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

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Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Title: 20 MW Enercon Wind farms (SAI) Pvt. Limited in Maharashtra.
Version: 5.0
Date of completion of PDD: 19/09/2012

A.2. Description of the project activity:

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Objective of the Project

The objective is development, design, engineering, procurement, finance, construction, operation and maintenance of 20 MW Wind Electricity Generation Project ("Project") in the state of Maharashtra to provide reliable, renewable power to the Western regional electricity grid of India (India has 5 regional electricity grids). The Project will lead to reduction of GHG emissions as it will displace electricity from fossil fuel based electricity generation plants. The commissioning of Wind Electric Generators (WEGs) is completed on 17 March 2009.

Nature of Project

The project is owned by Enercon wind farms (SAI) Pvt. Limited, a company incorporated to set up wind power project in the state of Maharashtra. Enercon (India) Limited ("Enercon") will be the equipment supplier and the operations and maintenance contractor for the Project. The generated electricity will be supplied to Maharashtra State Electricity Distribution Company Limited ("MSEDCL") under a long-term power purchase agreement (PPA).
The project activity involves installation of 25 number of E-48 machines (each having capacity of 800 kW) in Ahmednagar in the state of Maharashtra.

Contribution to Greenhouse Gas Emissions Reduction

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

1. **Social well being:**

- The project activity has led to the development of supporting infrastructure such as road network etc., in the wind park location, which also provides access to the local population.
- The project activity leads to alleviation of poverty by establishing direct and indirect benefits through employment generation and improved economic activities by strengthening of local grid of the state electricity utility.

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

- Use of a renewable source of energy reduces the dependence on imported fossil fuels and associated price variation thereby leading increased energy security.

2. **Environmental well being:**

- the project activity involves use of renewable energy source for electricity generation instead of fossil fuel based electricity generation which would have emitted gaseous, liquid and/or solid effluents/wastes.
- Being a renewable resource, using wind energy to generate electricity contributes to resource conservation. Thus the project causes no negative impact on the surrounding environment contributing to environmental well-being.

3. **Economic well being:**

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

4. **Technological well being:**

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

A.3. Project participants:

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

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

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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The host party to the project activity is the Government of India.

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

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The Project is located in the State of Maharashtra that forms part of the Western regional electricity grid of India.

A.4.1.3. City/Town/Community etc:

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The Project is spread across Panchpatta, village in Akole Taluk of Ahmednager District in state of 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 area extends between latitude 19^0 45' to 19^0 50'North and longitude $73^0$45' to $73^0$55'4' East. The site is located at a distance of 120 km from Pune by road. The nearest railway station is at Pune. A location map is attached at Appendix – 1. Details of wind turbines that comprise the project activity are provided below:

S.NO.	UID number	Loc.	Date of Comm.	Latitude	Longitude
1	EWFSPL-01	523	17/03/2009	19.6264	73.7842
2	EWFSPL-02	524	26/02/2009	19.6275	73.7838
3	EWFSPL-03	525	26/02/2009	19.6286	73.7834
4	EWFSPL-04	526	11/2/2009	19.6296	73.7830
5	EWFSPL-05	527	11/2/2009	19.6307	73.7829
6	EWFSPL-06	79	22/05/2008	19.7480	73.8370
7	EWFSPL-07	529	26/02/2009	19.6328	73.7829
8	EWFSPL-08	530	17/03/2009	19.6341	73.7836
9	EWFSPL-09	504	17/03/2009	19.6076	73.7888
10	EWFSPL-10	506	26/02/2009	19.6087	73.7888
11	EWFSPL-11	507	11/2/2009	19.6104	73.7887
12	EWFSPL-12	521	4/12/2008	19.6244	73.7849
13	EWFSPL-13	510	4/12/2008	19.6133	73.7888
14	EWFSPL-14	512	4/12/2008	19.6155	73.7889
15	EWFSPL-15	513	13/09/2008	19.6166	73.7887
16	EWFSPL-16	514	13/09/2008	19.6176	73.7884
17	EWFSPL-17	35	28/02/2007	19.6604	73.8144
18	EWFSPL-18	36	28/02/2007	19.6617	73.8145
19	EWFSPL-19	37	28/02/2007	19.6630	73.8146
20	EWFSPL-20	38	28/02/2007	19.6642	73.8144
21	EWFSPL-21	39	28/02/2007	19.6655	73.8141
22	EWFSPL-22	516	13/09/2008	19.6196	73.7877
23	EWFSPL-23	517	24/09/2008	19.6205	73.7871

24	EWFSPL-24	518	4/12/2008	19.6216	73.7866
25	EWFSPL-25	519	4/12/2008	19.6224	73.7859

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

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

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

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The Project involves 25 wind energy converters (WECs) of Enercon make (800 kW E-48) with internal electrical lines connecting the Project with local evacuation facility. The WECs generates 3-phase power at 400V, which is stepped up to 33 KV. The Project can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V ± 12.5%. The other salient features of the state-of-art-technology are:

- Gearless Construction - Rotor & Generator Mounted on same shaft eliminating the Gearbox.
- Variable speed function – has the speed range of 18 to 33 RPM thereby ensuring optimum efficiency at all times.
- Variable Pitch functions ensuring maximum energy capture.
- Near Unity Power Factor at all times.
- Minimum drawl (less than 1% of kWh generated) of Reactive Power from the grid.
- No voltage peaks at any time.
- Operating range of the WEC with voltage fluctuation of -20 to +20%.
- Less Wear & Tear since the system eliminates mechanical brake, which are not needed due to low speed generator which runs at maximum speed of 33 rpm and uses Air Brakes.
- Three Independent Braking Systems.
- Generator achieving rated output at only 33 rpm.
- Incorporates lightning protection system, which includes blades.
- Starts Generation of power at wind speed of 3 m/s.

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

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

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Crediting Period for the Project: fixed for 10 years

Years	Annual estimation of emission reductions in tonnes of CO2e
1/11/2010 to 31/10/2011	33,348

1/11/2011 to 31/10/2012	33,348
1/11/2012 to 31/10/2013	33,348
1/11/2013 to 31/10/2014	33,348
1/11/2014 to 31/10/2015	33,348
1/11/2015 to 31/10/2016	33,348
1/11/2016 to 31/10/2017	33,348
1/11/2017 to 31/10/2018	33,348
1/11/2018 to 31/10/2019	33,348
1/11/2019 to 31/10/2020	33,348
Total estimated reductions (tonnes of CO2e)	333,480
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	33,348

A.4.5. Public funding of the project activity:

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There is no ODA financing involved in the Project.

SECTION B. Application of a baseline and monitoring methodology

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

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Title: Consolidated baseline and monitoring methodology for "Grid-connected electricity generation from renewable sources"

Reference: Approved consolidated baseline methodology ACM0002 (Version 11, EB 52)

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

- Tool to calculate the emission factor for an electricity system – Version 2
- Tool for the demonstration and assessment of additionality – Version 5.2

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

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

The approved consolidated baseline and monitoring methodology ACM0002 Version 11 is the choice of the baseline and monitoring methodology and it is applicable because:

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

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

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According to ACM0002, for the baseline emission factor, the spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

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

Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Each state in a regional grid meets its demand with its own generation facilities and also with allocation from power plants owned by the Central Sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the Central Sector power plants. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The regional grid thus represents the largest electricity grid where power plants can be dispatched without significant constraints and thus, represents the "project electricity system" for the Project. As the Project is connected to the Western regional electricity grid, the Western grid is the "project electricity system".

Accordingly, the project boundary encompasses the physical extent of the Western regional electricity grid which includes the project site and all power plants connected physically to the electricity system.

	Source	Gas	Included?	Justification/ Explanation
Baseline	Electricity generation from power plants connected to the Western Grid	CO_2	Included	Main emission source
		CH_4	Excluded	This source is not required to be estimated for wind energy projects under ACM0002
		N_2O	Excluded	This source is not required to be estimated for wind energy projects under ACM0002
Project Activity	Electricity generation from the Project	CO_2	Excluded	Wind energy generation does not have any direct GHG emissions.
		CH_4	Excluded	
		N_2O	Excluded	

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

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

Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described below.

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

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

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

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

The purchase order for the project activity was placed on 17 August 2006 and engagement for developing the project as a CDM was signed immediately within 4 weeks of the placement of the purchase order. The PPA and stakeholder minutes are essential documents that are required to complete the PDD. The stakeholder meeting for the project activity was conducted on 15 November 2006. The loan agreement was signed in January 2007 and documents for preparation of PDD were submitted to the CDM team of Enercon in February 2007.

The PDD was prepared in the month of May 2007 after receiving relevant documents. The PDD was provided to the DoE on 4 July 2007 and PDD was finally webhosted on 10 July 2007.

S.No.	**Activity**	**Date**
1	Board Resolution	3 August 2006

1	Purchase Order	17 August 2006
2	Engagement with CDM consultant	19 September 2006
3	Intimation to the stakeholders	29 October 2006
4	Stakeholder Meeting	15 November 2006
5	Engagement with DoE	22 November 2006
6	Loan Agreement	22 January 2007
7	Documents submitted for PDD preparation	15 February 2007
8	PDD Preparation	March 2007 to May 2007
9	Webhosting	10 July 2007 to 8 August 2007

The project start date is 17 August 2006 and the PDD was webhosted for global stakeholder comments on 10 July 2007 which is less than two years. In accordance with the Annex 22 of EB 49, if the gap is less than two years between the documented evidence it can be concluded that the project proponent has taken real and continuing actions towards securing CDM status for the project activity.

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

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

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

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

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

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

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

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

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

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

Step 2: Investment Analysis

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

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

The guidance to investment analysis issued in EB 41 (paragraph 11) states that in cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity are appropriate benchmarks for equity IRR.

The tool for demonstration and assessment of additionality [para-5, sub step 2(b)] states that in cases where the project has more than one potential developer, the benchmark shall be based on parameters that are standard in the market, considering the specific characteristics of the project type. Accordingly, the weighted average cost of capital applicable to the project type has been considered as the benchmark.

The benchmark WACC for the project is **13.70**%. Further details of the benchmark considered and WACC calculations are presented in Appendix 3.

