CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Title: Clean Energy generation from wind energy in the state of Andhra Pradesh.
Version number: 05
Date of completion of the PDD: 12/03/2013

A.2. Description of the small-scale project activity:

The project activity is set up to produce clean power from the wind energy generators (WEG's). The project activity involves supply, erection, commissioning and operation of 8 machines of rated capacity 800 kW each. The machines are Enercon E-53 make. The generated electricity will be supplied to the Andhra Pradesh State Electricity Board under a long term power purchase agreement (PPA).

Purpose of the Project Activity

The purpose of the project activity is to utilize renewable wind energy for generation of electricity. The project activity replaces anthropogenic emissions of greenhouse gases (GHG's) into the atmosphere, which is estimated to be approximately 12,238 tCO_2e per year, by displacing the equivalent amount of electricity generation through the operation of existing fuel mix in the grid comprising mainly fossil fuel based power plants and future capacity expansions connected to the grid.

In the absence of the project activity, equivalent amount of electricity would have been generated from the connected/ new power plants in the southern grid, which are/ will be predominantly based on fossil fuels[1]. Whereas the operation of Wind Energy Generators (WEG's) is emission free and no emissions occur during the lifetime of the project activity. As per the applicable methodology the baseline scenario for the project activity is the grid based electricity system, which is also the pre-project scenario.

Enercon (India) Limited ("Enercon") is the equipment supplier and the operations and maintenance contractor for the project activity. The project activity is owned by Vish Wind Infrastructure LLP (hereafter referred as "VWILLP"). Enercon is having the responsibility of operation and maintenance of the wind farm.

Contribution to sustainable development

Ministry of Environment and Forests[2], Government of India has stipulated the social well being, environmental well being, economic well being and technological well being as the four indicators for sustainable development in the host country approval eligibility criteria for Clean Development Mechanism (CDM) projects[3].

The project activity contributes to sustainable development in the following manner:

1. **Social well being:**

[1] http://www.cea.nic.in/reports/monthly/executive_rep/mar10/8.pdf

[2] Ministry of Environment and Forest, web site: http://envfor.nic.in/cdm/host_approval_criteria.htm

[3] http://www.cdmindia.in/approval_process.php

- The candidate CDM project has resulted in investment in rural sector thereby creating employment opportunities for the skilled, semi skilled and unskilled manpower available in and around project location.
- 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.
- Use of a renewable source of energy reduces the dependence on imported fossil fuels and associated price variation thereby leading to increased energy security.

2. Economic well being:

- The project activity requires temporary and permanent, skilled and semi-skilled manpower at the wind farm; this will create additional employment opportunities in the region.
- The generated electricity will be fed into the Southern 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.

3. 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.

4. 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.

All the above - discussed points are the contributions of the project activity for the sustainable development.

A.3. Project participants:

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)
India (host)	Vish Wind Infrastructure LLP (Private)	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

India

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

Southern Region/ Andhra Pradesh State

A.4.1.3. City/Town/Community etc:

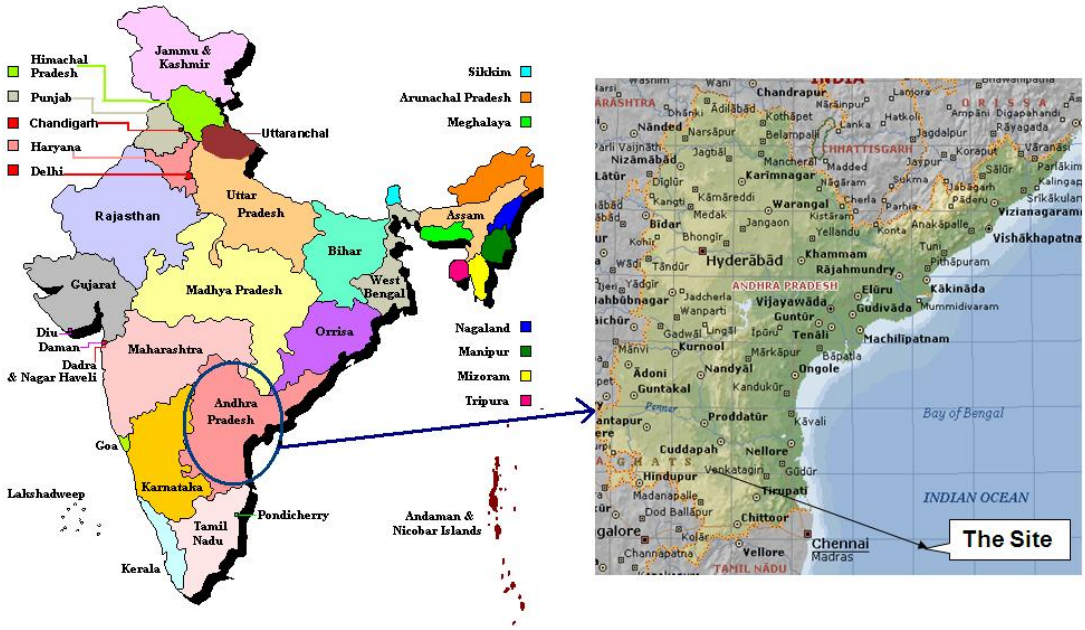
The project is located across the Petnikota village of Kurnool District of Andhra Pradesh state in India. Nearest railway station is at Tadipatri which is about 25 kms away from the site. Nearest airport is at Bangalore which is about 250 kms from the site.

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The project consists of 8 numbers of Enercon make E-53 WEGs of 800 kW each. The latitude and longitude of the project activity are given below:

WEG Serial No.	Location No.	Village	Latitude	Longitude
1	52	Petnikota	N 15°03'52.3"	E 78°02'28.8"
2	80	Petnikota	N 15°05'35.1"	E 78°01'17.9"
3	81	Petnikota	N 15°05'41.2"	E 78°01'20.0"
4	82	Petnikota	N 15°05'43.0"	E 78°01'32.8"
5	83	Petnikota	N 15°05'35.1"	E 78°01'36.0"
6	84	Petnikota	N 15°05'28.6"	E 78°01'41.3"
7	88	Petnikota	N 15°03'19.3"	E 78°02'44.1"
8	89	Petnikota	N 15°03'13.0"	E 78°02'44.0"

The physical location of the project activity is shown below:



A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

As defined under Appendix B to the simplified modalities and procedures for small-scale CDM project activities, the project activity proposes to apply following project types and categories:

Sectoral Scope **:** 01, Energy Industries (renewable/non-renewable sources)

Project Type **:** Renewable energy projects

Project Category **:** AMS-I.D, "Grid connected renewable electricity generation", (Version 17.0, EB 61)

The project activity comprises of 8 WEGs of Enercon's model E-53. The project uses technology that is environmentally clean and safe since there are no GHG emissions associated with the electricity generation from the windmills. VWILLP has contracted Enercon (India) Limited for the safe disposal of solid/oily waste. The solid /oily wastes generated as a result of the O&M activity at the site are disposed of through authorized third party contracted by Enercon for further disposal. The third party disposes the waste according to the environmental policies prevalent in Host country.

