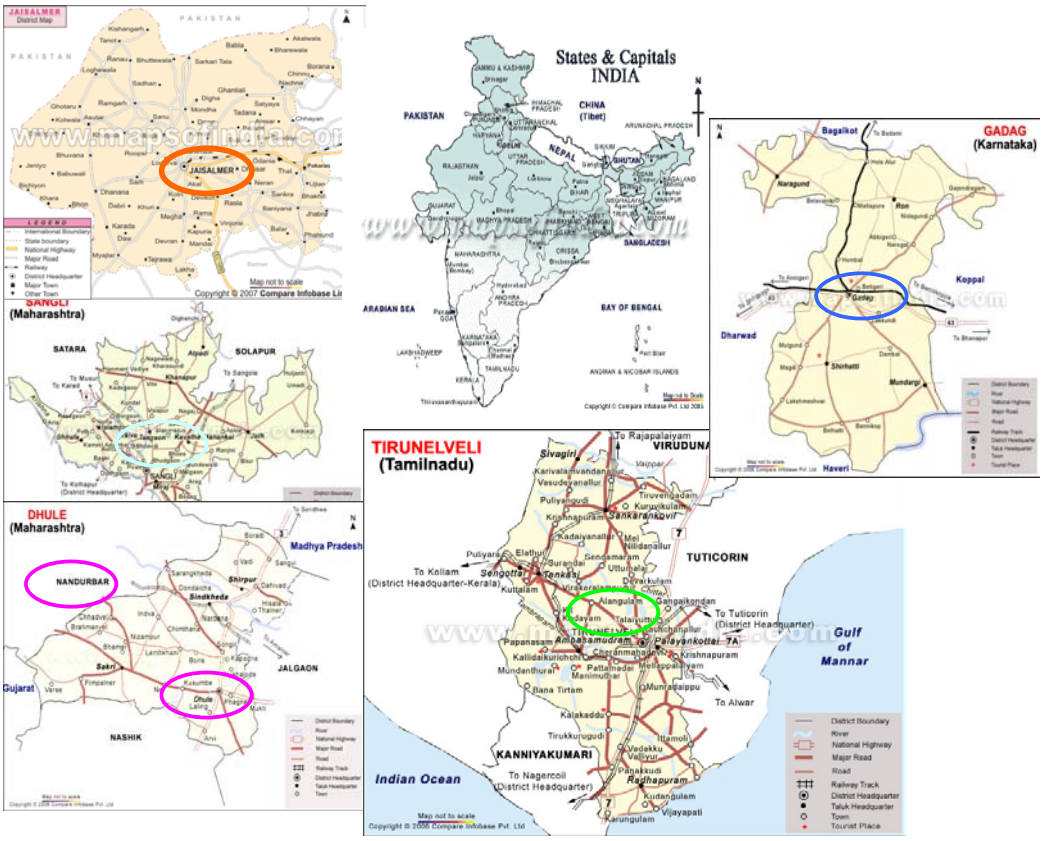


Figure 1: Location of Wind Turbines

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

The project activity is electricity generation from wind energy, which is a renewable resource the generated electricity is then supplied to the grid. The project hence can be considered under "Grid-connected electricity generation from renewable sources". The project activity has a capacity more than 15 MW (limit for small scale project). Therefore as per the scope of the project activities enlisted in the list of sectoral scopes and related approved baseline and monitoring methodologies, the project activity is a large scale project and may principally be categorized in Scope Number 1, Sectoral Scope – Energy Industries (renewable/non-renewable sources) and as per Voluntary Carbon Standard-1 the project activity falls under Renewable energy [wind, PV, solar thermal, biomass, liquid biofuels, geothermal, run-of river hydro].

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

Technology:

The wind turbine converts wind power to electricity. The project activity consists of state-of-the-art environmentally safe and sound technology by the Vestas, Suzlon, Chiranjeevi Wind Energy Ltd and Enercon make. These are based on the principle; the wind spins blades that are attached to a hub and turns as blades turn. Together, the blades and hub are called the rotor. The turning rotor spins a generator, producing electricity. There is also a controller that starts and stops the turbine blades. The generator, controller, and other equipments are found inside a covered housing (nacelle) directly behind the turbine blades. Outside, an anemometer measures wind speed and feeds this information to the controller. Wind turbines begin to turn with 'Cut-in-wind speeds". They automatically shut off at "cut-out wind speed" since anything above this speed is too hard on the machinery. The technology is a clean, indigenous and safe technology since there are no GHG emissions associated with the electricity generation. There is no technology transfer to the host country.

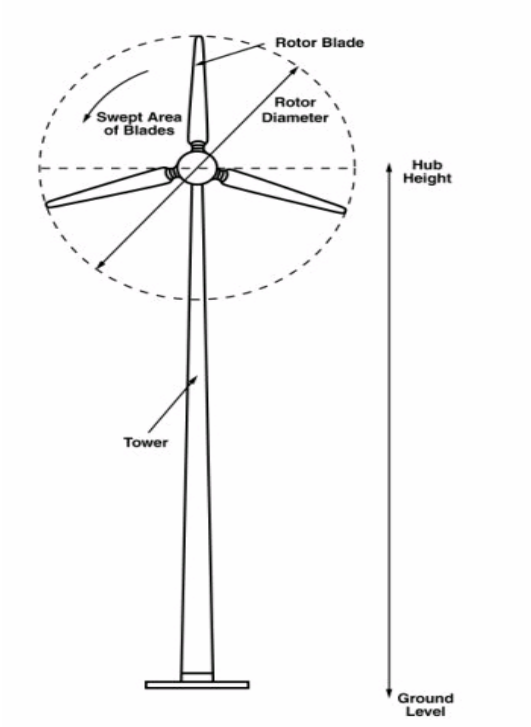


Figure 2: Wind Turbine: Schematic

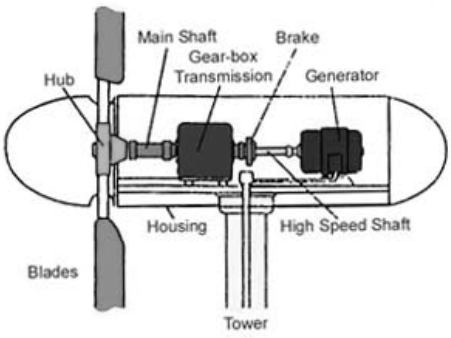


Figure3: Simplified Diagram of Wind Turbine Generator

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

Year	Annual estimation of emission reductions * in

	tonnes of CO_2 e
2004-05	1209
2005-06	11376
2006-07	36977
2007-08	37723
2008-09	37723
2009-10	37723
2010-11	37723
2011-12	37723
2012-13	37723
2013-14	37723
Total estimated reductions (tonnes of CO_2 e)	**313623**
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	31362
* Annual estimations for 2004-05 & 2005-06 are real however 2007 onwards are based on minimum generation guarantee provided by the WTG providers	

A.4.5. Public funding of the project activity:

The project has not received any public funding from Annex I countries and Official Development Assistance (ODA). The project is a unilateral 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:

Title: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Baseline Methodology - "Consolidated Baseline Methodology for grid connected electricity generation from renewable sources"
Monitoring Methodology – "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources"

Reference: Revision to the approved consolidated baseline methodology ACM0002
(Version 06: 19 May 2006)
Sectoral Scope : 1-Energy Industries (renewable/non-renewable sources)

It has been referred from the list of approved methodologies for CDM project activities in the UNFCCC CDM website (http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html).

VCS Category: Renewable energy [wind, PV, solar thermal, biomass, liquid biofuels, geothermal, run-of river hydro].

The additionality of the project has been justified using the additionality Test, applicable to Category "Renewable Energy (Wind)", as defined in the VCU Verification Criteria 10.A.

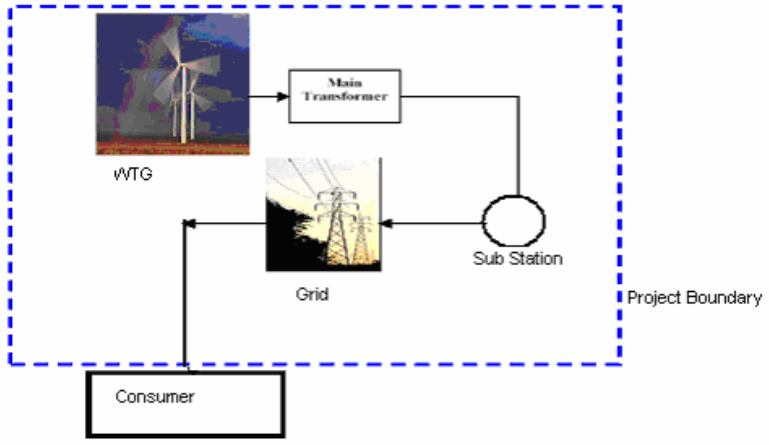
B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The project activity is a bundled wind power project of total installed capacity of 17.45 MW hence "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" ACM0002 is applicable for this project. This methodology includes electricity capacity additions from renewable sources such as:

- Run-of-river hydro power plants; hydropower projects with existing reservoirs where the volume of the reservoir is not increased (Not applicable).
- 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/m^2 (Not applicable).
- **Wind sources;** (present project falls under this category)
- Geothermal sources (Not applicable)
- Solar sources (Not applicable).
- Wave and tidal sources (Not applicable).
- Geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available (Not applicable).

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

Project boundary specified is encompasses the physical, geographical site of the renewable generation source. This includes the wind turbine installation, main transformer, sub-stations and the respective grid. The proposed project activity evacuates the power to the Regional Grid. Therefore, all the power plants contributing electricity to the Regional Grid are taken in the connected (project) electricity system for the purpose of baseline estimation.