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

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

Assumptions for Financial Model

Capacity of Machines in kW	800.0	Supplier's Offer
Number of Machines	25.0	Supplier's Offer
Project Capacity in MW	20.0	Supplier's Offer
Project Commissioning Date	30-Sep-07	Expected Date of Commissioning
Project Cost per MW (Rs. In Millions)	51.63	Calculated
Operations		
Plant Load Factor	21.0%	Max[Supplier's Estimate of 21%, Third party validated plf of 19.64%]
Insurance Charges @ % of capital cost	0.18%	Normative
Operation & Maintenance Cost % of capital cost	1.25%	Supplier's Offer
% of escalation per annum on O &	6.0%	Supplier's Offer

M Charges		
Tariff		
Base year Tariff (2007-08) - Rs./Kwh	3.50	MERC Order
Annual Escalation (Rs./kWh per Year)	0.15	MERC Order
Tariff applicable from 2020 onwards (Rs/kWh)	Cost +ROE	MERC Order
Project Cost	Rs Million	
Land and Infrastructure, Generator & Electrical Equipments, Mechanical Equipments, Civil Works, Instrumentation & Control, Other Project Cost, Pre operative Expenses, etc.		
Total Project Cost	1,032.50	**Supplier's offer**
Means of Finance		Rs Million
Own Source	15%	154.88
Term Loan	85%	877.63
Total Source		1,032.50
Terms of Loan		
Interest Rate	11.00%	Prime Lending Rate Published by RBI in August 2006
Tenure	10	Years
Income Tax Depreciation Rate (Written Down Value basis)		
on Wind Energy Generators	80%	IT Act
Book Depreciation Rate (Straight Line Method basis)		
On all assets	4.50%	Straight Line Method
Book Depreciation up to (% of asset value)	90%	MERC Order

Income Tax		
Income Tax rate	33.66%	IT Act
Minimum Alternate Tax	11.22%	IT Act
Working capital		
Receivables (no of days)	45	CERC Order
O & m exps	30	CERC Order
Crediting period starts	1-04-2010	Expected registration date
Length of Crediting period	10	Fixed Crediting Period
Baseline Emission Factor for Western Region (tCO2/MWh)	0.90641	CEA database version 02, dated 27 June 2007

The PLF for the project activity is chosen conservatively of the following options available to the PP:-

1. Third Party Validated PLF (19.64%)
2. Historically, maximum observed PLF for region (19.62%)
3. PLF estimate supplied by the supplier (21%)

The Project IRR for the Project without CDM revenues is 9.09%, which is not sufficient for the project developer to undertake the project activity without CDM.

Sensitivity Analysis

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

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

Capital Cost

In accordance with the investment guidance, the additionality for the project activity is demonstrated at the time of decision making. The price is taken from the detailed project report that is based on offer from the supplier. Therefore, it is considered appropriate to conduct sensitivity on the project cost at reasonable variation of 10%.

Capital Cost [In Millions]	929.25	1032.50	1135.75
Post tax Project IRR	10.98%	9.09%	7.43%

Tariff

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

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

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

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

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

On computation the average tariff after 13th year onwards based on MERC assumptions works out to be INR 1.80 per unit. On the upside if MERC does not consider adjustment of the surplus gained which is extremely unrealistic, the average tariff will be INR 2.30 per Unit. Therefore it is considered appropriate to conduct sensitivity on tariff at the rate of INR 2.30 per unit. The project IRR at tariff of INR 2.30 per unit after 13th year is 9.46%, which is lower than the benchmark. The project IRR at tariff of INR 3.50 per unit after term of PPA is 10.24%. The project crosses the benchmark at tariff of INR 11.54 per unit after term of PPA (after 13th year) which is not a likely scenario.

Plant Load Factor

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

Enercon has engaged Fair Aero for third party PLF validation. The PLF for the site as per third party independent party is 19.64%. Maharashtra State Electricity Commission has set the 20% PLF for the state of Maharashtra. Historically, maximum observed PLF for region of Ahmednagar is 19.62%. Plant load factor for the project activity provided by supplier is 21%. Sensitivity analysis of the Project IRR is therefore carried out at 23.1% which is maximum of the highest observed PLF in the district of Ahmednagar, 10% increase over the PLF given by MERC in tariff order dated 23-Nov-2003, 10% increase over PLF estimated by Fair Aero (third party independent source) and 10% increase in

generation estimate given by Enercon India Limited [Max (19.62%, 22%, 21.60%, 23.1%)]. The return that the project is expected to generate at PLF of 23.1% is 10.80%, which is less than the benchmark.

Sensitivity is summarized in below table:

	PLF @ 18.9%	PLF @ 21.0%	PLF @ 23.1%
Post tax Project IRR	7.26%	9.09%	10.80%

The sensitivity analysis clearly shows even with a higher PLF, the project is not able to generate sufficient returns. It can therefore be concluded that the project is financially not viable without CDM benefits. The project crosses the benchmark at PLF of 27% which is not a likely scenario.

O&M Cost

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

	10% decrease in O&M cost	Base O&M Cost	10% Increase In O&M cost
Post tax Project IRR	9.31%	9.09%	8.81%

Outcome of Step 2: If after the sensitivity analysis it is concluded that: (1) the proposed CDM project activity is unlikely to be the most financially/economically attractive (as per Step 2c para 11a) or is unlikely to be financially/economically attractive (as per Step 2c para 11b), then proceed to Step 4 (Common practice analysis).

The maximum observed project IRR is 10.80% in the sensitivity analysis with reasonable variations in base assumptions. The project IRR even with sensitivity is not only lower than WACC computed with average beta but also lower than WACC $_{\text{min beta}}$ computed by application of minimum beta.

Step 3: Barrier analysis

Not Opted for.

Step 4: Common practice analysis

The project was completed its commissioning on 17 March 2009. The delay in commissioning compared to scheduled commissioning date was due to long drawn procedure for securing clearance from the nodal agency. The nodal agency clearance for commissioning for the last set of machines was received by the PP in March 2009. We want to submit we have presented the common practice for the data that was available at the time of scheduled commission date. The total installed wind power capacity in Maharashtra was 1756.38 MW in 2007-08. The table below presents the year wise capacity addition of wind installations in the state of Maharashtra.

S. No.	Year	Wind Project Installation (MW)
1	Upto 1992	1.10
2	During 1992-93	-
3	During 1993-94	-
4	During 1994-95	1.50
5	During 1995-96	-
6	During 1996-97	2.77
7	During 1997-98	0.23
8	During 1998-99	23.34
9	During 1999-00	50.35
10	During 2000-01	118.67
11	During 2001-02	196.54
12	During 2002-03	2.00
13	During 2003-04	6.30
14	During 2004-05	48.80
15	During 2005-06	545.10
16	During 2006-07	483.6
17	During 2007-08	276.075

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

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

Paragraph 4(a) also states that projects can be considered similar if they rely on a broadly similar technology and are of a similar scale. Enercon Wind Farm Sai has a total capacity of 20 MW and hence the project is categorized as large scale project activity (>15MW). The proposed wind power project involves the installation of 25 wind turbines, each of which has rated output of 800 kV, providing a total capacity of 20 MW. Therefore in accordance with Paragraph 4(a), we have analysed wind projects of more than 15 MW capacities. During the period 2002-2008 a total of 476 MW was added from wind projects with more than 15 MW size. We would like to submit that the entire 476 MW is under CDM. The table below presents the links to all such projects.

Sl. No.	**Name of Owner**	**Capacity included in analysis [above 15 MW and commissioned after**	**Web links**

		2003-04]	
1	Essel Mining & Industries Ltd.	75	http://cdm.unfccc.int/UserManagement/FileStorage/O6LOWTE60VD7BDDY8ZB8AQBVNQQZCJ
2	Tata Power Company Ltd.	54.15	http://cdm.unfccc.int/Projects/Validation/DB/HT56HSU35JRCPA72BI950VBY8REB0U/view.html, http://cdm.unfccc.int/Projects/Validation/DB/EW3Z4AISTNLX8HM6DHB55JQMG22UA7/view.html
3	Bajaj Auto Ltd	65.2	http://cdm.unfccc.int/UserManagement/FileStorage/607RA3Q0VVBK4FPQ1DYZCN5KK3BYG6, http://cdm.unfccc.int/UserManagement/FileStorage/6PPT6HMIDAHDFYJP7WTMNECFWLLV6I
4	Jaiprakash Associates Limited	40.25	http://cdm.unfccc.int/UserManagement/FileStorage/VR9BGLXMKOPJN0U72IYCE4ZWQ5A36H
5	BP Energy India Pvt Ltd	40	http://cdm.unfccc.int/UserManagement/FileStorage/T0CJ85FSL1WN9VEXID67ZOBMQRGAPH
6	Reliance Innoventures Pvt Ltd	37.5	http://cdm.unfccc.int/UserManagement/FileStorage/D59AFLHK1U23OTNZ74S0ECVJMPQXBG
7	Gujarat Fluorochemicals Ltd.	35.1	http://cdm.unfccc.int/UserManagement/FileStorage/NICJM3EIBU249K20ZIVH6YRTJRL1O2, http://cdm.unfccc.int/UserManagement/FileStorage/MBU2TOWWYPYBCDT8WOVH7YFBVQOS5D
8	Shree Naman Developers Limited	28.125	http://cdm.unfccc.int/UserManagement/FileStorage/29V83ADQ4SI6E7YJC5KGFRO0HXBZML
9	Roaring 40s	28	http://cdm.unfccc.int/UserManagement/FileStorage/JN4HZXCBP2DV9IFTQSW8G73L56EKAU, http://cdm.unfccc.int/UserManagement/FileStorage/C1UNHEPDTF6K5WJYQ3BL84ORGZISXV, http://www.dnv.com/focus/climate_change/Upload/Roaring%2040s%20%20Maharastra.pdf