The WEGs generates 3-phase power at 400V, which is stepped up to 33 KV. The project activity can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V ± 12.5%. The average life time of the WEG is around 20 years as per the industry standards. The other salient features of the state-of-art-technology are:

E 53 Specifications

Turbine model	Enercon E- 53
Rated power	800 KW
Rotor diameter	53 m
Hub height	75 m
Turbine Type	Gearless horizontal axis wind turbine with variable rotor speed
Power regulation	Independent electromechanical pitch system for each blade.
Cut in wind speed	2.5 *m/s*
Rated wind speed	12 *m/s*
Cut out Wind speed	28-34 m/s
Extreme Wind Speed	59.5 *m/s*
Rated rotational speed	32 rpm
Operating range rot. speed	12-29 rpm
Orientation	Upwind
No of Blades	3
Blade Material	Fibre Glass Epoxy reinforced with integral lightning protection
Gear box type	Gear less
Generator type	Synchronous generator

Braking	Aerodynamic
Output Voltage	400 V
Yaw System	Active yawing with 4 electric yaw drives with brake motor and friction bearing
Tower	74 m concrete

There is no technology transfer involved in the project activity.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The estimated emission reductions over the 10-year fixed crediting period would be 122,380 tCO_2 as per details on annual emission reductions provided below:

Years	Estimation of annual emission reductions in tonnes of CO_2e
Year 1*	12,238
Year 2	12,238
Year 3	12,238
Year 4	12,238
Year 5	12,238
Year 6	12,238
Year 7	12,238
Year 8	12,238
Year 9	12,238
Year 10	12,238
Total estimated reductions (tonnes of CO_2e)	122,380
Total number of crediting years	10
Annual average of the estimated reductions over the crediting period (tonnes of CO_2e)	12,238

*1st year begins from the date of registration, and each year extends for 12 months

A.4.4. Public funding of the small-scale project activity:

There is no public funding from Annex 1 countries and no diversion of Official Development Assistance (ODA) is involved in the project activity.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

According to appendix C[4] of simplified modalities and procedures for small-scale CDM project activities, 'debundling' is defined as the fragmentation of a large project activity into smaller parts. A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities.

[4] http://cdm.unfccc.int/Projects/pac/howto/SmallScalePA/sscdebund.pdf

According to Para 2 of appendix C

A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

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

PP has another 2 WEGs of different project which is under CDM pipeline and installed at village Thummalapenta of Kurnool site and the minimum distance between two projects is more than 3 km. The project participant hereby confirm that there is no registered small scale project activity within the previous two years with them in the same project category and technology whose project boundary is within 1 km of the project boundary of the proposed small scale activity. Thus the project is not a de-bundled component of any other large-scale project activity.

SECTION B. Application of a baseline and monitoring methodology

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

The project activity is a small scale CDM project activity based on Appendix B of the simplified modalities and procedures for small-scale CDM project activities. The project activity conforms to the following category:

Sectoral Scope	:	'Energy industries (renewable - / non-renewable sources)'
Project Type	:	TYPE I - Renewable energy projects
Title of methodology	:	Grid connected renewable electricity generation.
Category	:	I.D. Grid connected renewable electricity generation
Reference [5]	:	Approved small scale methodology AMS I.D., Version 17, EB 61.

Tool: Tool to calculate the emission factor for an electricity system – Version 02.2.1

B.2 Justification of the choice of the project category:

The project activity is renewable energy generation though wind power and will supply electricity to the southern grid. As per the regulation of Electricity Act 2003, there are different regulatory bodies for distribution & transmission of electricity in the state of Andhra Pradesh. Electricity distribution is govern by APCPDCL while transmission of electricity is govern of APTRANSCO. Hence as per appendix B - 'Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories', Version- 17 the proposed CDM project falls under category I.D – Grid connected renewable electricity generation. The applicability of the project activity as small scale as per approved methodology AMS I.D. has been demonstrated below:

[5] http://cdm.unfccc.int/methodologies/DB/Q3VOK1HPBFTLSP7ZXFMY8R8Y4BEVJX

AMS I.D Applicability Criteria	Compliance of The Proposed Project Activity
This methodology comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal and renewable biomass that (a) Supplying electricity to a national or a regional grid. (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The Project is wind based renewable electricity generation, supplies electricity to the Andhra Pradesh state grid, which forms part of the Southern grid.
Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A) applies is included in Table 2.	The project activity is the installation of new wind energy generators (WEG's) which will supply the electricity to the Southern Grid. Since project activity is "Grid connected renewable electricity generation", methodology AMS-I.D is applicable.
This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity is the installation of new wind energy generators (WEG's) at a site where no renewable power plant was operating prior to project activity. The project is a Greenfield project.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m2.	This condition is not relevant, as the project activity is not the installation of a hydro power plant.
If the unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of	Project activity is the installation of wind energy generators (WEGs) and the total installed capacity of project is 6.4 MW which is less than the eligibility limit of 15 MW for a small scale CDM project activity.

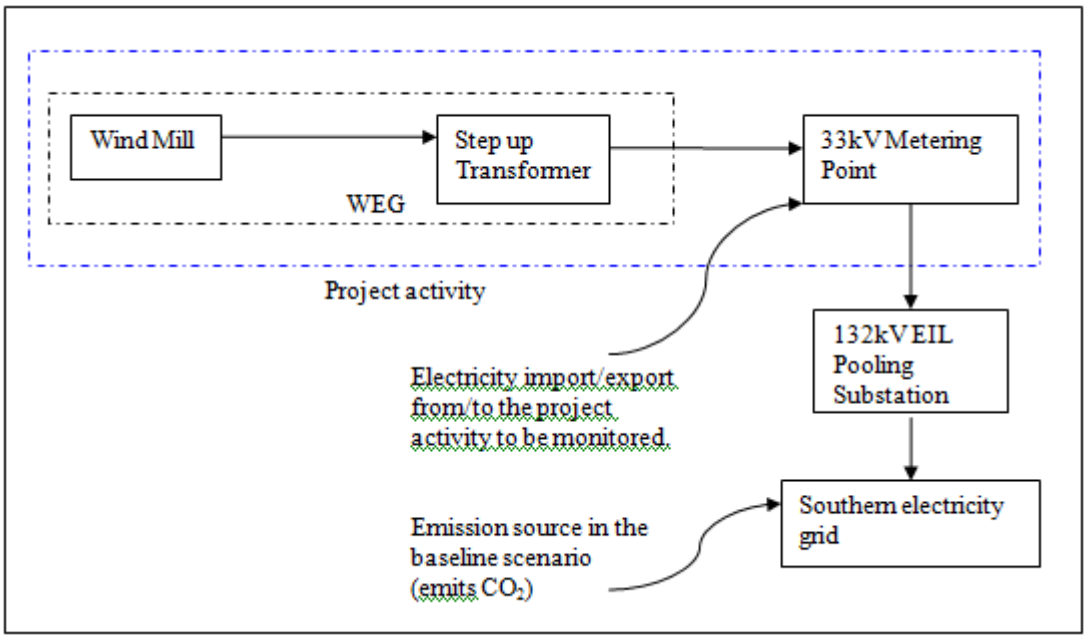
the entire unit shall not exceed the limit of 15MW.	
Combined heat and power (co-generation) systems are not eligible under this category.	Project activity is the installation of wind energy generators (WEGs), hence the condition is not applicable.
In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	This condition is not relevant, as the project activity does not involve capacity additions.
In the case of retrofit or replacement, to qualify as a small scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	Project activity is the installation of wind energy generators (WEGs) which do not involve retrofit measures or modifications, hence the condition is not applicable.