Sources of Gases:

	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.
		HFC_s	Excluded	Excluded for simplification. This is conservative.
		PFC_s	Excluded	Excluded for simplification. This is conservative.
		SF_6	Excluded	Excluded for simplification. This is conservative.
Project Activity	On-site fossil fuel consumption due to the implementation of the project	CO_2	Excluded	This source is not required to be estimated under ACM0002 for wind energy projects.
		CH_4	Excluded	Estimates not required
		N_2O	Excluded	Estimates not required

There are three choices available for choosing the grid system for the project activity,

1) National grid,
2) Regional grid; or
3) State grid.

In India, electricity is a concurrent subject between the State and the Central Governments. The perspective planning, monitoring of implementation of power projects is the responsibility of Ministry of Power, Government of India. At the state level the state utilities or State Electricity Boards (SEBs) are responsible for generation, transmission, and distribution of power. With power sector reforms there have been unbundling and privatisation of this sector in many states. Many of the state utilities are engaged in power generation also. In addition, there are different central / public sector organizations involved in generation like National Thermal Power Corporation (NTPC), National Hydro Power Corporation (NHPC), etc. in transmission e.g. Power Grid Corporation of India Ltd. (PGCIL) and in financing e.g. Power Finance Corporation Ltd. (PFC).

Description of the project boundary:
There are five regional grids: Northern, Western, Southern, Eastern and North-Eastern. Different states are connected to one of the five regional grids as shown in the Table below:-

States connected to different regional grids:

Regional grid	*Northern*	*Western*	*Southern*	*Eastern*	*North Eastern*
States	Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab,	Gujarat, Madhya Pradesh,	Andhra Pradesh, Karnataka,	Bihar, Orissa, West	Arunachal Pradesh, Assam,

	Rajasthan, Uttar Pradesh, Uttaranchal, Delhi	Maharashtra, Goa, Chattishgarh	Kerala, Tamil Nadu,	Bengal, Jharkhand	Manipur, Meghalaya, Mizoram, Nagaland, Tripura

The management of generation and supply of power within the state and regional grid is undertaken by the State Load Dispatch Centres (SLDC) and Regional Load Dispatch Centres (RLDC). Different states within the regional grids meet the demand from their own generation facilities plus generation by power plants owned by the central sector i.e. NTPC and NHPC etc. Specific quota is allocated to different states from the Central sector power plants. Depending on the demand and generation there are exports and imports of power within different states in the regional grid. Thus there is an exchange of power among states in the regional grid. Similarly there exists imports and export of power between regional grids.

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

"Consolidated baseline methodology for grid-connected electricity generation from renewable sources" ACM0002 (Version 06) classifies project activities under two heads

- *Project activities that do not modify or retrofit an existing electricity generation facility*

And

- *Project activities that modify or retrofit an existing electricity generation facility*

The present project activity falls under the former class since all the WTGs included in this project have been commissioned as new units and no modification or retrofitting of existing WTGs is involved.

Hence the baseline scenario in this case is identified as:

"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)"

The baseline emission factor (EF_y) (ex-ante) is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors.

Following information is used for baseline determination:

Sr. No.	Key Information/data used for baseline	Source of data/information
1.	Electricity supplied to the grid by the project	Monthly Meter Reading
2.	Western Regional Grid	CO_2 Baseline Database for the Indian Power Sector User Guide, Draft, Version 2.0 (21st June 2007) Central Electricity Authority, Government of India.
3.	Southern Regional Grid	
4.	Northern Regional Grid	

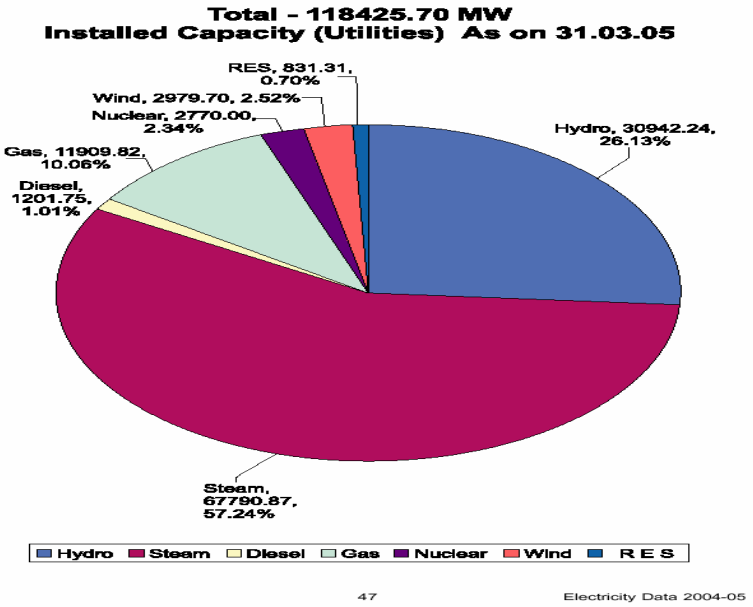
B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

The VCU Additionality Test, as defined in the VCU Verification criterion 10.A, has been applied for demonstration of additionality.

1. **The project is not common practice.**

- Provision of underlying service or product with the project technology does not exceed 51% in the defined market area (Barrier due to prevailing practices).

The net installed capacity in India is amounted to 118425.70 MW as on 31.03.2005, which includes steam 67790.88 MW, hydro 30942.24 MW, 1 Diesel 1201.75 MW, gas 11909.82 MW, Nuclear 2770 MW, wind 2979.70 MW, Biomass Power 727.53 MW, Biomass gasifier 61.80 MW and urban and industrial waste 41.98 MW. The percentage of installed capacity of hydro, thermal, nuclear & non conventional energy sources has been 26.13%, 57.24 %, 2.34[1]% and 3.22% respectively during the year.



Source: Central Electricity Authority, General Review 2006, page – 47

Up to the end of 31/08/2007, (a) the total installed capacity of India is 1,35,401.63 MW which includes 86,975.84 MW from thermal 64.5 % (Coal – 71,932.38 MW, Gas - 13.841.71 MW and Oil – 1,201.75 MW ie. 53.4%, 10.2 % and 0.9 % respectively), 34,130.76 MW from Hydro (24.8%), Nuclear – 4,120 MW (3.1 %) Renewable – 10175.03 (7.6%).

[1] Central Electricity Authority, General Review 2006;
http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

This clearly demonstrates that the wind power in India is not a common practice.

- Business-as-usual technology options are clearly defined and their position on the market proven by official Statistics.

In the Indian Power Sector, common practice involves investing mostly in medium or large-scale fossil fuel fired power projects (i.e. Thermal 64.5 % and Renewable 7.6 %). This is mainly due to the assured return on investment, economies of scale and easy availability of finances. This indicates that investing in projects of this nature (wind) is not a common practice. The above statistics provides from the Central Electricity Authority of India outlining the share of thermal fossil fuel fired power plant vs. wind power. This can be clearly demonstrated from Table no. 2.4 - CEA General Review 2006 which gives the installed electricity generation capacity (utilities only) prime mover wise / state wise as on 31/03/2005.

Region	State	Installed Capacity of Wind (MW)	Total MW in Region	% in Region	Total (MW) in State	% in State
Northern	Rajasthan	263.2	32478.5	**0.8**	3813.9	6.9
Western	Maharashtra	411.2	33242.8	**1.2**	13368.6	3.1
Southern	Karnataka	276.0	31876.4	**0.9**	5934.8	4.7
	Tamilnadu	1677.4	31876.4	**5.3**	8315.3	20.2

The above statistics shows that the installation of the wind power for Rajasthan (Northern), Maharashtra (Western), Karnataka & Tamilnadu (Southern) is 0.8 %, 1.2 %, 0.9 & 5.3 % respectively is not a common practice in the region.

This clearly shows that wind technology till 2005 was not a business as usual scenario in Northern region, Western region & Southern region.

2. The project is not required by regulation

- Local or National Legislation does not require the production of the underlying service or product with the chosen technology.

There is no National Legislation that requires the production of wind power energy.

- Additionally, the Project should not have been undertaken to meet a formal or voluntary target imposed by government regulation or under agreement with a government agency (e.g. the auto manufacturers and the EU, where companies agree to meet reduction targets voluntarily through their industry association).

Government regulation has not imposed a target. There is no regulation in place to enforce this target.
Even though government has taken initiatives to promote renewable energy the country there is no regulation in place to enforce this target.

- Carbon credits should not be the by-product from the creation of an ancillary environmental asset and/or financial instrument (e.g. renewable energy credits).

The credits are not the by-product of renewable energy credits or other environmental asset / financial instrument.

- The emission reductions from the project must not have been used against any voluntary corporate emission reduction targets.

The emission reductions were not used against any voluntary corporate emission reduction targets.

- Project is not a downstream energy efficiency project in a jurisdiction with a mandatory GHG emissions cap on upstream electricity generators.

There are no mandatory GHG emissions caps imposed by the local jurisdiction.

3. The project is not the least cost option for providing the underlying product or service.

- Companies shall provide calculations that illustrate that the project is not the Least Cost Option. (Investment barrier)

i) High capital cost

In India the wind power project involves high capital cost. The capital cost of wind energy is more for setting up of renewable energy plant compare to other fossil fuel fired sources. Moreover, the plant load factor[2] of wind energy ranges from 13 – 30 %. Fiscal benefits such as depreciation are equally applicable for all renewable energy projects. This results into lower rate of return on the investment. Following table cost to demonstrate the fact.