10	Shraddha Construn. & PowerGen. P.Ltd.	24.4	http://cdm.unfccc.int/Projects/Validation/DB/8A07E1ILQFSU987VE25G42BUJCJ90K/view.html, http://cdm.unfccc.int/UserManagement/FileStorage/KB4U21VQGNDI45MU0I2I7T5NZM03AJ
11	REI Agro Limited	22.4	http://cdm.unfccc.int/Projects/Validation/DB/PRGIFS0LCB17KXBE0L9AU3XPJN147O/view.html, http://cdm.unfccc.int/Projects/Validation/DB/LFTIDSON660NHIT5389DOU44QT1ZI2/view.html, http://cdm.unfccc.int/Projects/Validation/DB/C1QZHJ7KFG7HWISQM8MHLAPJKYIKXP/view.html, http://cdm.unfccc.int/Projects/Validation/DB/NEY6LY0N53NMIHHCTEZ3QHNHVV4RWV/view.html, http://sebiedifar.nic.in/documents/REIAGROLTD/ar062008.pdf
13	Ellora Times Ltd.	6.25	http://cdm.unfccc.int/Projects/Validation/DB/FCA2YR3O40994UEYCVUN9159OW0IVA/view.html
14	MSPL Limited	20	http://www.mspllimited.com/wind%20power.htm, http://cdm.unfccc.int/Projects/DB/DNV-CUK1142448670.58/view, http://cdm.unfccc.int/UserManagement/FileStorage/Q7FCFG27XNUZ6IB32EM7CTVC7KZG6R, http://cdm.unfccc.int/UserManagement/FileStorage/VN5EVS2SR0VKYCGEKG73TTWGL0QCXP, http://www.sgsqualitynetwork.com/tradeassurance/ccp/projects/434/Revised%20Final%20CDM_4_Kar_PDD.pdf
	Total	**476.375**	

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

However as an element of conservativeness PP has further assessed the common practice analysis for the project activity by extending range of variation considered for common practice analysis by considering all wind power projects above 10 MW commissioned during period 2002-2008. The links to the projects under CDM pipeline are provided in the table below:

S.No.	Project Owner	Capacity included in analysis [between 10 MW to 15 MW in Maharashtra and commissioned after 2002-03]	Weblinks
1	Shah Promoters & Developers	14.000	http://cdm.unfccc.int/Projects/DB/RWTUV1229007791.61/view
2	KRBL Limited	12.500	http://cdm.unfccc.int/Projects/DB/RWTUV1249547331.17/view
3	Avinash N Bhosale	12.000	http://cdm.unfccc.int/Projects/DB/RWTUV1200571866.2/view
4	Charisma Builders	10.800	http://cdm.unfccc.int/Projects/Validation/DB/C2CDWJ1RD12LJUY201MQ7WWC9QFJDO/view.html
5	C Mahendra Exports Ltd	10.000	http://www.sgsqualitynetwork.com/tradeassurance/ccp/projects/472/C%20Mahendra%20PDD_20.03.08.pdf
6	Deepak Ferti.& Petrochem.Corpn Ltd.	10.000	http://cdm.unfccc.int/Projects/DB/SGS-UKL1240498237.32/view
	Total	**69.30**	

After analysis it was found that 556.175 MW capacity was from wind projects with capacity above 10 MW and commissioned between April 2002 to March 2008. Out of 556.175 MW, the total of 545.675 MW [476.375+69.30] i.e. 98.11% capacity is under CDM pipeline. As can be seen, 98.11% of comparable projects have come up with the benefit of CDM. Hence wind power projects with similar capacity without CDM benefit is not a common practice.

Sub-step 4a is satisfied

Sub-step 4b is not required as no similar activities are observed.

From above it is clear that there are no wind power projects that are developed without CDM and hence wind power projects is not a common practice in Maharashtra.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The project activity was webhosted on 10 July 2007. The latest applicable baseline data that was available at the start of validation was therefore CEA database version 2 dated 21 June 2007. Thus we have applied CEA database version 2 for computing baseline for the project activity.

According to the approved methodology ACM0002 (Version 11) Emission Reductions are calculated as:-

$$ER_y = BE_y - PE_y - L_y$$

Where:

BE_y	Baseline Emissions in year *y* (t CO_2e/yr)
PE_y	Project Emissions in year *y* (t CO_2e/yr)
L_y	Leakage Emissions in year *y* (t CO_2e/yr)

Estimation of Baseline Emissions:
Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_{y} = EG_{PJ,y} * EF_{grid,CM,y}$$

Where:
BE_y = Baseline emissions in year *y* (tCO_2/yr)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

Since the project activity is the installation of a new grid connected renewable power plant the $EG_{PJ,y}$ is calculated as :

$$EG_{PJ,y} = EG_{facility,y}$$

Where:
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

The proposed project activity is in the state of Maharashtra which falls under western grid, baseline emission factor is calculated as combined margin, consisting of a combination of operating margin and build margin factors according to the procedures prescribed in the latest tool for calculating the emission factor for an electricity system. The steps of calculation are as follows:

STEP 1. Identifying the relevant electricity systems:

The Indian electricity system is divided into five regional grids, viz. (1) Northern, (2) Eastern, (3) Western, (4) North-Eastern and (5) Southern grid. Each grid covers several states. As the regional grids are interconnected, there is inter-state and inter-regional exchange. A small power exchange also takes place with neighbouring countries like Bhutan and Nepal.

Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Each state in a regional grid meets its demand with its own generation facilities and also with allocation from power plants owned by the Central Sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the Central Sector power plants. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The regional grid thus represents the largest electricity grid where power plants can be dispatched without significant constraints and thus, represents the "project electricity system" for the project activity. As the project activity is connected to the western regional electricity grid, the western grid is the "project electricity system".

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

Option I is opted for the project activity i.e. only grid power plants are included in the calculation.

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

According to the tool, the calculation of the operating margin emission factor is based on one of the following methods:

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

Any of the four methods can be used for calculating OM, The simple adjusted OM and dispatch data analysis OM cannot be currently applied in India due to lack of necessary data however, the simple OM method (option a) can only be used if low cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

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

	2001-02	**2002-03**	**2003-04**	**2004-05**	**2005-06**
Western Grid	8.5%	8.2%	9.1%	8.8%	12.0%

Source: CEA database version 2

The above data clearly shows that the percentage of total grid generation by low cost/must run plants (on the basis of average of five most recent years) for the western regional grid is less than 50 % of the total generation. Hence the Simple OM method can be used to calculate the Operating Margin Emission factor. The average operating margin method cannot be applied, as low cost/ must run resources in western grid constitute less than 50% of total grid generation.

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

STEP 4. Calculate the operating margin emission factor according to the selected method:

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

- Based on the net electricity generation, and a CO_2 emission factor of each power unit. (Option A), or
- Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option B)

The Central Electricity Authority, Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database i.e. The CO_2 Baseline Database provides information about the Combined Margin Emission Factors of all the regional electricity grids in India. The Combined Margin in the CEA database is calculated ex ante using the guidelines provided by the UNFCCC in the "Tool to calculate the emission factor for an electricity system". We have, therefore, used the Combined Margin data published in the CEA database, for calculating the Baseline Emission Factor.

The CEA database uses the option A i.e. data on net electricity generation and CO_2 emission factor for each power unit, the average efficiency of each power unit and the fuel type(s) used in each power unit, to calculate the OM of the different regional grids.

The simple OM emission factor is calculated based on the net electricity generation of each power unit and an emission factor for each power unit, as follows:

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

Where:

$EF_{grid,OMsimple,y}$	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	CO_2 emission factor of power unit m in year y (tCO2/MWh)
m	All power units serving the grid in year y except low-cost / must-run power units
y	The relevant year as per the data vintage chosen in step 3

The emission factor of each power unit m has been determined as follows:

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

Where:

$EF_{EL,m,y}$	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,m,y}$	Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,I,y}$	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)

$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
m	All power units serving the grid in year y except low-cost / must-run power units
i	All fossil fuel types combusted in power unit m in year y
y	The relevant year as per the data vintage chosen in step 3

STEP 5. Identify the group of power units to be included in the build margin:

The sample group of power units m used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or

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

Project participants should use the set of power units that comprises the larger annual generation.
Accordingly, the CEA database calculates the build margin as the average emissions intensity of the 20% most recent capacity additions in the grid based on net generation.
The build margin emission factor has been calculated ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. This option does not require monitoring the emission factor during the crediting period.

STEP 6. Calculate the build margin emission factor:

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

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

Where:

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

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) is determined as per the procedures given in step 4 (a) for the simple OM, using option A1 for *y* most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

STEP 7. Calculate the combined margin emissions factor:

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

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

Where:

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

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

According to ACM0002 the weights for OM and BM are 0.75 and 0.25 respectively.

Using the values for operating and build margin emission factor provided in the CEA database and their respective weights for calculation of combined margin emission factor, the baseline carbon emission factor (CM) is 906.41 tCO_2e/GWh.

Details of Baseline data:

Data of Operating for the three financial years from 2003-04, 2004-05 and 2005-06 and Build Margin for 2005-06 has been obtained from -

The CO_2 Baseline Database for the Indian Power Sector
Ministry of Power: Central Electricity Authority (CEA)
Version 2
Dated: 21 June 2007
Key baseline information is reproduced in Annex 3.
The detailed excel sheet is available at:
http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Estimation of Project Emissions
The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 11, there will be no project emissions in the project activity ($PE_y = 0$).

Estimation of Leakage Emissions
As per ACM0002 Version 11, no leakage has been considered for the calculation of emission factor ($LE_y = 0$).