The description provided in table above shows that the project activity satisfies the applicable conditions of the methodology, AMS ID. The project activity is a small scale activity as the capacity is 6.40 MW which is less than 15 MW ceiling capacity for the project to be considered under small scale activity as per the simplified modalities and procedures of the UNFCCC and the project capacity will remain same for the entire crediting period.

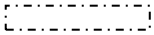
B.3. Description of the project boundary:

As per the applied methodology the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected. The project boundary thus comprises of WEG's and connected transformers, metering equipments, substation and the connected electricity grid used to transmit the generated electricity. The connected grid is southern grid.

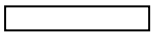
Flow diagram of the project boundary:



Represents project activity



Represents 1 unit of WEG (there are 8 such units in the project activity)



Represents project boundary

B.4. Description of baseline and its development:

In spite of significant growth in electricity generation over the years, the shortage of power continues to exist in India primarily on account of growth in demand for power, outstripping the growth in generation and generating capacity addition. Therefore in the absence of the project activity, equal amount of electricity would have been generated from the operation of existing fuel mix in the grids comprising mainly fossil fuel based power plants and future capacity expansion connected to the grids.

Establishing Baseline:

As per Appendix B of the simplified M&P for small-scale CDM project activities of the UNFCCC the project activity falls under category AMS I.D – "Grid connected renewable electricity generation."

Para 10, 11 and 12 of the AMS ID version 17 are relevant for baseline determination. Therefore baseline under section B.4 is determined using para 10, 11 and 12 of the approved methodology AMS ID version 17.

As per paragraph 10 of applied methodology-

The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

The project activity is a new grid connected power plant supplying electricity to southern grid, hence as per the applied methodology the baseline scenario for the project activity is the electricity delivered to the grid by the WEG's that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources.

As per paragraph 11 of applied methodology-

The baseline emissions are the product of electrical energy baseline $EG_{BL,\ y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

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

Where:

$BE_{\ y}$ = Baseline emissions in year y tCO_2.

$EG_{BL,\ y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{\ CO2,\ grid,\ y}$ = CO_2 emission factor in year y, tCO_2/MWh

The baseline emissions for the project activity are the electricity generated by the project activity multiplied by the emission factor of the concerned grid. The project activity is connected to Andhra

Pradesh electricity grid which is the part of southern grid hence southern grid is considered as baseline grid and emission factor of southern grid is used for the calculation of baseline emissions.

As per para 12 of applied methodology-

The Emission Factor can be calculated in a transparent and conservative manner as follows:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the Emission Factor for an electricity system'.

OR

(b) The weighted average emissions (in kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

We have used option (a) combined margin consisting of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system", version 02.2.1, as the applicable emission factor for determining baseline emissions.

The baseline emissions and emission reductions from the project activity are estimated based on the amount of electricity exported by the project activity to the southern grid multiplied by the emission factor of the southern grid calculated as the combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors.

Variable	**Data Source**
$EG_{BL, y}$ – Net electricity exported to the grid.	Records maintained by project participants
Parameter	**Data Source**
$EF_{grid,OM, y}$ = Operating margin CO2 emission factor for the project electricity system in year y (tCO_2/MWh)	CEA Database for CO_2 emission factor, version 6.0[6]
$EF_{grid,BM, y}$ = Build margin CO2 emission factor for the project electricity system in year y (tCO_2/MWh)	CEA Database for CO_2 emission factor, version 6.0
$EF_{grid,CM,y}$ = Combined margin CO2 emission factor for the project electricity system in year y (t CO2/MWh)	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 small-scale CDM project activity:

The project activity has been conceived as a CDM project since its inception. The project start date is 10 July 2010 and the PP has intimated UNFCCC on dated 16 Oct 2010 and DNA on dated 30 Oct 2010 about the project activity initiative within six months of the start date and received the acknowledgment both from UNFCCC & DNA. The acknowledgement from UNFCCC and Indian DNA has been provided to the DoE for verification. Chronology of events for project activity is as follows:-

S. No.	Activity	Date

[6] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

1	Board Resolution	09-July-10
2	Purchase Order	10-July-10
3	Authorization to EIL for CDM services	26-July-10
4	Intimation to UNFCCC and DNA	16-Oct-10
5	Commissioning date	31-Mar-2011
7	Intimation to the stakeholders	28-Apr-11
8	Stakeholder Meeting	07-May-11
9	Engagement with DoE	27-May-11
10	PDD web hosted for Global stakeholder comments.	01 July-11

As per the applicable methodology AMS I.D., version 17, "The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid".

The baseline scenario for the project activity is grid based electricity generation and in India, national electricity policy 2005 & Electricity Act 2003, doesn't restrict the power producer for the choice of fuel for power production. Further there are no policies and circumstances which can prevent the implementation of baseline scenario.

Additionality:

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

Referring to attachment A to appendix B[8] document of "indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories", project participants are required to provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

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

The additionality has been discussed based on the Annex 34[9] (EB 35). Some of the key barriers are discussed below:

[7] http://unfccc.int/resource/docs/cop7/13a02.pdf#page=36
[8] http://cdm.unfccc.int/Projects/pac/ssclistmeth.pdf
[9] http://cdm.unfccc.int/EB/035/eb35_repan34.pdf

Investment Barrier

Investment barrier: *a financially more viable alternative to the project activity would have led to higher emissions;*
Best practice examples include but are not limited to, the application of investment comparison analysis using a relevant financial indicator, application of a benchmark analysis or a simple cost analysis (where CDM is the only revenue stream such as end-use energy efficiency). It is recommended to use national or global accounting practices and standards for such an analysis.

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 alternative to the project activity is continuation of current situation i.e. no project activity, in that case equivalent amount of electricity would have been produced by the grid electricity system. This option will not require capital investment. Hence **investment comparison analysis** (option II) cannot be applied.

The Project Participant proposes to use **Option III – Benchmark Analysis.** The guidance to investment analysis issued in EB 62 (paragraph 12) 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 (Cost of 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.

The project activity of Vish Wind Infrastructure LLP is financed through 100% equity (own funds) hence equity IRR is the appropriate benchmark for the project participant.

The project under consideration is wind power project which has multiple potential investors; therefore as per para 13 of guidance on assessment of investment analysis version 5.0, EB 62,

In the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on parameters that are standard in the market. The DOE's validation of the benchmark shall also include its opinion on whether a company-specific benchmark or a benchmark based on parameters that are standard in the market is suitable in the context of the underlying project activity.

Therefore for the project under consideration, the PP is required to compute benchmark cost of equity that is based on parameters that are standard in the market.