Total cost for installation of wind power generation is higher, primarily because of higher investment, low PLF, higher transmission / wheeling charges need to create infrastructure at remote location etc. India[3].

CPPs – Installation Cost & PLF

Source	Estimated Installation Cost / MW in Crores	Plant Load Factor (PLF) in %
Coal	Rs. 4.25 to 4.50	75 to 80
LDO	Rs. 0.75 to 1.0	15 to 60
FO	Rs. 1 to 1.2	20 to 65
HFO	Rs. 1 to 1.5	20
Naphtha	Rs. 3.5 to 4.1	70 to 75
Natural Gas	Rs. 4.25 to 5	75 to 85
Wind (for project activity)	Rs. 5.34	13 to 30

The above figures in table clearly shows the least cost option available for generation of electricity with the use of fossil fuels, which are the source of the GHG's. The cost for wind power project is much higher as compare to the fossil fuel based power plants. Project proponent has chosen windmill project for power generation as cleanest alternative in spite of higher financial investments and other barriers associated with it. There are many risk involved in the present project (ie Financial, Technological etc), all this makes the project difficult to acquire loans from banks. These problems increase the financial difficulties of the project.

Also as wind energy is a clean energy; it is a costlier option, especially in India where availability of coal is abundance. Due to high capital cost & low PLF per unit power generation cost is higher compared to

[2] http://www.cbmjournal.com/content/2/1/8/table/T5

[3] Center of Monitoring India Economy, Energy 2002 (http://powermin.nic.in/research/pdf/captive_powerplants.pdf)

other fuel options such as coal. A comparative study of costs of electricity generation from different alternatives of power production is given below.

S.No.	Source	Power Generation cost/ kWh
Alt-1	Coal	Rs 2.27/ kWh
Alt-2	**Wind Energy**	**Rs 3.39/ kWh***
Basis: ***Alt-1: UNFCCC reference-1009: 3.7 MW Bundled Wind Power Project at Priyadarshini Polysacks Ltd. Dhulia District Maharashtra : http://cdm.unfccc.int/Projects/DB/RWTUV1174400034.93/view.html*** ***Alt-2: Calculated for project activity***		

The above table demonstrate the fact that the cost per unit generation for the alternative 1 (ie. Coal) is lower than the cost per unit generation for the alternative 2 (ie Wind Energy). This explained that the present project activity was not a Business-As-Usual case [i.e. Thermal 64.5 % with PLF 75-80% (Rs. 2.27 / kWh) and Renewable - Wind 7.6 % with PLF 13-30 % (Rs. 3.39 / kWh]. The project proponent who had to overcome the barriers and take a huge risk to put up the project activity considering the knowledge of carbon credit benefits helped them to make the decision easier towards setting up this renewable energy project.

The present project activity with installed capacity of 17.45 MW is not a least cost option available in India is demonstrated through above information hence it is additional.

ii) Less capacity utilization factor:

Though the potential locations for wind turbine installations are identified through detailed micrositing by reputed organizations in the country, the capacity utilization factor of the wind turbines in the country is 13 to 30 % while that of thermal power is 75-80 %. Low capacity factors,[4] and still lower dependable on-peak capacity factors, are a source of wind power's cost problem.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The baseline emission (BE_y in tCO_2) is the product of the baseline emission factor (EF_y in tCO_2/MWh) times the electricity supplied by the project activity to the grid (EG_y in MWh) minus the baseline electricity supplied to the grid in the case of modified or retrofit facilities (*EG baseline* in MWh), as follows:

$$\mathbf{BE_y = (EG_y - EGbaseline\ ) \times EF_y}$$

Since the following project does not involve any modification or retrofit of the existing generation facility hence **EGbaseline = 0**

EFy is determined as follows:

[4] http://www.downtoearth.org.in/full6.asp?foldername=20040630&filename=news&sec_id=18&sid=28

The weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$\mathbf{EF_y = w_{OM} * EF_{OM,y} + w_{BM} * EF_{BM,y}}$$

where the weights w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$), and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 below and are expressed in tCO_2/MWh.

For wind and solar projects, the default weights are as follows: $w_{OM} = 0.75$ and $w_{BM} = 0.25$ (owing to their intermittent and non-dispatchable nature).

$$\mathbf{EF_y = 0.75 \times EF_{OM,y} + 0.25 \times EF_{BM,y}}$$

Where,
EFy = baseline emission factor
BE_y = baseline emissions in tCO_2
$EF_{OM,y}$ = Operating Margin Emission Factor
$EF_{BM,y}$ = Build Margin Emission Factor

1. Calculation of operating margin emission factor for the region based on simple OM

For calculation of operating margin four options are available:
(a) Simple operating margin;
(b) Simple adjusted operating margin;
(c) Dispatch data analysis operating margin;
(d) Average operating margin.

According to ACM0002 / version 06 dispatch data analysis should be the first choice but for the current project, dispatch data analysis cannot be used because of unavailability of data.

The simple OM method was used as the low-cost/must run resources constitute less than 50% of the total grid generation of Western, Northern and Southern Grid in average of the five most recent years.

The simple OM emission factor ($EF_{OM,\ simple,\ y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh or MU) of all generating sources serving the system, not including low-operating cost and must-run power plants.

$$\mathbf{EF_{OM,y} = \frac{\sum F_{i,j,y} * COEF_{i,j\,y}}{\sum GEN_{j,y}}}$$

Where:

$\mathbf{F_{i,j,y}}$ 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,

$\mathbf{COEF_{i,j\ y}}$ is the CO_2 emission coefficient of fuel i (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y, and

$\mathbf{GEN_{j,y}}$ is the electricity (MWh or MU) delivered to the grid by source j.

The CO_2 emission coefficient $COEF_i$ is obtained as

$$\mathbf{COEF_i = NCV_i * EF_{CO2,i} * OXID_i}$$

Where:

$\mathbf{NCV_i}$ - is the net calorific value (energy content) per mass or volume unit of a fuel *i*,

$\mathbf{OXID_i}$ - is the oxidation factor of the fuel.

$\mathbf{EF_{CO2\ ,i}}$ - is the CO_2 emission factor per unit of energy of the fuel *i*.

2. Calculation of build margin factor for the region (ex ante):

Build margin can be calculated as the generation weighted average emission factor (tCO_2/MWh or MU) of a sample of power plant *m, as follows:*

$$\mathbf{EF_{BM,\,y}} = \frac{\mathbf{\sum F_{i,m,\,y} * COEF_{i,\,m}}}{\mathbf{\sum GEN_{m,\,y}}}$$

Where,

$\mathbf{F_{i,m,,y}}$, $\mathbf{COEF_{i,m}}$ are analogous to the variables described for the simple OM method for plants *m.*

3. Baseline emission factor (EF y)

The baseline emission factor EFy is calculated as the weighted average of the operating margin emission factor ($EF_{OM,\ simple,\ y}$) and the build margin emission factor ($EF_{BM,\ y}$), where the weights w_{OM} and w_{BM}, by default, are 75% w_{OM} & 25% w_{BM}, and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2/MWh or MU.

$$\mathbf{EF_y = 0.75\ x\ EF_{OM,y} + 0.25\ x\ EF_{BM,\,y}}$$

Data used for arriving at the $\mathbf{EF_y}$

Values for all regional grids for FY 2003-2004 until FY 2005-2006, including inter-regional and cross-border electricity transfers. (CEA, User Guide: Version 2)See Annex-III

$$\mathbf{BEy = EG_y * EF_y}$$

Where:

$\mathbf{EG_y}$ - is the net quantity of electricity generated by the project in year y, and
$\mathbf{EF_y}$ – is the carbon emission factor of the Grid

The grid emission factor for Indian power sector for the year 2006 has been calculated by CEA version 2.

Emission reduction due to project activity

Emission Reduction = Baseline Emission – Project Emission – Leakage

As wind power projects fall under clean energy sources for electricity generation, the emission from the project is taken as zero.

Leakage estimation is also not required.

Therefore:

Grid Emission Factor
For Western Region
$EF_y = w_{OM} * EF_{OM,y} + w_{BM} * EF_{BM,y}$
$EF_y = 0.75 \times EF_{OM,y} + 0.25 \times EF_{BM,y}$
$= 0.75 \times 0.9967 + 0.25 \times 0.63 = 0.905\ tCO_2/MWh$

Similarly for Southern and Northern regions the grid emission factors are

Southern Regional Grid- 0.930 tCO_2/MWh
Northern Regional Grid – 0.889 tCO_2/MWh

Baseline emissions or VERs generated by the project are estimated to be:

Baseline Emissions $_{(project)}$ = Grid Emission Factor * Power Generated from the Project
(tons of CO_2) *(tons of CO_2/MWh)* *(MWh/year)*

The value of Power Generation from the Projects when all WTGs are commissioned (Year 2008) is given in MWh in above equation.

Estimated Baseline

$BE_y = EG_y \times EF_y$

VER for $_{Western\ Region)}$ = 27000 (MWh) x 0.905 (tCO_2/MWh)
= 24435 tCO_2/y
VER for $_{(\ Southern\ Region\ )}$ = 12435 (MWh) x 0.930 (tCO_2/MWh)
= 11555 tCO_2/y
VER for $_{(\ Northern\ Region\ )}$ = 1950 (MWh) x 0.889 (tCO_2/MWh)
= 1733 tCO_2/y

The project activity is likely to export electricity at an average of 41.38 GWh annually.

EG_y = Minimum expected generation guarantee supplied by WTG manufacturer.

Total VERs = (Western region) + (Southern region) + (Northern region)
24435 + 11555 + 1733 = 37723

The project activity is displacing 41.38 GWh from the Western, Southern and Northern regional grids.