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

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

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Data / Parameter:	***$EF_{OM,y}$***
Data unit:	tCO2e/MWh
Description:	Operating Margin Emission Factor of Western Regional Electricity Grid
Source of data used:	"CO2 Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India, version 2. The "CO2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in

Value applied:	0.9985
Justification of the choice of data or description of measurement methods and procedures actually applied :	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002.
Any Comments:	--

Data / Parameter:	$EF_{BM,y}$
Data unit:	tCO2e/MWh
Description:	Build Margin Emission Factor of Western Regional Electricity Grid
Source of data used:	"CO2 Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India, version 2. The "CO2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.6300
Justification of the choice of data or description of measurement methods and procedures actually applied :	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002.
Any Comments:	--

Data / Parameter:	$EF_{CM,y}$
Data unit:	tCO2e/MWh
Description:	Combined Margin Emission Factor of Western Regional Electricity Grid
Source of data used:	"CO2 Baseline Database for Indian Power Sector" published by the Central Electricity Authority, Ministry of Power, Government of India, version 2. The "CO2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.90641
Justification of the choice of data or description of measurement methods and procedures actually applied :	Combined Margin Emission Factor has been calculated by weighting 75:25 on operating and build margin respectively.
Any Comments:	---

B.6.3 Ex-ante calculation of emission reductions:

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

Baseline emission factor (combined margin)
= 0.90641 tCO2e/MWh

Annual electricity supplied to the grid by the Project
= 20MW (Capacity) x 21% (PLF) x 8,760 (hours) / 1,000 GWh
= 36,792 MWh

Annual baseline emissions
= 0.90641 tCO2e/MWh x 36,792 MWh
= 33,348 tCO2e

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

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Year	Estimation of project activity emissions (tonnes of CO2e)	Estimation of baseline emissions (tonnes of CO2e)	Estimation of leakage (tonnes of CO2e)	Estimation of overall emission reductions (tonnes of CO2e)
1/11/2010 to 31/10/2011	0	33,348	0	33,348
1/11/2011 to 31/10/2012	0	33,348	0	33,348
1/11/2012 to 31/10/2013	0	33,348	0	33,348
1/11/2013 to 31/10/2014	0	33,348	0	33,348
1/11/2014 to 31/10/2015	0	33,348	0	33,348
1/11/2015 to 31/10/2016	0	33,348	0	33,348
1/11/2016 to 31/10/2017	0	33,348	0	33,348
1/11/2017 to 31/10/2018	0	33,348	0	33,348
1/11/2018 to 31/10/2019	0	33,348	0	33,348
1/11/2019 to 31/10/2020	0	33,348	0	33,348
Total (tonnes of CO2e)	0	333,480	0	333,480

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

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B.7.1 Data and parameters monitored:

Data / Parameter:	**EGy**
Data unit:	MWh (Mega-watt hour)
Description:	Net electricity supplied to the grid by the Project
Source of data to be used:	Electricity supplied to the grid calculated as per empirical formula given in section B.7.2. The net electricity supplied to the grid can be cross checked from the invoices raised on the state utility.

Value of data applied for the purpose of calculating expected emission reductions in section B.5	36,792
Description of measurement methods and procedures to be applied:	Refer Annex – 4 for an illustration of the provisions for measurement methods.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by MSETCL pursuant to the provisions of the power purchase agreement. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$EG_{JMR,Export}$
Data unit:	MWh (Mega-watt hour)
Description:	Electricity exported, as recorded by the main meter at the MSEDCL substation
Source of data to be used:	Export value from Joint meter reading taken at Substation in the presence of representatives of Enercon and state utility
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will not be directly used for estimation of emission reduction.
Description of measurement methods and procedures to be applied:	The Export reading is jointly noted from the main meter installed at the MSEDCL substation.
QA/QC procedures to be applied:	The meters will be calibrated once each year by the state utility. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$EG_{JMR,Import}$
Data unit:	MWh (Mega-watt hour)
Description:	Electricity imported, as recorded by the main meter at the MSEDCL substation
Source of data to be used:	Import value from Joint meter reading taken at Substation in the presence of representatives of Enercon and state utility
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will not be directly used for estimation of emission reduction.
Description of measurement methods and procedures to be applied:	The import reading is jointly noted from the main meter installed at the MSEDCL substation.
QA/QC procedures to	The meters will be calibrated once each year by the state utility. Refer Annex – 4

be applied:	for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$\sum_{y=0}^{N} EG_{gross,y}$
Data unit:	MWh (Mega-watt hour)
Description:	Summation of $EG_{gross, y}$ is the electricity generated from wind turbines of the project activity measured through its panel located in WTG tower.
Source of data to be used:	Generation value from the WTG panels.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will not be directly used for estimation of emission reduction.
Description of measurement methods and procedures to be applied:	Generation data will be archived from central monitoring station that collects data from the WTG panels.
QA/QC procedures to be applied:	Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$\sum_{y=0}^{M} EG_{gross,y}$
Data unit:	MWh (Mega-watt hour)
Description:	Summation of $EG_{gross, y}$ is the electricity generated from individual wind turbines other than the project activity connected to common MSEDCL meter measured through its panel located in WTG tower.
Source of data to be used:	Generation value from the WTG panels.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will not be directly used for estimation of emission reduction.
Description of measurement methods and procedures to be applied:	Generation data will be archived from central monitoring station that collects data from the WTG panels.
QA/QC procedures to be applied:	Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	EG_{export}
Data unit:	MWh (Mega-watt hour)
Description:	Electricity exported by the project activity to the grid
Source of data to be used:	Calculated as per empirical formula given in section B.7.2
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated as per empirical formula given in section B.7.2
Description of measurement methods and procedures to be applied:	Calculated as per empirical formula given in section B.7.2
QA/QC procedures to be applied:	Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	EG_{import}
Data unit:	MWh (Mega-watt hour)
Description:	Electricity imported by the project activity from the grid
Source of data to be used:	Calculated as per empirical formula given in section B.7.2
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Calculated as per empirical formula given in section B.7.2
Description of measurement methods and procedures to be applied:	Calculated as per empirical formula given in section B.7.2
QA/QC procedures to be applied:	Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived for crediting period + 2 years.

The data will be maintained in soft and hard format for crediting period + 2 years.

B.7.2 Description of the monitoring plan:

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Approved monitoring methodology ACM0002 / Version 11 Sectoral Scope: 1, "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources", by CDM - Meth Panel is proposed to be used to monitor the emission reductions.

This approved monitoring methodology requires monitoring of the following:

- Electricity generation from the project activity; and

- Operating margin emission factor and build margin emission factor of the grid, where *ex post* determination of grid emission factor has been chosen

Since the baseline methodology is based on ex ante determination of the baseline, the monitoring of operating margin emission factor and build margin emission factor is not required.

The generated electricity is measured through a two step procedure wherein the first metering is carried out at the controller of the machine with on-board meter. The monitoring of all these wind turbines is done from a common monitoring station as a part of central monitoring system. $EG_{gross,\ y}$ is the electricity generated from an individual wind turbine measured through its panel. The summation of total Electricity generated from wind turbine of the project proponent from individual meters (panel meter) in MWh is presented as:

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

where n = *number of WEGs of SAI connected at common MSEDCL meter*

and the summation of total Electricity generated (panel data) from the other wind turbines (total number of WEGs = m) attached to the common MSEDCL meter at the sub-station in MWh is presented as

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

where m = number of WEGs of other customer connected at common MSEDCL meter

The second metering is carried out at grid interconnection point (sub-station) wherein the Joint Meter Reading (JMR) is carried out on first day of every month in presence of the representatives of the project proponent & the state electricity utility (MSEDCL). This JMR is used for calculation of the amount of electricity supplied to the grid against which the utility makes the payment to the project proponent. The JMR gives both the "export" ($EG_{JMR,export}$) and "import" ($EG_{JMR,import}$) of the electricity to/ from the NEWNE grid based on common MSEDCL meter readings.

The apportioning of electricity generated from the various wind turbines is done by EIL, based on the power generation from the individual wind turbines connected to this MSEDCL meter. Operation and maintenance personnel from EIL prepare a monthly report on generation and consumption. This report contains details of power exported/imported to/from the grid by each of the wind turbines connected. This apportioned value is then used by the project proponent to raise invoice from MSEDCL.

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

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

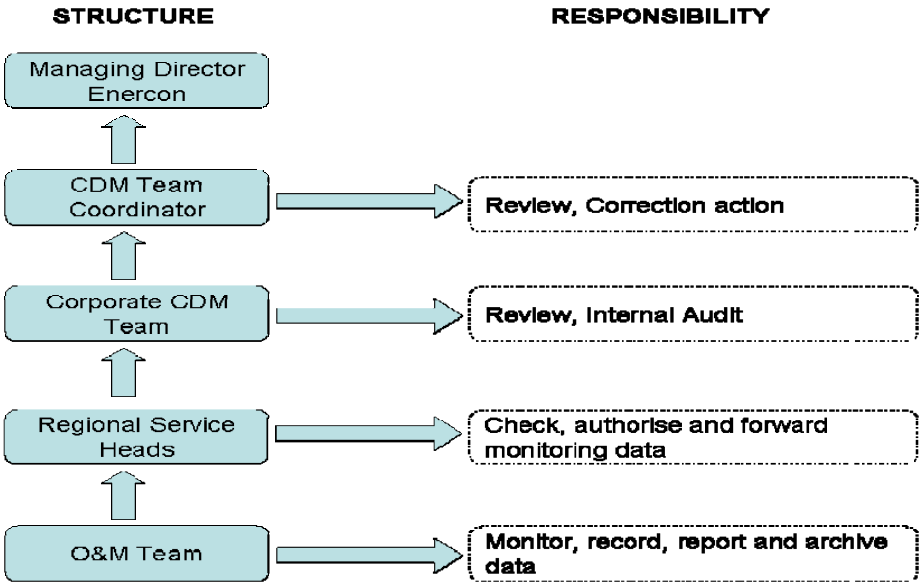
EG_{import} the electricity drawn from the grid by the project activity is calculated as follows:

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

EGy, the net electricity supplied to the grid by the project activity, is calculated as follows:

$EGy = EG_{export} - EG_{import}$

The operational and management structure implemented by Enercon is as follows:



Training procedure: Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the Wind Energy Converters (WECs), it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that Enercon's service staff is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. **The Enercon Training Academy** provides need-based training to meet the training requirements of Enercon projects. This includes emergency preparedness and handling of routine and non routine tasks so as to ensure 100% satisfactory service to the customers. The training is contemporary, which results in imparting focused knowledge leading to value addition to the attitude and skills of all trainees. This ultimately leads to creativity in problem solving.

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: 02/07/2009

Name of responsible person/entity: Project Participant and their advisors. The details of the PP are provided in the Annex 1 of the PDD.

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:

>>
17/08/2006, being the date of placement of purchase order for the wind energy generators.