The benchmark Cost of equity for the project is calculated as **16.40%**. The detailed calculation of the assumptions is provided in Appendix 1.

Further as per the latest guidelines of para 15 of annex 5 of EB 62, version 5.0,

If the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors".

Based on above latest guidelines of EB 62 the cost of equity benchmark has also been calculated based on default values. As the analysis has been carried out in nominal terms, the default value of expected return on equity (given in real terms in EB 62 Annex 13) has been adjusted with the inflation. The inflation value has been taken as per the forecast by the Reserve Bank of India (RBI).

The benchmark has been calculated as:

Nominal Benchmark = {(1+ Real Benchmark[10])*(1+Expected Inflation Rate[11]) – 1}
= {(1+11.75%)*(1+5.0%) – 1}
= 17.34%

For the demonstration of additionality and based on the conservative approach PP has selected the benchmark of 16.40% cost of equity out of above two values.

The project participant used following assumptions for investment analysis as per the information available at the time of project decision making

Capacity of Machines in kW	800	*WEG supplier offer dated 25 June 2010*
Number of Machines	8	*WEG supplier offer dated 25 June 2010*
Project Capacity in MW	6.40	*WEG supplier offer dated 25 June 2010*
Project Cost per MW (Rs. In Millions)	59.34	
Operations		
Plant Load Factor	23.80%	*Third party PLF report*
Insurance Charges @ % of capital cost	0.12%	*Insurance Quotation*
Operation & Maintanance Cost base year @ % of capital cost	1.30%	*WEG supplier offer dated 25 June 2010*
% of escalation per annum on O & M Charges	6.00%	*WEG supplier offer dated 25 June 2010*
Service Tax rate	10.00%	*Indian Union budget 2009-10 (http://indiabudget.nic.in/ub2009-10/fb/bill81.pdf)*

[10] Default value for expected return on equity of 11.75% published by UNFCCC under investment guidance version 5.0 has been used by PP.

[11] Expected Inflation rate for over 10 years period has been published by RBI (http://rbi.org.in/scripts/PublicationsView.aspx?id=12291). As per investment guidance, inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period. The crediting period for the project activity is 10 years and the mean WPI and CPI inflation rate are 5.0% and 6.0%. Conservatively, PP has selected 5.40% inflation rate based on data published by RBI.

Surcharge	Not applicable for LLP	*Indian Union budget 2009-10 (http://indiabudget.nic.in/ub2009-10/fb/bill10.pdf)*
Edu. Cess	3.00%	*Indian Union budget 2009-10 (http://indiabudget.nic.in/ub2009-10/fb/bill10.pdf)*
Service Tax on O&M expenses	10.30%	
Tariff		
Base year Tariff for first 10yrs after commissioning - INR./Kwh	3.50	*APERC Tariff Order dated 01.05.2009*
Project Cost	**INR Million**	
Land and Infrastructure, Generator & Electrical Equipments, Mechanical Equipments, Civil Works, Instrumentation & Control, Other Project Cost, Pre operative Expenses, etc.	379.76	
Total Project Cost	**379.76**	*WEG supplier offer dated 25 June 2010*
Means of Finance	***INR Million***	
Own Source	*379.76*	*The project is 100% equity project (CA certificate has been submitted to DOE)*
Term Loan	-	
Total Source	***379.76***	
Income Tax Depreciation Rate (Written Down Value basis)		
Depreciation as per IT Act	80%	*80% u/s section-32 of income-tax-act, rule 5(1), Appendix I of Indian IT Rules 1962.* *(http://law.incometaxindia.gov.in/DIT/File_opener.aspx?page=ITRU&schT=rul&csId=4a23cee1-1818-45d6-ab19-f155e08ed789&rNo=&sch=depreciation&title=Taxmann - Direct Tax Laws)*
Additional depreciation	20%	*u/s section 32(i)(iia) of income tax act* *(http://law.incometaxindia.gov.in/DIT/File_opener.aspx?page=ITAC&schT=&csId=e7d4edaa-f2fb-42b4-9cb1-2111050ffad7&rdb=sec&yr=d8867f97-7ef9-423c-99df-7ef492ca882f&sec=&sch=depreciation&title=Taxmann - Direct Tax Laws)*

Total depreciation on Wind Energy Generators	**100%**	
Book Depreciation Rate (Straight Line Method basis)		
On all assets	4.50%	*As per the section 205 & 350 of companies act 1956, schedule XIV, depreciation is allowed up to 95% of asset values* *Though being conservative PP has taken 10% as salvage value after the 20 years of useful life of WEG and 90% depreciation.* *Considering the 20 years useful life of the wind energy generators the rate of depreciation is to be 4.5% per annum as per SLM approach.* *(http://www.mca.gov.in/Ministry/pdf/Companies_Act_1956_13jun2011.pdf)*
Book Depreciation up to (% of asset value)	90%	
Income Tax		
Income Tax	30.00%	*Indian Union budget FY 2009-10* *(http://indiabudget.nic.in/ub2009-10/fb/bill81.pdf)*
Surcharge	Not applicable for LLP	*Indian Union budget FY 2009-10* *(http://indiabudget.nic.in/ub2009-10/fb/bill10.pdf ; http://indiabudget.nic.in/ub2009-10/fb/bill31.pdf)*
Cess	3.00%	*Indian Union budget FY 2009-10* *(http://indiabudget.nic.in/ub2009-10/fb/bill10.pdf)*
Income Tax rate	**30.90%**	
MAT	not applicable	*Indian Union budget FY 2009-10* *(http://www.llponline.in/tax_llp.php)*
Working capital		
Receivables (no of days)	30	*Billing Cycle*
O & M expenses (no of days)	90	*WEG supplier offer dated 25 June 2010*

The post tax equity IRR for the Project without CDM revenues is 8.29% i.e. less than the benchmark

Debt Equity Ratio: This is the first investment by Vish Wind Infrastructure LLP in the state of Andhra Pradesh. There are no other projects developed by PP prior to the investment decision date (10 July 2010) of project activity. PP started other wind power projects in different states of India either at same time of investment decision or after the investment decision of project activity. All of the projects are at different stages of CDM pipeline and out of which 3 projects has been registered..There are no existing debts in the company. The project is 100% equity financed; hence we have considered 100% equity in the financial calculations.

Plant Load Factor: As per EB 48, annex 11, Plant load factor validated by independent third party source can be used for investment analysis. Plant load factor for the project activity is taken from a third party assessment report. The plant load factor for the project site as determined by the third party is 23.80%.

Salvage Value: The project is depreciated up to 90% of the project cost (except for land that is non depreciable item); therefore we have considered land cost and 10% of the remaining value as salvage in the cash flow for computing equity IRR.

The post tax equity IRR for the Project without CDM revenues is 8.29% i.e. less than the benchmark.

Sensitivity Analysis:

The following sensitivity analysis has been conducted to check the robustness of the financial attractiveness of the project without CDM revenue by using Guidance on the Assessment of Investment Analysis, version-03, Annex-58, EB 51.