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

Data / Parameter:	**EFy**
Data unit:	t CO_2/MWh
Description:	Grid emission factor of the Western, Southern and Northern Grid
Source of data used:	calculated
Value applied:	0.905, 0.930 & 0.889
Justification of the choice of data or description of measurement methods and procedures actually applied :	The values for OM and BM have been calculated by Ministry of Power, Central Electricity Authority hence are authentic and reliable. http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm The EF calculation is based on the guidelines in ACM0002 (Version 06)
Any comment:	The values are for the year 2005-06

Data / Parameter:	**$EF_{OM,y}$**			
Data unit:	t CO_2/MWh			
Description:	CO_2 operating margin (Including import) emission factor of the Western, Southern, Northern Grid			
Source of data used:	CO_2 Baseline Database for the Indian Power Sector, User Guide, Version 2.0, CEA			
Value applied:	Region	2003 - 04	2004 - 05	2005 - 06
	Western	0.99	1.01	0.99
	Southern	1.0	1.0	1.01
	Northern	0.99	0.98	0.99
Justification of the choice of data or description of measurement methods and procedures actually applied :	The values have been calculated by Ministry of Power, Central Electricity Authority hence are authentic and reliable. http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm			
Any comment:	The values are for the year 2005-06			

Data / Parameter:	**$EF_{BM,y}$**
Data unit:	t CO_2/MWh
Description:	CO_2 build margin emission factor of the Western, Southern, Northern Grid
Source of data used:	CO_2 Baseline Database for the Indian Power Sector, User Guide, Version 2.0, CEA
Value applied:	0.63, 0.71, 0.60

Justification of the choice of data or description of measurement methods and procedures actually applied :	The values have been calculated by Ministry of Power, Central Electricity Authority hence are authentic and reliable. http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
Any comment:	The values are for the year 2005-06

B.6.3 Ex-ante calculation of emission reductions:

The emission reductions from the project activity are calculated in the following steps:

Step 1: Calculating the Operating Margin emission factor ($EF_{OM,y}$)

According to ACM0002, Baseline emission factor is calculated as combined margin, consisting of a combination of operating margin (OM) and build margin (BM) factors.
The operating margin emission factor has been calculated using 3 years data calculated by Central Electricity Authority (CEA) in their CO_2 baseline database.
The $EF_{OM,Y}$ is estimated to be:

Thus the $EF_{OM,Y}$ for Western Region Grid based on three years average is estimated to be **0.998tCO_2/MWh**
Thus the $EF_{OM,Y}$ for Northern Region Grid based on three years average is estimated to be **0.985 tCO_2/MWh**
Thus the final $EF_{OM,Y}$ for Southern Region Grid based on three years average is estimated to be **1.003 tCO_2/MWh**

Step 2: Calculation of the Build Margin Emission Factor $EF_{BM,Y}$

The $EF_{BM,y}$ is estimated as **0.630, 0.600 and 0.711 tCO_2/MWh, for Western, Northern and Southern respectively** (with sample group m constituting most recent capacity additions to the grid comprising 20% of the system generation) for the year 2005-06, as given by CEA.

Step 3:. Calculation of Baseline Emission Factor EF_y

2. Grid Emission Factor
Calculate the baseline emission factor $EF_{y\ as}$ the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$\mathbf{EF_{,y} = w_{OM} * EF_{OM,y} + w_{BM} * EF_{BM,y}}$
Where the weights w_{OM} and w_{BM} are 75% and 25% respectively, and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2/MWh.

Western Regional Grid (Maharashtra) – 0.905 T CO_2/MWh

Southern Regional Grid (Karnataka, Tamilnadu) - 0.930 T CO_2/MWh
Northern Regional Grid (Rajasthan) – 0.889 T CO_2/MWh

Baseline emissions or VERs generated by the project are estimated to be:

Baseline Emissions $_{(project)}$ **= Grid Emission Factor * Power Generated from the Project**
(tons of CO2) *(tons of CO2/MWh)* *(MWh/year)*

Note: The value of Power generated from the project is based on minimum generation guarantee provided by the WTG providers (refer B.6.1 for calculations).

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

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of overall emission reductions* (tonnes of CO_2 e)
2004-05	0	1209	0	1209
2005-06	0	11376	0	11376
2006-07	0	36977	0	36977
2007-08	0	37723	0	37723
2008-09	0	37723	0	37723
2009-10	0	37723	0	37723
2010-11	0	37723	0	37723
2011-12	0	37723	0	37723
2012-13	0	37723	0	37723
2013-14	0	37723	0	37723
Total	0	**313623**	**0**	**313623**

* Annual estimations for 2004-05 & 2005-06 are real however 2007 onwards are based on minimum generation guarantee provided by the WTG providers

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
Description:	Electricity supplied to the grid by the project. Net Electricity export by the project annually (obtained from joint meter reading by Regional electricity board and project promoter on monthly basis). Note: Net Electricity Export to grid = Electricity export to grid – Electricity import from grid – Electricity Losses, if any (Transmission and Distribution losses)

Source of data to be used:	Measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	--
Description of measurement methods and procedures to be applied:	Monitoring: trivector meter will be used for monitoring Data Type: measured Frequency: hourly measured Recording: Monthly from joint meter Archiving Policy: Paper & Electronic Responsibility: Project Head would be responsible for regular calibration of the meter. Calibration Frequency: Once a year.
QA/QC procedures to be applied:	The project revenue is based on the net units displaced as measured by main metering system installed at the interconnection point (substation point). The meters used are calibrated periodically by state electricity utility. The net electricity exported to the grid can be cross verified with the joint meter readings also can be double checked with electricity sales receipt (Invoice)
Any comment:	Data will be archived during the whole crediting period + 2 years or of the last issuance of VERs for this project activity, whichever occurs later

B.7.2 Description of the monitoring plan:

"Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources" ACM0002 (Version 6) is applicable for the following project activity. The methodology requires monitoring of the following:

- Electricity generation from the proposed project activity;
  Applicable for the project.

- Data needed to recalculate the operating margin emission factor, if needed, based on the choice of the method to determine the operating margin (OM), consistent with "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);
  Not applicable as the values of Operating Margin and Build Margin Emission Factors have been calculated by the Central Electricity Authority.

- Data needed to recalculate the build margin emission factor, if needed, consistent with "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);
  Not applicable as the values of Operating Margin and Build Margin Emission Factors have been calculated by the Central Electricity Authority.

- For geothermal power projects, data needed to calculate fugitive carbon dioxide and methane emissions and carbon dioxide emissions from combustion of fossil fuels required to operate the geothermal power plant.
  Not applicable for the project.

- For new hydro electric power projects, the surface area of reservoir at the full reservoir level.
  Not applicable for the project.

The project activity essentially involves generation of electricity from wind, the employed WEG can only convert wind energy into electrical energy and cannot use any other input fuel for electricity generation. Thus no special ways and means are required to monitor leakage from the project activity.

The proposed project activity requires evacuation facilities for sale to grid and the evacuation facility is essentially maintained by the state power utility.

- The primary recording of the electricity fed to the state utility grid will be carried out jointly at the incoming feeder of the state power utility. Machines for sale to utility will be connected to the feeder.

- The joint measurement will be carried out once in a month in presence of both parties (the developer's representative and officials of the state power utility). Both parties will sign the recorded reading. On the basis of joint meter reading, Invoice has been raised by project proponent. Invoice copy is considered as sale of net electricity to grid and same values are incorporated in emission reduction calculation sheet (excel calculation tool) for calculating the emission reduction and subsequently in monitoring report.

- The secondary monitoring, which will provide a backup (fail-safe measure) in case the primary monitoring is not carried out, would be done at the individual WEGs. Each WEG is equipped with an integrated electronic meter. These meters are connected to the Central Monitoring Station (CMS) of the entire wind farm through a wireless Radio Frequency (RF) network (SCADA). The generation data of individual machine can be monitored as a real-time entity at CMS. The snapshot of generation on the last day of every calendar month will be kept as a record both in electronic as well as printed (paper) form.

The project proponents have signed an "Operation and Maintenance" agreement with the supplier of the wind turbines for the operation of the wind farm. The O& M management structure is as follows:

Routine Maintenance Services:

Routine Maintenance Labour Work involves making available suitable manpower for operation and maintenance of the equipment and covers periodic preventive maintenance, cleaning and upkeep of the equipment including –

a) Tower Torquing
b) Blade Cleaning
c) Nacelle Torquing and Cleaning
d) Transformer Oil Filtration
e) Control Panel & LT Panel Maintenance
f) Site and Transformer Yard Maintenance

Security Services: This service includes watch & ward and security of the wind farm and the equipment.

Management Services:

a) Data logging in for power generation, grid availability, machine availability.
b) Preparation and submission of monthly performance report in agreed format.
c) Taking monthly meter reading jointly with utility, of power generated at wind farm and supplied to grid from the meter/s maintained by utility for the purpose and co-ordinate to obtain necessary power credit report/ certificate.

Technical Services:

a) Visual inspection of the WTG and all parts thereof.
b) Technical assistance including checking of various technical, safety and operational parameters of the equipment, trouble shooting and relevant technical services.
c) Annual and monthly training schedules are organized by the manufacturers and suppliers of the wind turbines.

The responsibilities of VER project team is presented below-

Designation	Responsibilities
Project Head	▪ Overall performance monitoring ▪ Project Execution
Project Executer and Controller	▪ Operation ▪ Verification of data ▪ Site visit to check authenticity of data and take corrective action wherever necessary ▪ Storage of Data
Site Main Controller	▪ Operation, Monitoring and Verification of data ▪ Data recording ▪ Storage of data
Operation and Maintenance Contractor	▪ Operation and Maintenance ▪ Data recording ▪ Storage of Data

Emergency preparedness procedures:

- During the operations and maintenance the health safety kits and first-aid-box with necessary medicines are ready available for 24 hours.