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

>>
20 years

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

C.2.1. Renewable crediting period

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

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
01/11/2010 or registration of the project with UNFCCC whichever is later. The crediting period of the project will start after registration of the project with UNFCCC.

C.2.2.2. Length:

>>
10 Years

SECTION D. Environmental impacts

>>

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

>>
Enercon (India) Limited appointed Care sustainability to conduct Rapid Environmental Impact Assessment Study, in the district of Ahmednagar where the project activity of Enercon is located, to

assess the impact of the project on the local environment. The report on Rapid Environmental Impact Assessment Study was provided by the Care Sustainability in January 2007.

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

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

The study area represents part of Ahmednagar district. The terrain comprises hilly areas with flat hilltops. The hills are generally covered with shrubs and grass and trees are not found on the hilltopsAs the project is in barren land with only few varieties of shrubs and small trees in the area, it will not have any impact on the fauna found in the region. There are no rare and endangered species reported in the project area. No impact on Bio-diversity is expected because of implementation of WECs.

Erection of WECs does bring about changes in the topography of the region. However, the changes in the topography are not very much significant at said wind farm site and do not affect the project region adversely.

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

>>

EIA conducted in the district of Ahmednagar where the project is located, demonstrated that there is no major impact on the environment due to the installation and operation of the windmills in the region. Since the project employs only wind to generate energy the local ecology is not likely to get impacted by this type of project activity. The local population confirmed that there is no noise or dust nuisance due to windmills. The EIA also ruled out any adverse impacts on the local population, birds, animals and archaeological sites and due to the project activity. The parameters monitored to assess the impact demonstrated that the project activity has not affected the local ecology adversely.

SECTION E. Stakeholders' comments

>>

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

>>

The comments from local stakeholders were invited through two local stakeholder meetings both conducted on 15-November-2006 at Ahmednagar District, the advertisement in a local newspaper was placed in Sarvmat on 29th October 2006 inviting the local stakeholders for the meetings.

The local stakeholder consultation meeting had representatives from the nearby villages, representatives of Enercon (India) Limited. The minutes of the meeting are set out in Appendix 2.

E.2. Summary of the comments received:

>>

Summary of the comments received in Ahmednagar District.

- The local Stakeholders in general were satisfied with the progress brought about in their village area due to establishment of the Wind Energy Project.
- The villagers showed concern about the effects of wind energy project on the rainfall
- The disturbance that may be caused by the noise produced by the windmills.
- The villagers were ready to support the project team and were please with the development of roads and employment opportunities provided by the project in the project area. The stakeholders commented that they are grazing their animals as usual. The stakeholders also commented that there has been no problem of water drainage or logging of rainwater in their farms due to the project. The project officials have not cut any forest and have developed roads, which have made the lives of the people easier. The youths of the village commented that there has been no problem of dust or any other sort of pollution from the project. They said that these types of projects must be promoted at other places also. The project officials requested the villagers to continue giving the support to the project personnel as they have done in the past. The villagers responded by saying that they can support the project teams by providing them by food water and other available facilities.
- When asked if the villagers had any expectations from the company the villagers said that they would like to see this area becoming greener. Enercon should carry out some plantations works in the area.

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

>>

Enercon's response to the stakeholder queries in Ahmednagar District

- The WECs will not have any affect on the rainfall. The windmills produce electricity by utilizing the energy contained in the wind. It is a scientifically proven fact that wind has no relation with the amount of rainfall occurring in the region.
- Answering to the question about the noise produced from the windmills the officials said that the wind energy converters used by Enercon are of gearless technology and thus they produce minimum sound on operation, also on account of better blade design the noise produce from the running of windmills is reduced.
- Enercon officials also stressed on the need to educate the children in the villages. Enercon does provide employment opportunities but for that there is an urgent need to educate the children in the villages to the high school level. If eligible candidates are found then Enercon can hire them.
- Responding to the expectation from the villagers, officials said that for carrying out the plantation work in the area support from villagers is required. Enercon will require help from the villagers for carrying out the plantation works.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Enercon (India) Limited
Street/P.O.Box:	A-9, Veera Industrial Estate, Veera Desai Road, Andheri (W)
Building:	Enercon Tower
City:	Mumbai
State/Region:	Maharashtra
Postfix/ZIP:	400 053
Country:	India
Telephone:	+91-22-6692 4848
FAX:	+91-22 - 67040473 / 66921175
E-Mail:	yogesh.mehra@enerconindia.net
URL:	www.enerconindia.net
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	Mehra
Middle Name:	
First Name:	Yogesh
Department:	Corporate
Mobile:	+91-98200 40301
Direct FAX:	+91-22-6692 1177
Direct tel:	+91-22-6702 2832
Personal E-Mail:	yogesh.mehra@enerconindia.net

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The Project Activity does not involve any ODA financing.

Annex 3

BASELINE INFORMATION

The Operating Margin data for the most recent three years and the Build Margin data for the Western Region Electricity Grid as published in the CEA database version 2 are as follows:

Simple Operating Margin

	Western Grid (tCO2e/MWh)
Simple Operating Margin - 2003-04	0.9903
Simple Operating Margin - 2004-05	1.0120
Simple Operating Margin - 2005-06	0.9934
Average Operating Margin of last three years	0.9985

Build Margin

	Western Grid (tCO2e/MWh)
Build Margin	0.6300

Combined Margin Calculations

	Weights	**Western Grid (tCO2e/MWh)**
Operating Margin	0.75	0.9985
Build Margin	0.25	0.6300
Combined Margin		0.90641

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

Annex 4

MONITORING INFORMATION

- **Metering Equipment:** The metering equipment (main and check) are capable of recording and storing half hourly readings of all the electrical parameters with digital output.

- **Meter Readings:** The monthly meter readings (both main and check meters) are taken jointly by the parties each month. At the conclusion of each meter reading an appointed representative of MSETCL and Enercon sign a document indicating the number of Kilowatt-hours indicated by the main meter.

- **Inspection of Energy Meters:** the entire main and check energy meters (export and import) and all associated instruments, transformers installed at the Project are of 0.2% accuracy class. Change in accuracy of meter is not under the control of project participant. Each meter is jointly inspected and sealed on behalf of the Parties and is not to be interfered with by either Party except in the presence of the other Party or its accredited representatives.

- **Meter Test Checking:** the entire meter Test Checking: main and check meters are tested for accuracy with reference to a portable standard meter. The portable standard meter is owned by MSETCL. If during testing, both the Main and Check Meter are found within the permissible limit of error i.e. 0.2%, the energy computation will be as per the Main Meter. The consumption registered by the main meters alone will hold good for the purpose of metering electricity supplied to the grid as long as the error in the main meters is within the permissible limits.

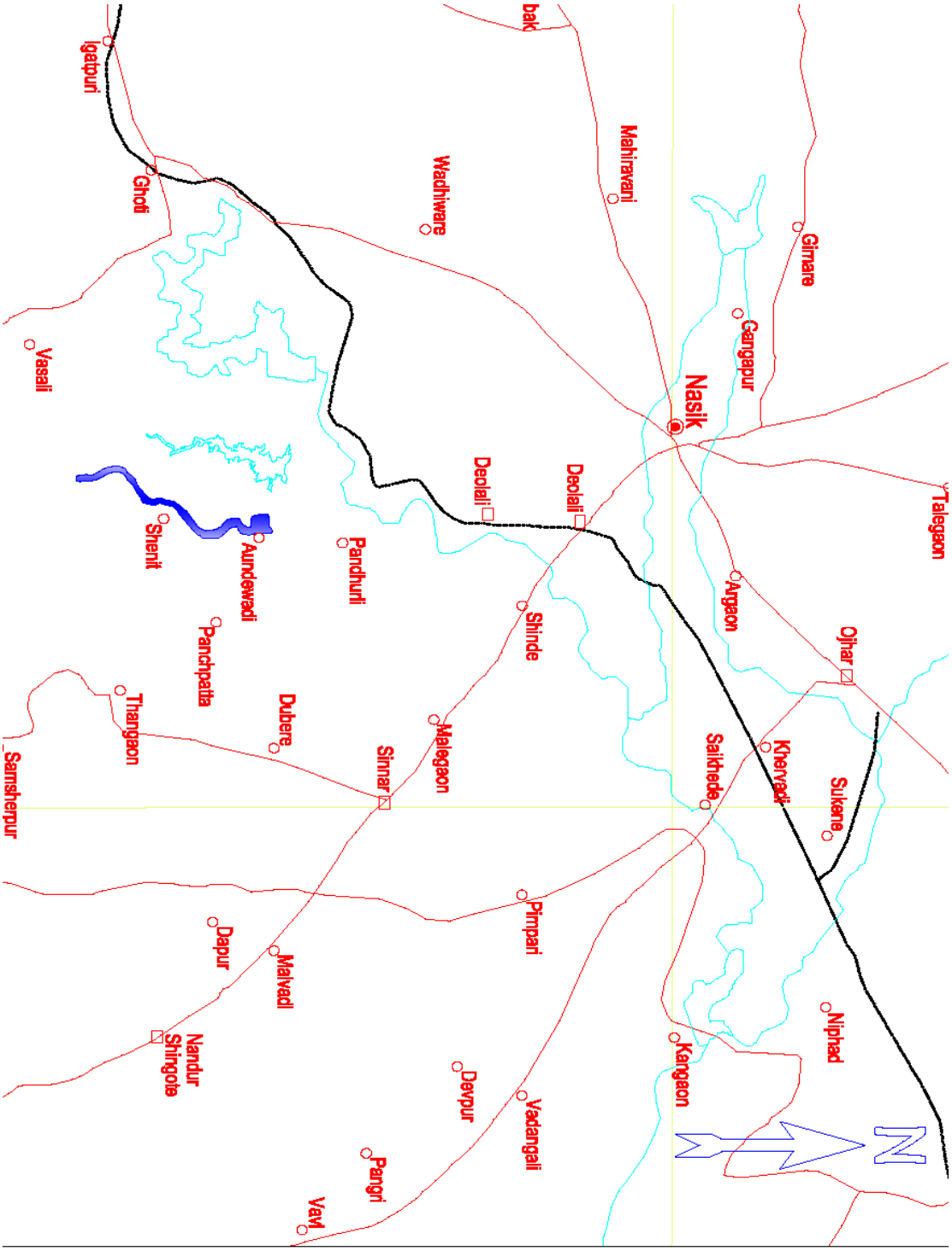
- The main meter readings are apportioned based upon the LCS meter readings from the individual WTGs to compute net electricity supplied from individual WTGs. The LCS meter readings are archived electronically on continuous basis. Joint meter reading at the EB substation is noted each month. Therefore cumulative LCS meter reading for each month is used for purpose of allocation of net electricity supplied to the grid from the project activity.