The project viability is affected by the following cost parameters more than 20% during its complete life time of 20 years:

- Cost of WEGs
- Plant Load Factor
- O&M Charges
- Tariff

The details for each sensitive parameter and sensitivity analysis are provided as:

Capital Cost

The capital cost for the project activity is taken from the offer provided by the WEG supplier and hence capital cost is subjected to the variation of +/-10%. Therefore we have considered it appropriate to conduct sensitivity on capital cost.

Capital Cost [In Millions]	**(-10%) 341.78**	**(Base Value) 379.76**	**(+10%) 417.74**
Equity IRR	10.31%	8.29%	6.61%

Further as per the purchase order placed by VWILLP the total project cost is INR 352.00 million which is 7.31% below than the project cost used at the time of decision making, which comes under the 10% sensitivity analysis done and the IRR at actual project cost is 9.54% which is below than the benchmark.

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 PLF of 23.80% is based on the third party assessment report which is in line with Annex 11 of EB 48. However to check the robustness of the

financial model, sensitivity on PLF is conducted at ±10%. The sensitivity beyond this range will not be reasonable assumption to make as the PLF is taken from third party assessment report.

Sensitivity is summarized in below table:

PLF	**(-10%) 21.42%**	**(Base Value) 23.80%**	**(+10%) 26.18%**
Equity IRR	6.62%	8.29%	9.86%

From the above analysis it is clear that the IRR for the project activity is less than the benchmark.

According to the generation reports for the project activity from the date of commissioning (Oct 2010) till Oct 2011, PLF for the project activity is 22.37% which is below than the third party PLF estimation and which has been covered under ±10% sensitivity range.

Being more conservative PP did the analysis on PLF up to the value at which IRR crosses the benchmark. IRR crosses the benchmark at the PLF 39.23%, which is 64.85% higher than the base PLF (23.80%), provided by third party. The PLF value of 39.23% is not possible scenario considering all the factors of plant operation and last one year PLF of 22.37% of project activity, hence this PLF value of 39.23% was considered unrealistic for sensitivity.

Operation and Maintenance cost

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

By varying the O&M cost by ±10% the equity IRR has following value:

O&M (% of capital cost)	**-10% decrease in O & M Cost**	**(Base Value) 1.30%**	**+10% increase in O&M Cost**
Equity IRR	8.54%	8.29%	8.04%

From the above sensitivity analysis it is clear that a decrease of 10% in O&M, the IRR for the project activity is 8.54% which is below than the benchmark.

Further as per the O&M agreement signed by VWILLP with O&M contractor (Enercon) dated 28 Mar 2011, the O&M cost is INR 0.44 million/WEG which will escalate at 5% per annum. PP has done the sensitivity analysis on actual O&M cost which is 0.93% of project cost used in investment analysis and at 5% escalation, and the IRR is 9.11% which is below than the benchmark.

Tariff

Andhra Pradesh state electricity commission in the tariff order dated 01May 2009 has fixed the tariff for the period of 10 years and decided to fix the Single Part tariff for the first ten years at INR3.50 per unit. As per the electricity act 2003 Section 61, the tariff should progressively reflect the cost of supply of

electricity and return on investment only with an overall objective of reducing subsidies. The National tariff policy also determines tariff based on return on investment.

As per tariff order the levelized tariff for period of 20 years is INR 3.43 per unit. However commission has approved the tariff of INR. 3.50 for the first ten years which is higher than the levelized tariff of INR 3.43 per unit. Therefore it is very unlikely that the tariff of INR. 3.50 will be approved after 10th year assuming that the commission has provided a higher tariff for the first 10 years of operation.

Though being conservative PP has selected the tariff of INR 3.50 per unit after term of PPA and equity IRR is 8.29% which is less than the benchmark. However unrealistic but still PP has done sensitivity of +10% on tariff after 10th year and equity IRR is 8.80% which is lower than the benchmark.

By varying the Tariff by 10% the equity IRR has following value:

Tariff beyond the term of PPA	**10% decrease over base tariff after 10 years**	**Base tariff (INR. 3.50 after 10 years)**	**10% Increase over base tariff after 10 years**
Equity IRR	7.75%	8.29%	8.80%

From the above sensitivity analysis it is clear that an increase of 10% in tariff, the IRR for project activity is 8.80% which is below than the benchmark.

The equity IRR crosses the benchmark at the tariff of 15.66 INR/kWh after 10 years which is unrealistic scenario for the project activity.

As can be seen, the equity IRR of the project activity remains well below the benchmark even under the sensitivity analysis. Therefore it can be concluded that the proposed CDM project activity is unlikely to be the most financially/economically attractive.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to the approved methodology AMS I D (Version 17) Emission Reductions are calculated as:-

$ER_y = BE_y – PE_y – LE_y$ …… (1)

Where:

BE_y	Baseline Emissions in year *y* (t CO_2e/yr)
PE_y	Project Emissions in year *y* (t CO_2e/yr)
LE_y	Leakage Emissions in year *y* (t CO_2e/yr)
ER_y	Emission Reduction in year y (t CO_2e/yr)

Estimation of Baseline Emissions:

As per the paragraph 11 of applied methodology the baseline emissions are the product of electrical energy baseline $EG_{BL, y}$ expressed in kWh of electricity produced by the renewable generating unit multiplied by an emission factor.

$BE_y = EG_{BL, y} * EF_{CO2, grid, y}$ …… (2)

Where:

BE_y = Baseline emissions in year y tCO_2.

$EG_{BL, y}$ = Energy baseline in year y MWh.

$EF_{CO2, grid, y}$ = CO_2 emission factor in year y, tCO_2/MWh.

The project activity is located in the state of Andhra Pradesh which falls under southern grid which is not part of Annex -I. Therefore as per the paragraph 12 of the applied methodology 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, version 02.2.1. The steps of calculation are as follows:

STEP 1. Identifying the relevant electricity systems:

The Indian electricity system is divided into two regional grids, viz. (1) Northern, Eastern, Western, North-Eastern and (2) 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 neighboring countries like Bhutan and Nepal.

According to "Tool to calculate the emission factor for an electricity system" version 02.2.1, If a connected electricity system is located partially or totally in Annex-I countries, then the emission factor of that connected electricity system should be considered zero.

The above applicability criteria are not applicable for the project activity since the project activity will supply the electricity to the southern grid of host country India, which is a not a part of Annex- I country hence the "Tool to calculate the emission factor for an electricity system" is applicable for the project activity. 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 southern regional electricity grid, the southern 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:

	2004-05	**2005-06**	**2006-07**	**2007-08**	**2008-09**
NEWNE	16.84%	18.0%	18.5%	19.0%	17.3%
South	21.61%	27.0%	28.3%	27.1%	22.8%
India	18.01%	20.1%	20.9%	21.0%	18.6%

Source: CO2 Baseline Database for the Indian Power Sector – Central Electricity Authority

The above data clearly shows that the percentage of total grid generation by low cost/must run plants (on the basis of average of five most recent years) for the southern 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 southern grid constitute less than 50% of total grid generation.