- Fire extinguishers are provided in all areas and refilled before their expiry dates. Safety training programs are arranged by Site manager once in six months to various persons including securities from state government fire service department persons.

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)

Baseline Completion Date: 14/08/2007

Name of person/entity determining the baseline: Project sponsors (as per Annex-1) & their consultant, MITCON Consultancy Services Ltd.

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:

29/12/2004 (the earliest date of start in the bundle – Sarvana Spinning Mills based on Commissioning Certificate)

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

20 years 0 months

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:

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:

29/12/2004 (the earliest date of start in the bundle – Sarvana Spinning Mills based on Commissioning Certificate)

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

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

Government of India in its notification[5] dated 14th September, 2006, has directed that "construction of new projects or activities or the expansion or modernization of existing projects or activities listed in the Schedule to the above mentioned notification entailing capacity addition with change in process and or technology shall be undertaken in any part of India only after the prior environmental clearance from the Central Government or as the case may be, by the State Level Environment Impact Assessment Authority, duly constituted by the Central Government".

Hence all new projects or expansion and modernization of existing projects or activities listed in category A and B of the Schedule to the notification has to obtain prior EIA clearance. Wind power projects have not been included in either of the categories thus these projects do not require to undertake environmental clearance prior to their installation.

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:

Brief review of the environmental impacts project activity is discussed below -

During construction phase

The construction phase involved erection of WEG in particular location. Although movement of materials for erection produced some dust pollution, the impacts were negligible and do not have any significant impact on the environment.

During operation phase

Impact on air

There are absolutely no negative impacts on air due to the project activity.

Impact on water

No water is consumed for the project activity and no effluent is discharged from the project activity and hence, there is no impact on water due to the project activity.

Impact on biodiversity

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

The installation of a wind farm does not cause negative impact on ecology. It does not affect flora and fauna in any way.

SECTION E. Stakeholders' comments

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

The promoters organized formal & informal stakeholder consultation with the objective to inform the local interested stakeholders which include villagers, technology suppliers, and farmers on the environmental and social impacts of the project activity and discuss their concerns related to the development and operation of the activity. Details are -

No.	Name of the Sponsor	Mode of Consultation (formal / informal)	Date
1	Vindhya Spinning Mills Private Limited	Formal	16/03/2007
2	Prima Papers & Engineering Pvt. Ltd	Formal	28/11/2006
3	Sarvana Spinning Mills	Formal	17/03/2007
4	Kumaragiri Textiles Ltd	Formal	16/03/2007
5	Chhotabhai Jethabhai Patel & Co	Formal	12/04/2007
6	Amar Associates	Formal	19/05/2007
7	Others	Informal	-

E.2. Summary of the comments received:

Once the project and process was informed, including the local job creation and benefits, the local stakeholders had no objections or negative comments relating to the project

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

There were no negative comments received therefore it was not necessary to incorporate the comments into the project design or alter the project in any way

Annex 1
CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

MITCON will act as a focal point for all communication with the project participants given bellow.

Organization:	Vindhya Spinning Mills (P) Ltd
Street/P.O.Box:	4, Shanmuga Nadar Road
Building:	Geethalaya Building
City:	Sivakasi
State/Region:	Tamilnadu
Postfix/ZIP:	626123
Country:	India
Telephone:	04562 – 222715
FAX:	04562 - 224682
E-Mail:	camel@md3.vsnl.net.in
URL:	www.vindhyamills.com
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	Kodiswaran
Middle Name:	A
First Name:	V
Department:	--
Mobile:	Not Available
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Organization:	Rameshkumar Hanjarimal Rathod
Street/P.O.Box:	Gujari Bazar
Building:	283 'B'
City:	Kolhapur
State/Region:	Maharashtra
Postfix/ZIP:	416002
Country:	India
Telephone:	0231 – 22543873, 2543877
FAX:	0231 - 2692535
E-Mail:	chandu@rathodarts.com
URL:	www.rathodarts.com
Represented by:	
Title:	Proprietor
Salutation:	Mr.
Last Name:	Rathod
Middle Name:	K

First Name:	Hanjarimal
Department:	--
Mobile:	Not Available
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Organization:	Prima Papers & Engineering Pvt. Ltd
Street/P.O.Box:	Budhawar Peth
Building:	774, 'Chaitanya'
City:	Pune
State/Region:	Maharashtra
Postfix/ZIP:	411002
Country:	India
Telephone:	020 – 24456296
FAX:	020 – 24455908
E-Mail:	Pearl-ip@eth.net
URL:	--
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Joshi
Middle Name:	G
First Name:	Rajeev
Department:	--
Mobile:	Not Available
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Organization:	Rathi Dye Chem (P) Ltd
Street/P.O.Box:	Bhandarkar Institute Road, Deccan Gymkhana
Building:	'Vrundali' Block o – 1, 851/2
City:	Pune
State/Region:	Maharashtra
Postfix/ZIP:	411004
Country:	India
Telephone:	020 – 25672052, 25672053, 25672948
FAX:	020 – 25672051
E-Mail:	marketing@rathicolours.com purchase@rathicolours.com
URL:	www.rathicolours.com
Represented by:	
Title:	Director

Salutation:	Mr.
Last Name:	Rathi
Middle Name:	H
First Name:	Sunil
Department:	--
Mobile:	Not Available
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Organization:	Sarvana Spinning Mills Kumaragiri Textiles Limited
Street/P.O.Box:	524, Mint street, Park town
Building:	IInd Floor
City:	Chennai
State/Region:	Tamilnadu
Postfix/ZIP:	600003
Country:	India
Telephone:	044 – 25353514, 25355005
FAX:	044 - 25355571
E-Mail:	--
URL:	--
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Balaji
Middle Name:	-
First Name:	P
Department:	--
Mobile:	09840152627
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	ppbalaji79@yahoo.com

Organization:	Chhotabhai Jethabhai Patel & Co
Street/P.O.Box:	--
Building:	C J House, Motapore
City:	Nadiad
State/Region:	Gujarat
Postfix/ZIP:	387001
Country:	India
Telephone:	0268 – 2562633, 2562634, 2562635
FAX:	0268 – 2562637
E-Mail:	ceejaygroup@yahoo.co.in

URL:	--
Represented by:	
Title:	General Manager
Salutation:	Mr.
Last Name:	Shah
Middle Name:	T
First Name:	D
Department:	--
Mobile:	Not Available
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Organization:	Vijay S. Lodha
Street/P.O.Box:	147, Kothrud Petrol Circle
Building:	--
City:	Pune
State/Region:	Maharashtra
Postfix/ZIP:	411 038
Country:	India
Telephone:	020 – 25394057
FAX:	--
E-Mail:	vijaylodha@hathway.com
URL:	--
Represented by:	
Title:	Proprietor
Salutation:	Mr.
Last Name:	Lodha
Middle Name:	S
First Name:	Vijay
Department:	--
Mobile:	Not Available
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Organization:	M J Associates
Street/P.O.Box:	Hamirpura
Building:	Vadera havan
City:	Barmer
State/Region:	Rajasthan
Postfix/ZIP:	387001
Country:	India
Telephone:	02982 – 221082

FAX:	--
E-Mail:	jainml@icenet.net
URL:	--
Represented by:	
Title:	Partner
Salutation:	Mr.
Last Name:	Jain
Middle Name:	-
First Name:	Mangi Lal
Department:	--
Mobile:	09829253747
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Organization:	Adarsha Gaur Gum Udyog
Street/P.O.Box:	Opp. Krishi Upaj Mandi, Industrial Area
Building:	--
City:	Barmer
State/Region:	Rajasthan
Postfix/ZIP:	344 001
Country:	India
Telephone:	02982 – 20747, 21036
FAX:	02982 – 20471
E-Mail:	adarsh@sancharnet.in
URL:	--
Represented by:	
Title:	Partner
Salutation:	Mr.
Last Name:	Jain
Middle Name:	D
First Name:	Rikhab
Department:	--
Mobile:	Not Available
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Organization:	Amar Associates
Street/P.O.Box:	64, New Bardan Lane
Building:	--
City:	Mumbai
State/Region:	Maharashtra

Postfix/ZIP:	400003
Country:	India
Telephone:	022 – 24135016, 24135017, 56605016, 56605017
FAX:	022 – 22419489
E-Mail:	society@pobox.com
URL:	--
Represented by:	
Title:	Member – AOP
Salutation:	Mr.
Last Name:	Shah
Middle Name:	B
First Name:	Sanjay
Department:	--
Mobile:	Not Available
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Organization:	Hermes Electronics Pvt. Ltd.
Street/P.O.Box:	Thane Belapur Road, Turbhe Naka
Building:	102, Sagar Ratan Industries Premises, Plot-D-265, TTC Area MIDC
City:	Navi Mumbai
State/Region:	Maharashtra
Postfix/ZIP:	400705
Country:	India
Telephone:	022 – 7902638, 7671298, 7615979
FAX:	022 – 7672291
E-Mail:	herms@rolta.net
URL:	--
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Jadhav
Middle Name:	B
First Name:	Shivaji
Department:	--
Mobile:	Not Available
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Organization:	Raj Infrastructure Developers
Street/P.O.Box:	Near Mhatre Bridge