- The electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WEGs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report. The calibration of the LCS meters will be conducted annually by the third party throughout the monitoring period.

  If during the meter test checking,
  - The main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the permissible limits, then the meter reading will be as per the main meter as usual. The check meter shall, however, be calibrated immediately.
  - The main meter is found to be beyond permissible limits of error, but the corresponding check meter is found to be within permissible of error, then the meter reading for the month up to the date and time of such test shall be as per the check meter. There will be a revision in the meter reading for the period from the previous calibration test up to the current test based on the readings of the check meter. The main meter shall be calibrated immediately and meter reading for the period thereafter till the next monthly meter reading shall be as per the calibrated main meter.

- Both the main meters and the corresponding check meters are found to be beyond the permissible limits of error, both the main meters shall be immediately calibrated and the correction applied to the reading registered by the main meter to arrive the correct reading of energy supplied for metering electricity supplied to the grid for the period from the last month's meter reading up to the current test. Meter reading for the period thereafter till the next monthly reading shall be as per the calibrated main meter.
- If during any of the monthly meter readings, the variation between the main meter and the check meter is more than the permissible limit for meters of 0.2% accuracy class, all the meters shall be re-tested and calibrated immediately.

Appendix 1 – Location Map



Appendix 2- Minutes of Local Stakeholder Consultation Meeting

Public Stake Holder Consultation Meeting – District Ahmednagar, Maharashtra

Venue: Ahmednagar, Enercon Site Office
Date: 15.11.06
Time: 3 pm to 5 pm

Participants of the Meeting:

A meeting and discussions were held in connection with Environment/Renewable Energy Projects on 15.11.06 in the afternoon from 3 to 5 pm at Enercon Site office, Sata Colony, Ahmednagar between Ahmednagar Villagers and Enercon. More than 20 persons from nearby villages were present to attend the meeting. Enercon (India) Limited was represented by Shri Mahesh Bag (Admin), Mr. Vivek Sen (Corporate) Mumbai, Mr. Sandeep Bhinde Enercon Ahmednagar., Mr. Shridhar Golambe Enercon Ahmednagar.

Stakeholders present for the meeting:

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

21. Tukaram Baburao Vagule

Welcome Address:

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

Proceedings:

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

Address By the Chief Guests:

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

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

QUESTIONS ASKED BY VILLAGERS:

1. Does the Wind Energy Machines affects the rainfall?

   Ans. The questions were answered by Shri. Bag Saheb stating that there is lot of difference between the heights of installed Wind Energy Machines and clouds, which cause rain. There is no relation between Wind Energy Machine and rainfall. Rain is natural phenomenon and is not affected or stopped by windmills.

2. Will the Sound/Noise produced from the Wind energy converters cause problems to humans and animals living in the nearby areas?

   Ans. Shri. Bag Sahed answered the question stating that the blades will not make any noise and they are on 56 m height. The design of machine is so that it will produce very less sound and will not disturb animals or people while crossing the Project Area.

OTHER QUESTIONS (QUESTIONS ASKED TO THE VILLAGERS):

Q1 What developments took place after Wind Energy project came up in the area?

Ans. There are number of developments like Road, Transportation, Employment, running of State Buses etc.,

Q2 Should we promote such Projects?

Ans. Yes. We should promote projects, which will develop roads, transportation, employment etc.,

Q3 As per your views, how does this project affect Environment or livelihood?

Ans. The project will not affect livelihood or Environment.

Q4 While developing Wind Energy Project what kind of help can we (Enercon (India) Limited) expect from the villagers?

Ans. Villagers can provide the project persons with Drinking water, Eatables etc., on time.

Q5 Do you maintain good relation with personnel and authorities of this project ?

Ans. Yes, we do have very good relations with competent authorities of this project.

Q6 Does this project provide any employment opportunities?

Ans. Yes. The project has provided some employment opportunities.

Q7 Does this project has developed Transportation / road developments etc.,

Ans. Yes. Road and Transportation has improved due to the project activity.

Q8 Is Wind Energy cheaper when compared to other source of energy development?

Ans. Yes. Wind Energy is developed with the wind, which is freely available. So wind is the cheapest compared to other sources of energy. Also it does not cause any pollution and thus does not affect the environment.

Q9 How do projects relate to your life?

Ans. We use the road constructed at the site. Also we do take our domestic animals near the constructed site area where our domestic animals graze.

Q10 Does sound of blades disturbs your lives?

Ans. No. the sound of windmill operation is less and does not affect us.

Q11 If the field / land got damaged due to water drainage caused by the construction of the project?

Ans. No such nuisance has occurred.

Q12 Is there any difficulty (prohibition by the project officials) to take the domestic animals for grazing?

Ans. No.

Q13 Is there any affect on the yield of the grains from your fields?
Ans. No.

Q14 Did you find the Project officials cutting the trees on the forest land?

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

Q15 Is there any dust related problem from the project? If any dust arises, how does it affects?

Ans. No. No there is no such affect of dust.

Expectations of Villagers:

The meeting proceeded and Enercon officials asked the villagers about their expectations from the company. The villagers expressed following expectations:

1. Plantation of trees in the area: Enercon will certainly do plantations in the area and will engage villagers for the purpose of plantation.

Ending Note:

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

Appendix 3

Selection of Appropriate Benchmark:

In choosing an appropriate benchmark we have based our approach on the principles of financing and investment decision making that are well found in theory and practice of corporate financing world wide. We have derived from text book on "Corporate Finance Theory and Practice" by Dr. Aswath Damodaran

of Stern School of Business, New York University. Dr. Damodaran is one of the foremost authorities in the world in the field of Investment Analysis.

The guidance to investment analysis issued in EB 41 (paragraph 11) states that in cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity are appropriate benchmarks for equity IRR.

It is also worthwhile to note that the captioned project is a Greenfield wind power generation project that generates and supplies electricity to the state grid, therefore the project can not have only one possible project developer. The tool for demonstration and assessment of additionality [para-5, sub step 2(b)] states that in such cases (where the project has more than one potential developer) the benchmark can not be based on internal cost of equity or WACC and shall be based on parameters that are standard in the market, considering the specific characteristics of the project type. Hence, we have not used company or project specific parameters for the calculation of the benchmark (such as company WACC, project and company specific interest rates, etc.).

Accordingly, the weighted average cost of capital applicable to the project type has been considered. Weighted average cost of capital (WACC) is calculated as weighted average cost of equity and cost of debt as illustrated below

WACC = [D/ (D+E)]*[Cost of Debt] + [E/ (D+E)]*[Cost of Equity]

Cost of Debt:

Cost of debt is defined as the rate at which lenders agree to lend money to a project. The additionality tool and the guidance to investment analysis clarify that for projects that benchmark for project with more than one potential developer should not be based on project specific parameters but should represent the standard in the market. Accordingly, the bank prime lending prevailing at the time of project start date has been considered as the cost of debt. The prime lending rate at the time of investment was in the range of 10.75% to 11.25% [Source: Reserve Bank of India, http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/71430.pdf], therefore average lending rate of 11.00 % has been considered.

Interest costs are tax deductible, therefore in order to arrive at the post tax cost of debt, the cost of debt is multiplied with marginal tax rate. As per 80 IA of Income Tax Act; the green field wind power projects are eligible to claim tax holiday for 10 consecutive years from the first 15 years. In such cases where the normal tax is exempted and the project has to pay Minimum alternative tax. The tenure for power sector projects in India is 10 years and same is true for our project activity as well. Further as interest on loan is tax deductible; therefore Marginal tax rate of 11.22% is used for computation of cost of Debt while calculating applicable WACC for the project.

Cost of Equity:

The expected return on equity has been determined using the Capital Asset Pricing Model (CAPM)[2]. The CAPM economic model is used worldwide to determine the required/expected return on equity based on

[2] The Capital Asset Pricing Model (CAPM) was published in 1964 by William Sharpe, for his work on CAPM Sharpe received the Nobel Prize in 1990. http://www.investopedia.com/articles/06/CAPM.asp

potential risk of an investment. The CAPM framework is the Nobel award winning work of financial economist Dr. William Sharpe.

Ke = Rf + B x (Rm - Rf)
where:
Ke = Rate of return on equity capital;
Rf = Risk-free rate of return;
B = Beta;
Rm – Rf = Market risk premium;

Risk free rate:

The risk free rate is understood as the rate of return on an asset that is theoretically free of any risks, therefore the yeild rates are considered as risk free rates. Page 188 of text book on "Corporate Finance Theory and Practice" by Dr. Aswath Damodaran[3], Stern School of Business, New York University, describes that the yield rates are suitable indicators of risk free rates when the time horizon for the investment is long term.

Accordingly the risk free rate has been taken from yield rates available at the decision making date. This has been considered as it was in the year of investment (i.e in that year, the company had the alternative of this long term risk free investment). The data on yield rate is published by Reserve Bank of India. (Web-link: http://rbidocs.rbi.org.in/rdocs/Publications/PDFs/87456.pdf)

The applicable risk free rate is 6.63%.

Risk Premium:

The most common approach for estimating the risk premium is to base it on historical data, in the CAPM, the premium is estimated by looking at the difference between average return on stocks and risk free return. It is preferred to use long term premimums, i.e over a period of 25 years, since considering shorter time periods can lead to large standard errors because volatility in stock returns [page 191, Corporate Finance Theory and Practice, Dr. Aswath Damodaran]. It is also preferred to calculate the risk premium based on geometric mean of the returns since arithmetic mean overstates the risk premium. Geometric mean is defined as the compounded annual return over the same period [page 191, Corporate Finance Theory and Practice, Dr. Aswath Damodaran].