The project participants 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

Using the above calculation procedure the value of operating margin (OM) emission factor (average of last three years (2007-08, 2008-09 & 2009-10)) is 0.96843tCO2e/MWh. The data obtained from "CO2 Baseline Database for Indian Power Sector" version 6.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on the tool "Tool to calculate the emission factors for an electricity system"..

STEP 5. Calculate the build margin (BM) emission factor:

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.

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.

Using the above calculation procedure the value of build margin (BM) emission factor (for the year 2009-10) is 0.76340 tCO2e/MWh. The data obtained from "CO2 Baseline Database for Indian Power Sector" version 6.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on the tool "Tool to calculate the emission factors for an electricity system".

STEP 6. Calculate the combined margin emissions factor:

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or
(b) Simplified CM.

Since project activity is located in the state of Andhra Pradesh state of India, which is not a Least Developed Country (LDC) or in a country with less than 10 registered projects at the starting date of validation; that's why the weighted average CM method (option A) is preferred option.

The combined margin emissions factor is calculated as follows:

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

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 "**Tool to calculate the emission factor for an electricity system",** 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 0.91717 tCO_2e/MWh.

Project Emissions:

As per AMS I.D. version 17.0 (EB-61), for most renewable energy project activities, PEy = 0. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of ACM0002.

- Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption);
- Emissions from water reservoirs of hydro power plants.

As per the AMS I.D, CO2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion".

Since project activity is wind power project and there is no on-site consumption of fossil fuels due to the project activity hence as per the applied methodology the emissions from the project activity are taken as nil.

PE_y = 0..... (3)

Leakage:

Since no equipment is transferred from another project activity or that any existing equipment is transferred to another activity, leakage as per AMS ID is taken as zero.

LE_y = 0..... (4)

Details of Baseline data:

Data of Operating and Build Margin for the three financial years from 2007-08 to 2009-10 has been obtained from -

The CO_2 Baseline Database for the Indian Power Sector
Ministry of Power: Central Electricity Authority (CEA)
Version 6.0
Key baseline information is reproduced in annexure 3.
The detailed excel sheet is available at:
http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

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

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO_2e/MWh
Description:	Operating Margin Emission Factor of Southern Regional Electricity Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" version 6.0 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value applied:	0.96843

Justification of the choice of data or description of measurement methods and procedures actually applied:	Calculated by using 3 years vintage (2007-2008, 2008-2009 and 2009-10) data obtained from "CO_2 Baseline Database for Indian Power Sector" version 6.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on the tool "Tool to calculate the emission factors for an electricity system"..
Any Comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2e/MWh
Description:	Build Margin Emission Factor of Southern Regional Electricity Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" version 6.0 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value applied:	0.76340
Justification of the choice of data or description of measurement methods and procedures actually applied:	2009-10 data obtained from "CO_2 Baseline Database for Indian Power Sector" version 6.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on the tool "Tool to calculate the emission factors for an electricity system".
Any Comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	**$EF_{CO2, grid, y}$**
Data unit:	tCO_2e/MWh
Description:	Combined Margin Emission Factor of Southern Regional Electricity Grid
Source of data used:	Combined Margin Emission Factor ($EF_{CM,y}$) is calculated as the weighted average of Operating Margin Emission Factor ($EF_{OM,y}$) and Build Margin Emission Factor ($EF_{BM,y}$). The "CO_2 Baseline Database for Indian Power Sector" version 6.0 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value applied:	Combined Margin Emission Factor (EFy or $EF_{CM,y}$) | 0.91717
Justification of the choice of data or description of	In case of wind power projects default weights of 0.75 for EF_{OM} and 0.25 for EF_{BM} are applicable as per ACM0002. Refer Annex – 3 for comprehensive calculation of Combined Margin

measurement methods and procedures actually applied:	Emission Factor. Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002, and Tool to Calculate the emission Factor for an Electricity System.
Any Comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

B.6.3 Ex-ante calculation of emission reductions:

The baseline emissions are calculated as:

$$\mathbf{BE_{y} = EG_{BL,y} * EF_{CO2,grid,y}}$$

The annual electricity supplied to grid by the project activity is calculated as:
Installed capacity * operating hours * PLF

$EG_{BL,y}$ = 6.4 * 8760 * 23.80%
= 13343.23 MWh

Baseline emission factor (combined margin)
= 0.91717 tCO_2e/MWh

Hence baseline emissions are:

BE_y = 13343.23MWh * 0.91717 tCO_2e/MWh
= 12238 tCO_2e

Project emissions and leakage emissions for the project activity are zero.

Hence emission reductions are calculated as:

$ER_y = BE_y – PE_y – LE_y$
= 12,238 - 0 - 0
= 12,238 tCO_2e/year

The emission reductions from the project activity are estimated to be **12,238 tCO_2e/year**.

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

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Year	Estimation of project activity emissions (tCO_{2e})	Estimation of baseline emission (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
Year 1*	0	12,238	0	12,238
Year 2	0	12,238	0	12,238
Year 3	0	12,238	0	12,238
Year 4	0	12,238	0	12,238
Year 5	0	12,238	0	12,238
Year 6	0	12,238	0	12,238

Year 7	0	12,238	0	12,238
Year 8	0	12,238	0	12,238
Year 9	0	12,238	0	12,238
Year 10	0	12,238	0	12,238
Total (tonnes of CO_2e)	**0**	122,380	**0**	122,380

*1st year begins from the date of registration, and each year extends for 12 months.

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**$EG_{BL, y}$**
Data unit:	MWh (Mega-watt hour)
Description:	Net electricity supplied to the grid by the Project activity.
Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Annual electricity supplied to the grid by the Project = 6.40 MW (Capacity) x 23.80%(PLF) x 8,760 (hours) MWh = 13343.23 MWh
Description of measurement methods and procedures to be applied:	Net electricity supplied to the grid is used in calculation of emission reduction of the project activity. Detailed procedure calculating net electricity supplied to the grid is given in section B.7.2. Please refer Annex 4 for details of metering procedure & metering equipment.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. Please refer Annex 4 for details for QA/QC procedure.
Any comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

Data / Parameter:	**$EG_{JMR, Export,y}$**
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity Export recorded at 33kV (JMR at 33kV metering points) cluster metering points connecting total 8 machines of the project activity.
Source of data to be used:	Electricity export to grid sourced from Statement of Billing Parameters/ Joint Meter Reading (JMR) recorded at cluster metering point.
Value of data applied for the purpose of calculating expected emission reductions in	= 13343.23

section B.5	
Description of measurement methods and procedures to be applied:	Electricity to export to the grid will be recorded by cluster meters (main and check) connecting 8 turbines at 33kV level. Please refer Annex 4 for details of metering procedure & metering equipment.
QA/QC procedures to be applied:	Value of $\mathbf{EG_{JMR,\ Export,y}}$ can be crosschecked from transmission loss calculation sheet provided by the state utility. QA/QC procedures will be as implemented by Discom/ State Utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. Please refer Annex 4 for details for QA/QC procedure.
Any comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