Building:	F – 3, Himali Appartment
City:	Erandwana, Pune
State/Region:	Maharashtra
Postfix/ZIP:	411004
Country:	India
Telephone:	020 – 32909913
FAX:	020 – 25535711, 25535712
E-Mail:	jadhav_shraddha@yahoo.co.in shraddha_constructionpg@yahoo.co.in
URL:	--
Represented by:	
Title:	General Manager
Salutation:	Mr.
Last Name:	Reddy
Middle Name:	D
First Name:	D
Department:	--
Mobile:	09881148311
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Organization:	Hotel Sheetal
Street/P.O.Box:	F. C. Road
Building:	1180, Dnyaneshwar Paduka chowk
City:	Shivaji Nagar, Pune
State/Region:	Maharashtra
Postfix/ZIP:	411005
Country:	India
Telephone:	020 – 25535165, 25535267, 25535168
FAX:	020 - 56027933
E-Mail:	--
URL:	www.hotelsheetal.com
Represented by:	
Title:	Partner
Salutation:	Mr.
Last Name:	Sherkar
Middle Name:	--
First Name:	Parag
Department:	--
Mobile:	09822539999
Direct FAX:	Not Available
Direct Tel:	Not Available

Personal E-Mail:	Not Available

Organization:	P. R. Patil
Street/P.O.Box:	Ganesh Nagar
Building:	Datta Nivas
City:	Akluj
State/Region:	Maharashtra
Postfix/ZIP:	413101
Country:	India
Telephone:	02185 – 227599
FAX:	02185 – 225699
E-Mail:	Ppatil1953@hotmail.com
URL:	--
Represented by:	
Title:	Proprietor
Salutation:	Mr.
Last Name:	Patil
Middle Name:	R
First Name:	P
Department:	--
Mobile:	9860137999
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Organization:	Preetam Enterprises
Street/P.O.Box:	Shivaji Uyamnagar
Building:	1325/91
City:	Kolhapur
State/Region:	Maharashtra
Postfix/ZIP:	416008
Country:	India
Telephone:	0231 – 2658551, 2661429, 2657798
FAX:	0231 - 2656119
E-Mail:	kop@dunungindustries.in
URL:	--
Represented by:	
Title:	Partner
Salutation:	Mr.
Last Name:	Dunung
Middle Name:	--
First Name:	Rajendra
Department:	--
Mobile:	09881909990

Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	rajendra@dunungindustries.in

Organization:	Shree Panchganga Agro Impex Pvt. Ltd
Street/P.O.Box:	Pune Nagar Road
Building:	Gat No – 559/1A
City:	Wagholi, Pune
State/Region:	Maharashtra
Postfix/ZIP:	412207
Country:	India
Telephone:	020 – 227052795, 227052796
FAX:	020 – 27051376
E-Mail:	info@panchaganga.com
URL:	www.panchaganga.com
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	Goyal
Middle Name:	--
First Name:	Ashok
Department:	--
Mobile:	Not Available
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Organization:	Fashion Apparels Pvt. Ltd.
Street/P.O.Box:	M. I. Road
Building:	111
City:	Jaipur
State/Region:	Rajasthan
Postfix/ZIP:	302001
Country:	India
Telephone:	0141 – 2371501
FAX:	0141 – 2376801
E-Mail:	fapl.jaipur@gnbgroup.com
URL:	--
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Bhargava
Middle Name:	--
First Name:	Rajesh

Department:	--
Mobile:	Not Available
Direct FAX:	Not Available
Direct Tel:	Not Available
Personal E-Mail:	Not Available

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

CENTRAL ELECTRICITY AUTHORITY: CO2 BASELINE DATABASE

VERSION	**2.0**
	21 June
DATE	**2007**
BASELINE METHODOLOGY	**ACM0002 /**
	Ver 06

EMISSION FACTORS

Weighted Average Emission Rate (tCO2/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	0.72	0.73	0.74	0.71	0.71	0.71
East	1.09	1.06	1.11	1.10	1.08	1.08
South	0.73	0.75	0.82	0.84	0.78	0.74
West	0.90	0.92	0.90	0.90	0.92	0.87
North-East	0.42	0.41	0.40	0.43	0.32	0.33
India	0.82	0.83	0.85	0.85	0.84	0.82

Weighted Average Emission Rate (tCO2/MWh) (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	0.72	0.73	0.74	0.71	0.72	0.72
East	1.09	1.03	1.09	1.08	1.05	1.05
South	0.74	0.75	0.82	0.84	0.78	0.74
West	0.90	0.92	0.90	0.90	0.92	0.88
North-East	0.42	0.41	0.40	0.43	0.48	0.33
India	0.82	0.83	0.85	0.85	0.84	0.81

Simple Operating Margin (tCO2/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	0.98	0.98	1.00	0.99	0.97	0.99
East	1.22	1.22	1.20	1.23	1.20	1.16
South	1.02	1.00	1.01	1.00	1.00	1.01
West	0.98	1.01	0.98	0.99	1.01	0.99
North-East	0.73	0.71	0.74	0.74	0.71	0.70
India	1.02	1.02	1.02	1.03	1.03	1.02

Simple Operating Margin (tCO2/MWh) (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	0.98	0.98	1.00	0.99	0.98	0.99
East	1.22	1.19	1.17	1.20	1.17	1.13
South	1.03	1.00	1.01	1.00	1.00	1.01
West	0.98	1.01	0.98	0.99	1.01	0.99
North-East	0.73	0.71	0.74	0.74	0.84	0.70
India	1.01	1.02	1.02	1.02	1.02	1.02

Build Margin (tCO2/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North					0.53	0.60
East					0.90	0.97
South					0.71	0.71
West					0.77	0.63
North-East					0.15	0.15
India					0.70	0.68

Combined Margin (tCO2/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	0.76	0.76	0.77	0.76	0.75	0.80
East	1.06	1.06	1.05	1.07	1.05	1.06
South	0.87	0.85	0.86	0.86	0.85	0.86
West	0.87	0.89	0.88	0.88	0.89	0.81
North-East	0.44	0.43	0.44	0.44	0.43	0.42
India	0.86	0.86	0.86	0.86	0.86	0.85

GENERATION DATA

Gross Generation Total (GWh)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	144,292	151,185	155,385	165,735	168,438	179,751
East	58,936	64,048	66,257	75,374	85,776	93,902
South	129,035	131,902	136,916	138,517	144,086	147,355
West	162,329	165,805	177,399	172,682	183,955	188,606
North-East	5,319	5,332	5,808	5,867	7,883	7,778
India	499,911	518,272	541,764	558,175	590,138	617,392

Net Generation Total (GWh)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	135,230	141,415	144,743	155,043	157,291	168,206
East	53,350	58,097	59,841	68,428	77,968	86,014
South	121,158	123,630	127,789	128,373	134,676	138,329
West	150,412	153,125	164,448	159,780	170,726	176,003
North-East	5,195	5,213	5,671	5,752	7,762	7,655
India	465,345	481,479	502,492	517,376	548,423	576,206

Build Margin (tCO2/MWh) (not adjusted for imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North					0.53	0.60
East					0.90	0.97
South					0.71	0.71
West					0.77	0.63
North-East					0.15	0.15
India					0.70	0.68

Combined Margin in tCO2/MWh (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	0.76	0.76	0.77	0.76	0.75	0.80
East	1.06	1.05	1.04	1.05	1.04	1.05
South	0.87	0.85	0.86	0.86	0.85	0.86
West	0.87	0.89	0.88	0.88	0.89	0.81
North-East	0.44	0.43	0.44	0.44	0.49	0.42
India	0.85	0.86	0.86	0.86	0.86	0.85

EMISSION DATA

Absolute Emissions Total (tCO2)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	97,866,565	102,743,113	106,808,582	109,996,544	112,212,597	120,056,079
East	58,026,488	61,427,499	66,593,200	75,512,010	83,956,860	92,517,515
South	89,019,263	92,112,060	105,187,726	108,049,156	105,539,862	101,712,149
West	135,192,153	141,597,621	148,557,341	144,127,175	157,781,065	153,933,199
North-East	2,202,108	2,158,348	2,280,049	2,462,796	2,468,463	2,532,819
India	382,306,576	400,038,640	429,426,898	440,147,681	461,958,846	470,751,761

Absolute Emissions OM (tCO2)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	97,866,565	102,743,113	106,808,582	109,996,544	112,212,597	120,056,079
East	58,026,488	61,427,499	66,593,200	75,512,010	83,956,860	92,517,515
South	89,019,263	92,112,060	105,187,726	108,049,156	105,539,862	101,712,149
West	135,192,153	141,597,621	148,557,341	144,127,175	157,781,065	153,933,199
North-East	2,202,108	2,158,348	2,280,049	2,462,796	2,468,463	2,532,819
India	382,306,576	400,038,640	429,426,898	440,147,681	461,958,846	470,751,761

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

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	25.9%	25.7%	26.1%	28.1%	26.8%	28.1%
East	10.8%	13.4%	7.5%	10.3%	10.5%	7.2%
South	28.1%	25.5%	18.3%	16.2%	21.6%	27.0%
West	8.2%	8.5%	8.2%	9.1%	8.8%	12.0%
North-East	42.2%	41.7%	45.8%	41.9%	55.5%	52.7%
India	19.2%	18.9%	16.3%	17.1%	18.0%	20.1%

Net Generation in Operating Margin (GWh)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	100,189	105,076	106,942	111,450	115,151	120,869
East	47,570	50,308	55,377	61,378	69,746	79,863
South	87,114	92,103	104,449	107,603	105,568	100,978
West	138,071	140,173	150,889	145,264	155,731	154,918
North-East	3,002	3,039	3,074	3,343	3,456	3,621
India	375,947	390,700	420,730	429,040	449,653	460,249