Therefore the risk premium has been calculated as the difference in compounded annual return bewteen the BSE-200 and the yield rate since the year of inception of BSE 200. The detailed calculations are presented in the attached excel sheet.

The applicable risk premium is 11.87%.

Beta:

[3] Dr. Damodaran, one of the foremost authorities in the world in the field of Investment Analysis

Beta (B) indicates the sensitivity of the company to market risk factors. Beta represents the market risk for an asset and is calculated as the statistical measure of volatility of a specific asset/investment relative to the movement of a market group. The conventional approach for estimating beta of an investment is a regression of returns on investment against returns on a market index. For companies that are not publicly listed, the beta is determined by referring beta values of publicly listed companies that are engaged in similar types of business. The project activity type is wind power generation; the approach therefore should be to base the beta for the project on the beta values of listed wind power generation companies in India. However, there was only one wind energy company (BF Utility) listed on any stock exchange in India (both BSE- Bombay Stock Exchange and NSE-National Stock Exchange) in year. Therefore, in the absence of adequate data on companies which are exclusively into the exactly same type of business (i.e wind power projects), the next best option for assessing the risk of these projects is to consider the data available on companies which are involved in similar businesses.

The Beta Value represents two types of risk:-

(1) Financial Risk

(2) Business Risk

We have considered beta values of all electricity generating companies in India. The group of companies considered includes renewable as well as conventional power generating companies. It is understood that risky businesses are likely to have higher cost of equity than safer businesses; projects in riskier businesses will have to cover these higher costs. Hence, investors demand a higher return from renewable energy projects than from conventional energy ones, given the higher risks in renewable, including risks of technology, risks from significantly varying and unpredictable resource availability (e.g. wind), and a lower established support base for such projects relative to that for conventional power (e.g. grid connections, bank finance, suppliers, etc.).

Unlevered beta represents the companies that do not carry financial (leverage) risk which is not the case for our project activity. To account for such differences in leverage (debt equity gearing), beta values of reference companies shall be first unlevered and re-levered using the applicable debt equity mix for the project.

In case of our project, the debt equity ratio is 85:15 which is higher than the debt equity ratio of the power companies whose betas values are considered for computation of WACC. This means that re-levering will result in a higher beta value and higher benchmark cost of capital. Therefore use of raw Beta value is considered conservative.

The applicable Beta value has been determined on the basis of the Beta values of all power generating companies in India which were listed on the stock exchange at the time of this investment. Beta values of individual companies have been sourced from Bloomberg. The table below summarises the beta values:

Company Name	Beta
BF UTILITIES LTD	1.73
CESC LTD	1.46
Gujarat Industries	1.18
NEYVELI LIGNITE	1.47
RELIANCE ENERGY	1.09
TATA POWER CO	1.28
Average	**1.37**

Minimum	**1.09**

Source: Bloomberg, Beta snapshots are provided in Appendix 4.

The debt equity ratio of the companies considered for computing beta have lower debt equity ratio compared to project activity. Hence the use of raw beta values is conservative and is used for computing weighted average cost of capital.

Calculation of Benchmark WACC:

`The WACC is the weighted average of the cost of equity and cost of debt used for financing. As per the additionality tool, standard parameters (and not project specific ones) are required to be used for arriving at the benchmark rate. In India, a debt to equity ratio of 70:30 is considered as the norm for financing wind power projects. Accordingly the WACC has been calculated based on a 70:30 debt to equity ratio.

WACC = [D/ (D+E)]*[Cost of Debt] + [E/ (D+E)]*[Cost of Equity]

For calculation of WACC, a debt to equity ratio of 70:30 has been considered, as typical for the project type.

WACC = 70%* Cost of debt + 30%*[Rf + B x (Rm - Rf)]

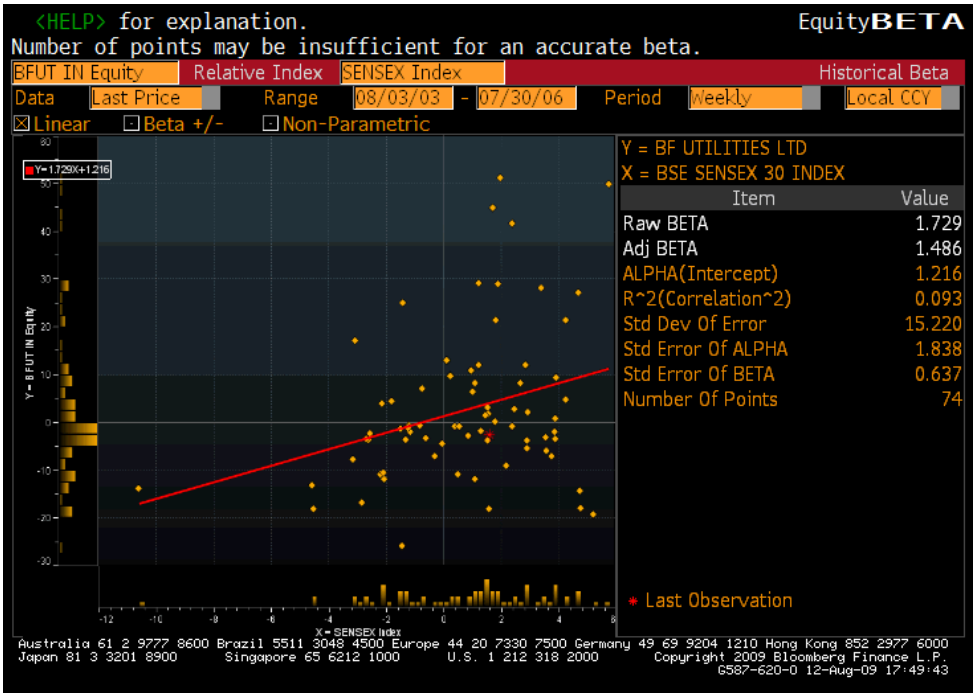
Therefore, WACC = 70% * 11.0% * (1-11.22%) + 30% * (6.63% + 1.36* 11.87%) = **13.70%**

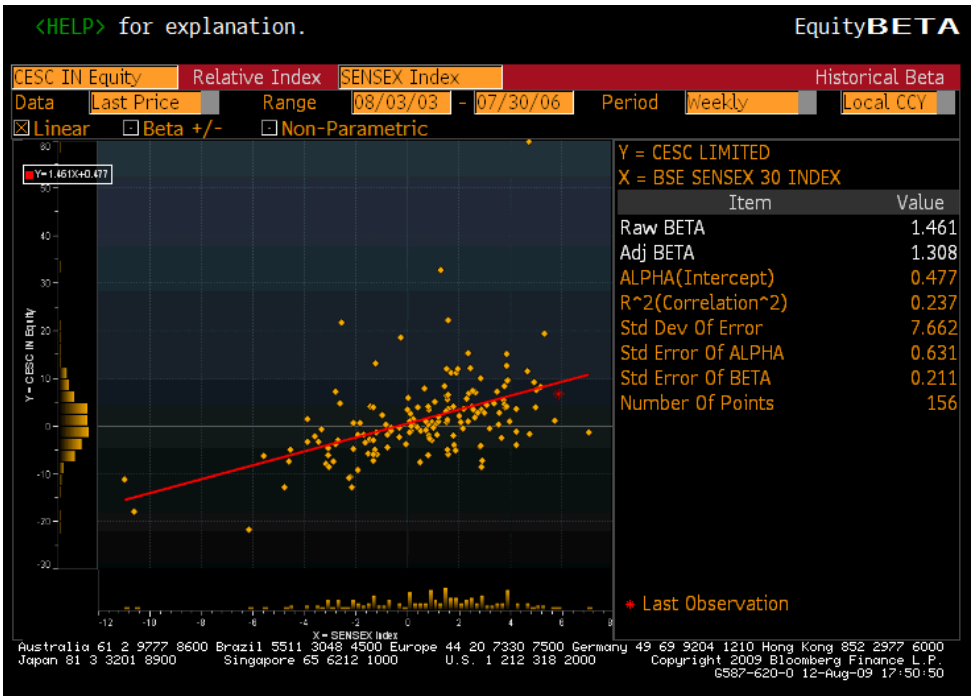
Even with the application of the minimum beta value, WACC works out to be:

$WACC_{min\ beta}$ = 70% * 11.0% * (1-11.22%) + 30% * (6.63% + 1.09* 11.87%) = **12.71%**