Data / Parameter:	$\mathbf{EG_{JMR,\ Import,y}}$
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity Import recorded at 33kV (JMR at 33kV metering point) cluster metering points connecting total 8 machines of the project activity.
Source of data to be used:	Electricity import from the grid as per the Statement of Billing Parameters/ Joint Meter Reading (JMR) recorded at cluster metering point.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	=0 (assumed)
Description of measurement methods and procedures to be applied:	Electricity import from the grid will be recorded by cluster meters (main and check) connecting 8 turbines at 33kV level. Please refer Annex 4 for details of metering procedure & metering equipment.
QA/QC procedures to be applied:	Value of $\mathbf{EG_{JMR,\ Import,y}}$ can be crosschecked from certified "statement showing energy admitted and amount paid details of M/S. Enercon India Ltd clients" given by state utility/APPCC (Andhra Pradesh Power Co-Ordination Committee) It may be noted that energy import by the project activity will be export by the grid to the project activity and therefore electricity import by the project activity is denoted as export by the grid in the certified statement by the state utility. QA/QC procedures will be as implemented by Discom/ State Utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. Please refer Annex 4 for details for QA/QC procedure.
Any comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

Data / Parameter:	$\mathbf{EG_{Export,y}}$
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity exported by project activity to grid after apportioning of line losses between 33kV metering point (Cluster meter) & 132kV metering point (Bulk

	metering point at Enercon Sub-station)
Source of data to be used:	Certified "transmission loss calculation sheet" given by state utility/APCPDCL (Andhra Pradesh Central Power Distribution Company Limited).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	= 13343.23
Description of measurement methods and procedures to be applied:	Value of $\mathbf{EG_{Export,y}}$ will be calculated by Electricity Board independently. Either Enercon or PP doesn't have any role or control on calculation of net electricity generation/export. Detailed procedure calculating $EG_{Export,y}$ is given in section B.7.2. Please refer Annex 4 for details of metering procedure & metering equipment.
QA/QC procedures to be applied:	Value of $EG_{Export,y}$ can be crosschecked from the tariff invoices raised by PP on the DISCOM. QA/QC procedures will be as implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. Please refer Annex 4 for details for QA/QC procedure.
Any comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

Data / Parameter:	$\mathbf{EG_{Import,y}}$
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity import by project activity from grid after apportioning of line losses between 33kV metering point (Cluster meter) & 132kV metering point (Bulk metering point)
Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	=0 (assumed)
Description of measurement methods and procedures to be applied:	Detailed procedure calculating $EG_{Import,y}$ is given in section B.7.2. Please refer Annex 4 for details of metering procedure & metering equipment.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD.

	Please refer Annex 4 for details for QA/QC procedure.
Any comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

Data / Parameter:	**T_E**
Data unit:	Percentage (%)
Description:	Percentage Line loss between the 33 kV metering points (cluster meters including project activity of project activity) and the metering point at 132 kV at the ENERCON pooling substation.
Source of data to be used:	Certified "transmission loss calculation sheet" given by state utility/APCPDCL (Andhra Pradesh Central Power Distribution Company Limited).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be directly applied. =0 (assumed)
Description of measurement methods and procedures to be applied:	Percentage Line loss between metering point at 33kV and the metering point at 132kV at ENERCON substation is applied directly to the meter reading taken at cluster meters at 33 KV for the project activity. ENERCON pooling Substation is connected to the machines of the project activity and the machines commissioned by the other project owners. Therefore Line loss is applied to the project activity by the state utility as reflected in the Monthly billing records taken at 33kV level. The line loss calculation is done by state utility and is directly used for adjusting the net export recorded at 33kV metering clusters. Refer Annex – 4 and Section B.7.2 for an illustration of the provisions for measurement methods.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by Discom/State utility (state utility/APCPDCL) pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. Please refer Annex 4 for details for QA/QC procedure.
Any comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

B.7.2 Description of the monitoring plan:

Wind based electricity generation is not associated with any kind of leakages. Hence, the sole parameter for monitoring is the electricity supplied to the grid. The Project is operated and managed by Enercon. They follow the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, finance, construction, commissioning and operation of the wind power project.

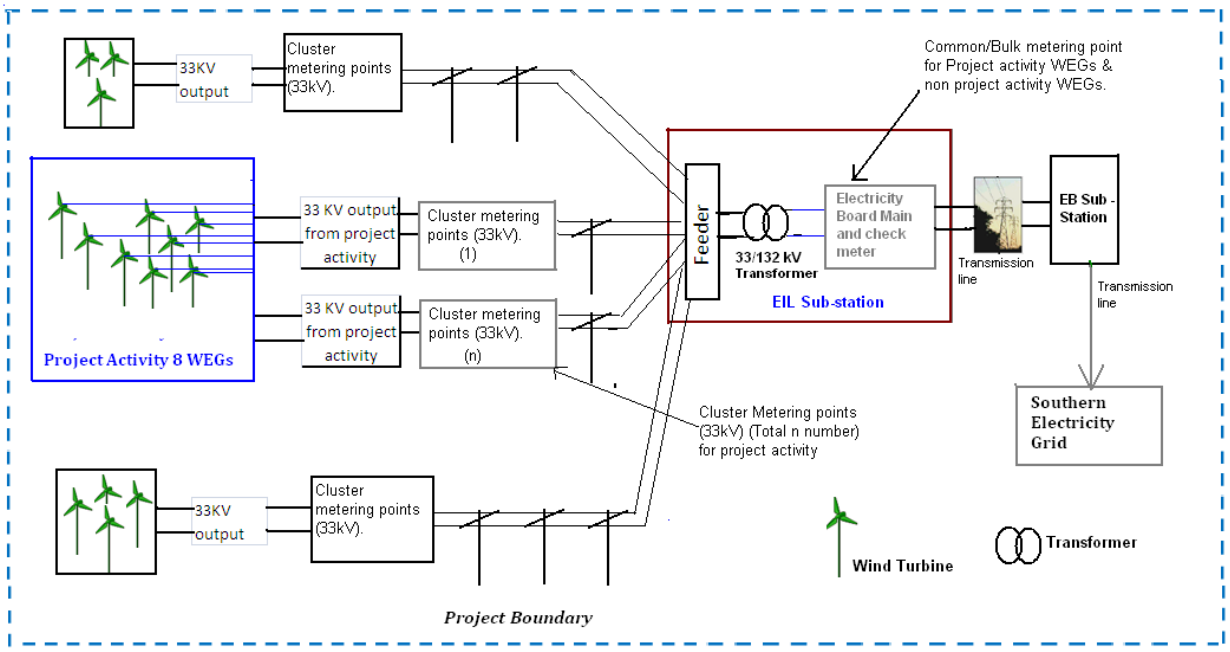
This approved monitoring methodology requires monitoring of the electricity generation from the project activity.

Since the baseline methodology is based on ex ante determination of the baseline, the monitoring of operating margin emission factor and build margin emission factor is not required. Further, wind based electricity generation is not associated with any kind of leakages. Hence, the sole parameter for monitoring is the electricity generated by the project and supplied to the grid.