20% of Net Generation (GWh)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	27,046	28,283	28,949	31,009	31,458	33,641
East	10,670	11,619	11,968	13,686	15,594	17,203
South	24,232	24,726	25,558	25,675	26,935	27,666
West	30,082	30,625	32,890	31,956	34,145	35,201
North-East	1,039	1,043	1,134	1,150	1,552	1,531
India	93,069	96,296	100,498	103,475	109,685	115,241

Net Generation in Build Margin (GWh)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North					32,064	34,340
East					15,818	17,567
South					27,987	28,158
West					35,257	35,425
North-East					2,055	1,793
India					113,181	117,283

Absolute Emissions BM (tCO2)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North					17,108,583	20,622,114
East					14,303,611	16,990,438
South					19,839,024	20,029,713
West					27,148,870	22,318,133
North-East					299,121	266,981
India					78,699,210	80,227,378

IMPORT DATA

Net Imports (GWh) - Net exporting grids are set to zero

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	0	0	0	0	3,616	5,748
East	489	555	357	1,689	0	0
South	1,162	1,357	518	0	0	0
West	321	0	797	962	285	11,982
North-East	0	0	0	0	2,099	0

Share of Net Imports (% of Net Generation)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
North	0.0%	0.0%	0.0%	0.0%	2.3%	3.4%
East	0.9%	1.0%	0.6%	2.5%	0.0%	0.0%
South	1.0%	1.1%	0.4%	0.0%	0.0%	0.0%
West	0.2%	0.0%	0.5%	0.6%	0.2%	6.8%
North-East	0.0%	0.0%	0.0%	0.0%	27.0%	0%

Annex 4

MONITORING INFORMATION

The points given below detail the monitoring plan

- The Electronic Meter that is used for monitoring is the Export-Import Energy Meter and is installed before State Electricity Board's grid.
- Its is a three phase, Four wire, 50Hz, 110 Volts, 6Amp,Time of Day (ToD), Export-Import Tri-vector Energy meter which are maintained and calibrated by the State Electricity Board.
- The calibration procedure followed requires calibrating the meter once in a 12 month, by the State Electricity Board (SEB) as per Central Electricity Act & it is responsible for Energy Meter calibration check with their calibrated Reference Standard Meter having tracability with International Standards.
- The Purchaser / wheeling agent of power performs calibration check in presence of representative of owner.
- The import and export of electricity is continuously monitored by the export/ import meter and the data is recorded on a monthly basis jointly by the proponent and the electricity board.
- This meter is located at the delivery point of wind power in SEB's grid. This accounts for the import of electricity that is used by the project proponent. Hence the net electricity generated is calculated from the joint meter reading and recorded /archived in paper/electronic
- If there are more than one Power producer(s) delivering energy produced by them using the common evacuation system and through the common metering equipment, then they shall identify a common agency responsible for joint meter reading with MSEDCL. The Joint Meter Reading taken at common evacuation system shall be supported by meter readings of individual power producers using such common evacuation system. Based on this break up, limited to total energy delivered, the power generated from the individual power plant shall be certified by MSEDCL *(ref: PPA section 11.05 Joint Meter Reading Para C.)*
- The complete monitoring responsibility is carried out as follows:
    - Monitoring is joint responsibility of both owner as well as State Electricity Board (SEB) hence, daily monitoring is in the scope of owner
    - Monthly monitoring is a joint responsibility. All services are provided by SEB to the owner of wind farm.
    - Though the ownership of the meter is with owner, but it is in possession of SEB's sealed meter box under lock & Key as per statutory requirements. Owner can only see readings through glass window of sealed meter box.

Annex 5

Salient Features of 0.6 MW (S 52) WEG

Sr. No.	Particulars	Specifications
1.	Rotor diameter	52 m
2.	Hub height	75 m
3.	Installed electrical output	600 kW
4.	Cut-in wind speed	3.5 m/s
5.	Rated wind speed	12 m/s
6.	Cut-off wind speed	25 m/s
7.	Rotor swept area	2124 m^2
8.	Rotational speed	24 rpm
9.	Rotor material	GRP
10.	Regulation	Pitch
11.	Generator	Asynchronous Generator, 4 pole
12.	Rated output	600 kW
13.	Rotational speed	1500 rpm
14.	Operating voltage	690 V
15.	Frequency	50 Hz
16.	Enclosure class	IP 56
17.	Insulation class	H
18.	Cooling system	Air cooled
19.	Gear box	3-stage gearbox, 1 planetary & 2 helical
20.	Manufacturer	Winergy
21.	Gear ratio	1:63.633
22.	Nominal load	660 kW
23.	Type of cooling	Oil cooling system, Forced lubrication
24.	Yaw drive system	2 active electrical yaw motors
25.	Yaw bearing	Polyamide slide bearing
26.	Safety system	
26.1	Aerodynamic brake	3 independent system with blade pitching
26.2	Mechanical brake	Spring applied hydraulically released disc brake
27.	Control unit	Actual operating conditions, UPS back-up system
28.	Tower	Tubular
29.	Design standards	GL special class

Salient Features of 1.25 MW S-70 (66) WEG

Sr. No.	Particulars	Specifications
1.	Rotor diameter	66 m
2.	Hub height	74 m
3.	Installed electrical output	1250 kW
4.	Cut-in wind speed	3 m/s
5.	Rated wind speed	14 m/s
6.	Cut-out wind speed	22 m/s
7.	Rotor swept area	3421 m^2
8.	Rotational speed	1006 / 1506 rpm (50 Hz), 1208 / 1810 rpm (60 Hz)
9.	Rotor material	GRP
10.	Regulation	Pitch
11.	Generator	Asynchronous Generator, 4/6 pole
12.	Rated output	250/1250 kW
13.	Rotational speed	1010/1515 rpm
14.	Operating voltage	690 V
15.	Frequency	50 / 60Hz
16.	Protection	IP 56
17.	Insulation class	H
18.	Cooling system	Air cooled
19.	Gear box	3-stage gearbox, 1 planetary & 2 helical.
20.	Manufacturer	Winergy
21.	Gear ratio	74.917:1
22.	Nominal load	1390 kW
23.	Type of cooling	Oil cooling system
24.	Yaw drive system	4 active electrical yaw motors
25.	Yaw bearing	Polyamide slide bearing
26.	Safety system	
26.1	Aerodynamic brake	3 times independent pitch regulation
26.2	Mechanical brake	Spring power disc brake, hydraulically released, fail safe. Microprocessor controlled, indicating.
27.	Control unit	Actual operating conditions, UPS back-up system
28.	Tower	Tubular
29.	Design standards	GL/IEC

Salient Features of 0.6 MW E-40 WEG

Sl No.	Particulars	Details
1.	**Type designation**	: E – 40
2.	**Rotor with Pitch Control**	
	Type	: Upwind rotor with active pitch control
	Direction of Rotation	: Clockwise
	No. of Blades	: 3
	Rotor Dimension	: 44 m
	Swept area	: 1521 sqm
	Blade material	: GRP/Epoxy Resin
	Profiting	: ENERCON Profile
	Rotor speed	: Variable, 18 – 37
	Cone angle	: 0´´
	Rotor Axle Angle	: 3°
	Pitch Control	:Three synchronised regulating systems with individual blade adjustment
	Lighting Protection for Blades	: For each rotor blade one integrated ENERCON lighting conductor System
3.	**Generator**	
	Type	: Ring Generator (Synchronous type)
	Rated Output	: 600 kW
	Voltage	: 440 V
	Frequency	: Variable
	Insulation Class	: F (155°)
	Winding of Generator	: Rotor and Stator is jointless copper winding and the use of vacuum impregnation process and special resin for impregnation like the one for high-tension generators.
4.	**Mounting**	: The Generator and rotor (with 3 Blades) is mounted on the same main pin without the gear box (it is gearless machine)
5.	**Drive Train with Generator**	
	Hub	: Rigid
	Generator	: Enercon ring generator (Synchronous type)
	Brake system Yaw Control	: Three independent pitch control systems active via adjusting gears, damped via friction bearing
6	**Wind Velocities**	
	Start up wind VI	: 2.5 m/s
	Rated wind VR	: 12 m/s
	Shutdown wind VO (10 min)	: 25 m/s
	Wind VA (peak)	: None
7	**Electrical Connection**	
	Grid Voltage	: 11kV/22kV/33kV through step-up Transformer
	Grid Frequency	: Variable
	Permissible band for trouble free operation	: 45 Hz to 55 Hz
8.	**Controls**	: DC / AC 440 V, 600 kW (Controlled by pulse

	Converter Inverter	modulation with the help of microprocessor)
9.	**Transformer**	
	Rating	: 700 kVA
	Service	: Outdoor
	Primary Voltage	: 400 V
10.	**Power Factor**	: All the outputs will be nearing unity without the use of capacitors.
11.	**Tower**	
	Height	: 56 m
	Type	: Tubular, Conical
	Material	: Steel
	No. of sections	: 5
	Assembling	: At site
	Ladder Type	: With integrated climbing protection
	Safety system	: DIN 32770
	Surface Treatment	: Painted with Epoxy
	Diameter at Bottom	: 3.5 M
	Diameter (Top)	: 1.33 m
12.	**Weight of WEC Rotor head with blades**	
	Nacelle including Generator	: 9100 kg
	Main pin and Machine carrier	: 21600 kg
	Tower	: 64200 kg

Salient Features of 0.8 MW E-48 WEG

ENERCON's E-48 wind turbine is yet another success story in the company's medium class power range.