Appendix 4

Beta Snapshots from Bloomberg

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EquityBETA
CESC IN Equity
Relative Index
SENSEX Index
Historical Beta
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Range
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07/30/06
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Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Y=1.461X+0.477
Y = CESC LIMITED
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA
1.461
Adj BETA
1.308
ALPHA(Intercept)
0.477
R^2(Correlation^2)
0.237
Std Dev Of Error
7.662
Std Error Of ALPHA
0.631
Std Error Of BETA
0.211
Number Of Points
156
* Last Observation
Y = CESC IN Equity
X = SENSEX Index
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2009 Bloomberg Finance L.P.
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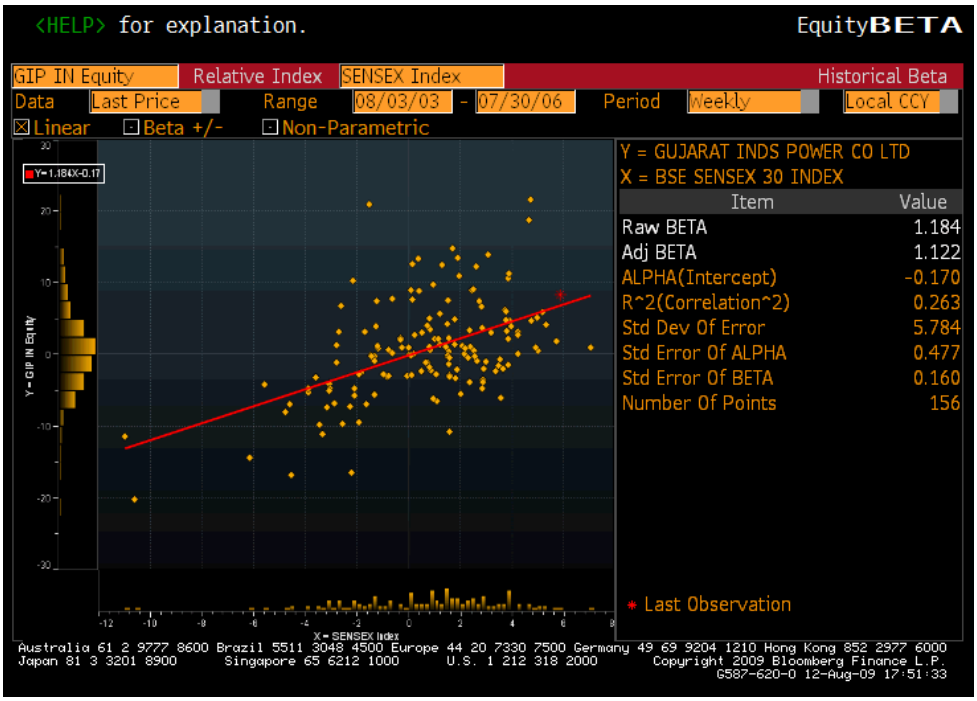
<HELP> for explanation.
EquityBETA
GIP IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
08/03/03
07/30/06
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Y=1.184X-0.17
Y = GUJARAT INDS POWER CO LTD
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA
1.184
Adj BETA
1.122
ALPHA(Intercept)
-0.170
R^2(Correlation^2)
0.263
Std Dev Of Error
5.784
Std Error Of ALPHA
0.477
Std Error Of BETA
0.160
Number Of Points
156
* Last Observation
Y = GIP IN Equity
X = SENSEX Index
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2009 Bloomberg Finance L.P.
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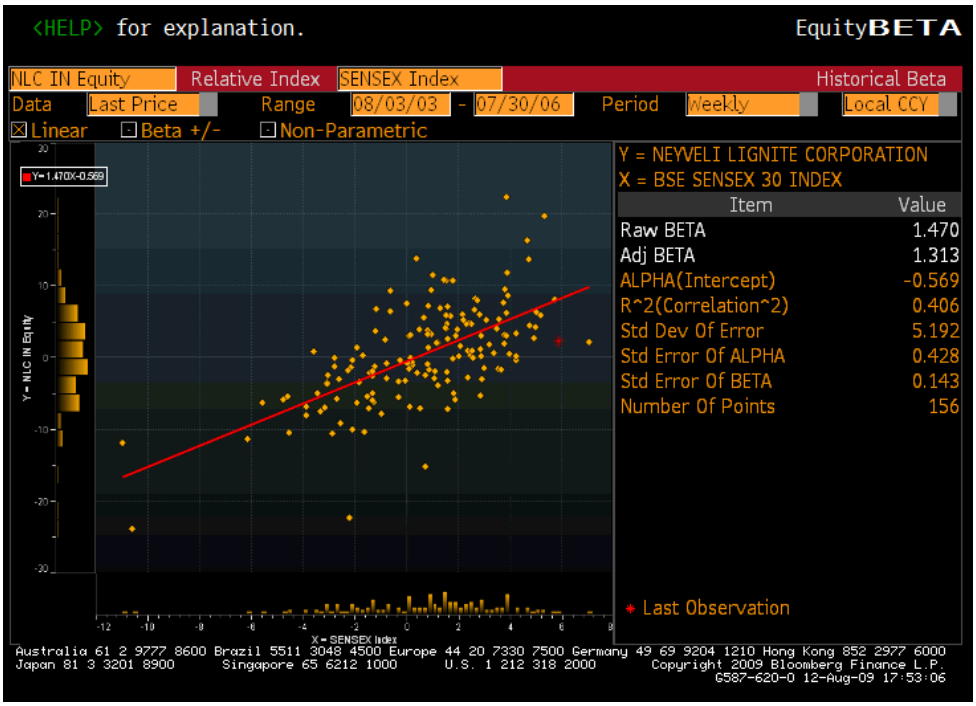
<HELP> for explanation.
EquityBETA
NLC IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
08/03/03
07/30/06
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Y=1.470X-0.569
Y = NEYVELI LIGNITE CORPORATION
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA
1.470
Adj BETA
1.313
ALPHA(Intercept)
-0.569
R^2(Correlation^2)
0.406
Std Dev Of Error
5.192
Std Error Of ALPHA
0.428
Std Error Of BETA
0.143
Number Of Points
156
* Last Observation
Y = NLC IN Equity
X = SENSEX Index
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
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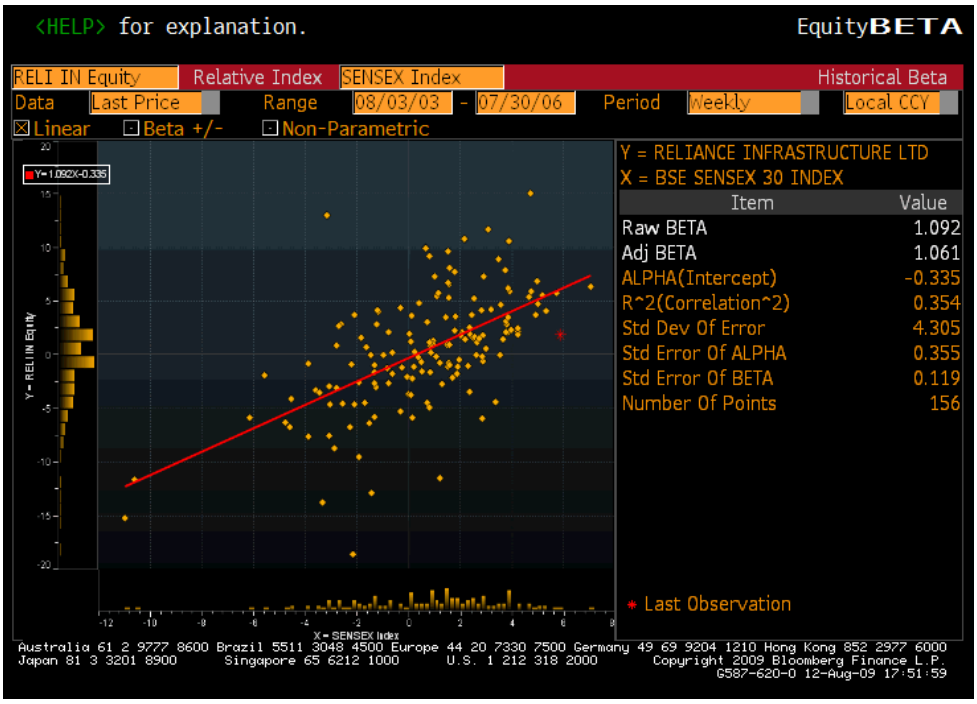
<HELP> for explanation.
EquityBETA
RELI IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
08/03/03
07/30/06
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Y=1.092X-0.335
Y = RELIANCE INFRASTRUCTURE LTD
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA
1.092
Adj BETA
1.061
ALPHA(Intercept)
-0.335
R^2(Correlation^2)
0.354
Std Dev Of Error
4.305
Std Error Of ALPHA
0.355
Std Error Of BETA
0.119
Number Of Points
156
* Last Observation
Y = RELI IN Equity
X = SENSEX Index
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
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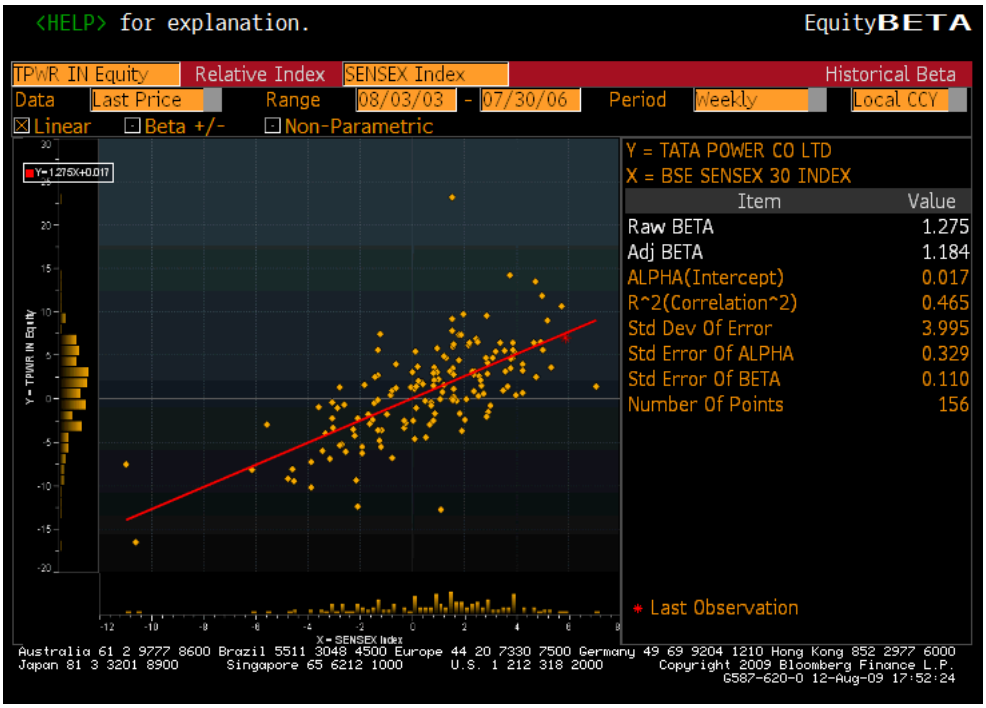
<HELP> for explanation.
EquityBETA
TPWR IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
08/03/03
-
07/30/06
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Y=1.275X+0.017
Y = TATA POWER CO LTD
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA
1.275
Adj BETA
1.184
ALPHA(Intercept)
0.017
R^2(Correlation^2)
0.465
Std Dev Of Error
3.995
Std Error Of ALPHA
0.329
Std Error Of BETA
0.110
Number Of Points
156
Last Observation
Y = TPWR IN Equity
X = SENSEX Index
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2009 Bloomberg Finance L.P.
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