With a rated power of 800 kW and a sophisticated rotor blade design, the E-48 wind turbine is the most profitable system within its class. Together with a choice of different tower versions up to 76 m, the E-48 offers an economically sound solution to complex sites worldwide.

Rated power:	800 kW
Rotor diameter:	48 m
Hub height:	50 - 76 m
Wind class (IEC):	IEC/NVN II
Turbine concept:	Gearless, variable speed, variable pitch control
Rotor	
Type:	Upwind rotor with active pitch control
Direction of rotation:	Clockwise
Number of blades:	3
Swept area:	1,810 m^2
Blade material:	Fibreglass (epoxy resin); integrated lightning protection
Rotational speed:	Variable, 16 - 30 rpm
Pitch control:	ENERCON blade pitch system, one independent pitching system per rotor blade with allocated emergency supply
Drive train with generator	
Hub:	Rigid
Main bearings:	Single-row cylindrical roller bearings
Generator:	ENERCON direct-drive synchronous annular generator
Grid feeding:	ENERCON converter
Braking systems:	- 3 independent blade pitch systems with emergency supply - Rotor brake - Rotor lock
Yaw control:	Active via adjustment gears, load-dependent damping
Cut-out wind speed:	28 - 34 m/s (with ENERCON storm control)
Remote monitoring:	ENERCON SCADA

Salient Features of 0.5 MW V-39 WTG

Details	Technical data
Overall data	
Cut in wind speed	4 m/s
Cut out wind speed	25 m/s
Survival wind speed	70m/s
Tip Speed	64 m/s
Rotor Speed	26 m/s
Hub height	50 m
Regulation	Pitch
Gear Box	
Type	Planetary / Helical
Gear ratio	1:58.2
No of steps	3
Generator	
Rated Power Output	500 kW
Type	Single wound asynchronous
Voltage	690 v
Revolutions	1526 rpm
Frequency	50 Hz
Tower	
Type	Lattice / Tubular
Height / Optional	48.1 m
Material	Steel
Sections	6/4
Nacelle Cover	Fiberglass Reinforced Polyester
Rotor	
No of Blades	3
Diameter	47 m
Swept area	1735 m^2
Power Regulation	Pitch regulated
Brake System	Full featuring of blade Disc brake Slewing system with gear motors yawing
Control	Microprocessor based

Salient Features of 0.6 MW Pawanshakti WTG

Details	Technical data
Overall data	
Cut in wind speed	4 m/s
Cut out wind speed	25 m/s
Survival wind speed	70m/s
Tip Speed	64 m/s
Rotor Speed	26 m/s
Hub height	50 m / 65 m
Regulation	Pitch
Gear Box	
Type	Planetary / Helical
Gear ratio	1:58.2
No of steps	3
Generator	
Rated Power Output	600 kW
Type	Single wound asynchronous
Voltage	690 v
Revolutions	1527 rpm
Frequency	50 Hz
Tower	
Type	Lattice
Height / Optional	48.1 m / 63.1 m
Material	Steel
Sections	6/9
Nacelle Cover	Fiberglass Reinforced Polyester
Rotor	
No of Blades	3
Diameter	47 m
Swept area	1735 m^2
Power Regulation	Pitch regulated
Brake System	Full featuring of blade Disc brake Slewing system with gear motors yawing
Control	Microprocessor based

Salient Features of 0.35 MW (N 3335) WEG

Particulars	Specifications
Rotor	
Diameter	33.4 m
Rotor Blade Type	LM 14.4 / 15.4, NACA 63.2 XX
No of Rotor Blade	3
Orientation	Upwind / Horizontal
Rotational Speed	24 / 32 rpm
Rotational direction	Clockwise
Rotor Blade material	Glass fibre reinforced plastic
Swept area	876 m2
Hub height	50 m
Operational Data	
Cut in wind speed	3.5 m/s
Cut off wind speed	25 m/s
Survival wind speed	67 m/s
Gear Box	
Type	Integrated 3 stage helical spur, splash lubricated
Gear Ratio	1:31.5
Generator	
Type	One asynchronous, pole changeable
Rotational speed	756/1006 rpm
Rated output	100/350 kW
Rated voltage	415 V
Frequency	50 Hz
Insulation	Class 'F'
Enclosure class	IP 55 (Air Cooled)
Operating Breaks	
Aerodynamic brake	Blade tip breaks
Mechanical brake	Spring applied hydraulically released disk brakes operated simultaneously for maintenance & inspection.
Yaw drive	
Method of operation	2 active electrical yaw motors
Bearing type	Polymide slide bearing
Rotational speed	7.5 min/revolution (0.5 / sec)
Control Unit	
Microprocessor control with 8-band display indicating operation conditions and defect conditions. Control includes thyrister switchgear watchdog for operation monitoring Logbook with real time clock connections for control, for daily telecommunication and for servicing interface for remote monitoring & operation.	
Reactive power compensation	
Compensation	With PF greater than 0.9
Safety system	
A. Brake system	Automatic application by synchronous hydraulic control of the blade tip brakes in case of:
	a. Vibration or shock loading

	b. Over temperature of the gearbox or generator failure of the thyrister & control in the case of wind speed in excess of 25 m/s
	c. Variation in the rated voltage range +10 %
	d. Variation in the frequency range of +1/-2 Hz
	e. Asymmetric phasing
	f. line interruption with automatic reconnection after 10 minutes.
B. Brake system	Spring applied hydraulically released disk brake
C. Brake system	Aerodynamic direct application initiated by over speed of the rotor.
Tower	
Type	Lattice tower, hot dip galvanised
Tower Height	48.0 m
Construction	Bolted

Salient Features of 1.5 MW (S - 82) WEG

Item	**Description**

Make	SUZLON
Model No.	S 82
Rating in kW	1500
Rotor Diameter (m)	82
Highest hub height (m)	78.5 m
Type of Tower (Tubular/Lattice)	Tubular
No. of Blades	3
Power Regulation (Pitch/Stall)	Pitch
Type of Generator (Synchronous/Asynchronous)	Asynchronous
Single Speed/Dual Speed /Variable Speed (Generator)	Dual
AC/DC/AC System (Yes/No)	No
Rated voltage (v)	690V(50HZ)
Geared/Gearless	Geared
Cut-In Wind Speed (m/s)	4 m/s
Cut-Out Wind Speed (m/s)	20 m/s
Rated Wind Speed (m/s)	14 m/s
Survival Wind Speed (m/s)	52.5 m/s
a) Weight of tower in (Kg)	142000 KG
b) Weight of Nacelle in (Kg)	62637 KG
C) Weight of Rotor in (Kg)	29845 KG
d) Total Weight (Kg)	**234482 KG**
Units to be generated per annum (kWh) at projected CUF	Approx 26.82 lacs/mw p.a
Auxiliary Consumption (kWh)	Approx less than 1% of generation
Reactive Energy requirement	Approx 10% of active energy
Type of Utilisation	Sale to MSEDCL
Wind Power Density	289 watts/msq (at30m)
Capacity Utilization Factor (CUF)%	20.00%
Power Curve	Enclosed
Type test Certificate/Self Certificate	Enclosed
Schedule Month/Year of Commissioning	23-02-2007

Salient Features of 0.25 MW (Chiranjivi Make) WEG

Item	**Description**
i) Power regulation	Stall regulation
ii) Air Tip brakes	Hydraulic activated blades tips

iii) Blade material	FRP
iv) Blade length	13.4 m
v)Blade/profile	NACA 63-4XX,FFA-W3
vi) Rotary direction	Clock-wise
vii) Number of blades	3
viii) Rotor Diameter	29.2 m
ix) Swept area	670 sqm
x) Tip speed	58.6 m/sec
xi) Nominal revolutional speed	38 RPM (Nominal)
	53 RPM (Maximum)
xii) Starting wind speed (Cut in wind speed)	4.0 m/sec
xiii) Nominal output wind speed (Rated wind speed)	18 m/sec
xiv) Cut out wind speed	25.0 m/sec
xv) Survival wind speed	70 m/sec
xvi) Hub height	51.5 m

Gear Box

Item	**Description**
i) Gear ratio	1: 39,446
ii) Maximum power transmission	400 KW

RAKE SYSTEM

Item	**Description**
i) Aerodynamic brake system	Hydraulically activated turnable blade tip
ii) Aerodynamic brake tip brake system	Hydraulically activated turnable brake tip
iii) Hydraulic fail save disc Brake system	Disc brake on high speed shaft
iv) Parking Brake (Mechanical)	Mechanical Latch

GENERATOR

Item	**Description**
i) Nominal power	270 KW
ii) Current rating	437 Amps
iii) Voltage rating	415 Volts, 3 phase
iv) Frequency	50 Hz
v) Number of poles	Four
vi) Insulation class	F
vii) Temperature classification	F
viii) Coupling	Flexible coupling
ix) Protection	Over temperature

YAWING SYSTEM

Item	Description
i) Ratio	1: 1201
ii) Yawing motor	Two numbers 0.37 KW, 415 V, AC, 3ph, 50 HZ
iii) Type	Electrical driven yaw gear unit
iv) Control	Opto-Electronic Wind vane

CONTROL SYSTEM

Item	Description
i) Details to be furnished	Microprocessor Based Control System

TOWER

Item	Description
i) Type	Lattice
ii) Height	50 m
iii) Surface treatment	Sand blasted and Galvanized
iv) Accessories	Ladder and Safety rope
v) Surface protection	Galvanized

FOUNDATION

Item	Description
i) Type	Reinforce concrete square raft and square columns
ii) Factor of safety	1.0 on dead load
iii) Wind load assumed	65 m/sec
iv) Total Compressive stress	200 kg/sqcm