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

Description of metering arrangement for project activity:-

Layout of Metering arrangement for project activity is as follows:-



From the above line diagram it is clear that metering system for the project activity consists of clusters of individual metering points at 33kV at project site. Each 33kV metering points will have one main meter of 0.2% of accuracy class which is exclusively be connected to WEGs of the project activity i.e. there will be no WEGs of other project owners that are connected to these metering point. The 8 WEGs of project activity is connected to total 3 cluster metering points at the project site

In addition the 33kV metering points there are two set of main & check meter of 0.2% accuracy class at 132kV Enercon Pooling sub-station at Ankireddy palli (common/Bulk metering point) where all the WEGs of project activity and non-project activity are connected.

From the above line diagram it is clear that the machines of the project activity and other project developers at the wind farm have individual metering points at 33kV at the project site. Further PP will make clusters of WEGs at the project site for the purpose of metering. Each cluster will have a main

meter & check meter. The WTGs of the project activity will be connected to individual dedicated cluster meters.

From the above layout it is clear that the clusters meters (dedicated meters/ individual meters) of project activity and other customers are connected to the Enercon pooling sub-station at Ankireddipalli at bulk metering point at 132 kV. There are two set of main and one check meter at the Enercon substation. Since the main and check meters (bulk meter) at 132 kV metering point at the ENERCON pooling substation is connected to the machines of the project activity and the machines commissioned by the other project developers, therefore in order to determine the net electricity supplied to the grid at 132 kV at the ENERCON substation, the state utility apply Line loss to the meter reading recorded at the 33 KV.

The total % of Line loss from WEGs (33kV metering point) to Enercon substation (132kV metering point) is calculated by the state utility. Net Electricity supplied to the grid by project activity is calculated by applying Line loss to the meter readings taken at 33 kV metering point of the project activity.

The procedure for calculation of the percentage Line loss is set-out below:

$$T_E = \frac{(X1+X2+X3+X4+.....Xn) - Y}{(X1+X2+X3+X4+.....Xn)} \times 100\%$$

Where,

T_E = *Percentage Line loss incurred in Line between the meters located at 33 kV metering point (including the machines of the project activity and other project developers) and the meters located at 132kV metering point (bulk meter: main and check) at high voltage side of receiving sub-station. Refer above picture for schematic of the flow diagram.*

(X1+X2+X3+X4+.....Xn) = *Summation of meter readings (Export) at 33 kV metering points for all the project developers connected to receiving substation (including the machines of the project activity and other project developers)*

Y = *Export Reading at bulk meter installed at high voltage side of transformer of the receiving sub-station at 132 kV connecting machines of the project activity and other project developers. Refer above picture for schematic of the flow diagram.*

Monthly JMR recorded at 33 kV metering points as given by APCPDCL contains the following data:-

1. Electricity Export ($\mathbf{EG_{JMR, Export,y}}$) : Electricity export to the grid at 33kV metering point.
2. Electricity Import ($\mathbf{EG_{JMR, Import,y}}$) : Electricity import from grid at 33kV metering point.

Net Electricity supplied to the Grid is calculated as:-

$$\mathbf{EG_{BL,y} = EG_{Export,y} - EG_{Import,y}}$$

Where,

$$EG_{Export,y} = EG_{JMR,\ Export,y} \times (1 - T_E) \quad \text{.....(1)}$$

$$EG_{Import,y} = EG_{JMR,\ Import,y} \times (1 + T_E) \quad \text{.....(2)}$$

In Andhra Pradesh state the electricity imported by WEGs (Electricity exported by grid to WEGs) is charged by state utility based on KVAH & KVA reading of import instead of the reading of kWh and at the rate of applicable HT tariff, while payment against electricity exported by WEGs (Electricity imported by grid from WEGs) to PP is made based on kWh reading (after deducting transmission loss between 33kV & 132 kV level). Hence to arrive the net import at 132 kV PP has applied the same transmission loss (value in %) factor in import value (kWh reading) of WEGs recorded at 33kV as per formula mentioned above (refer formula 2).

In case the date of registration or start date of the crediting period of the project activity does not match with the date of joint meter report or billing cycle, PP will forego the emission reductions for that particular period.

Procedure to deal with data uncertainty:

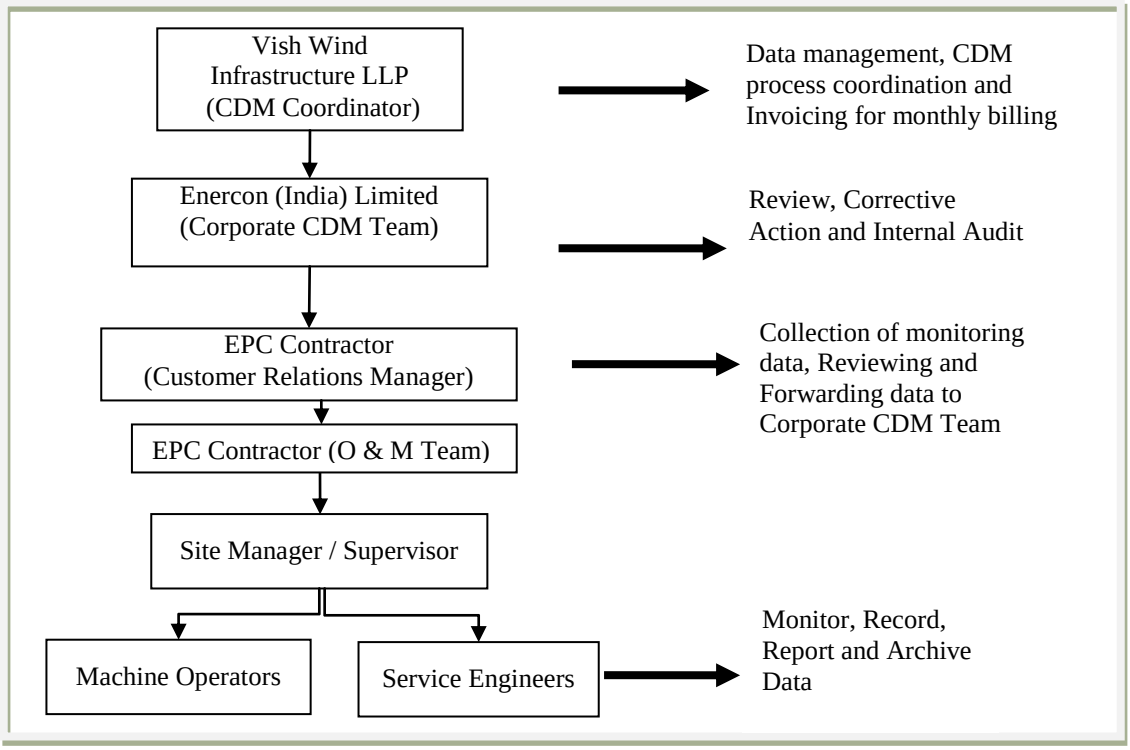
During the calibration, if the meter is found to be outside the permissible limits of the error and if that meter readings have been used in JMR, the (–ve) error value would be applied to electricity export and (+ve) error value will be applied to import of electricity from grid to all the JMR values since the date of last calibration. The meter would be replaced immediately with new calibrated meter

In case both main and check meters are found not to be working in the accuracy range during the calibration test, both the meters shall be replaced immediately and the correction will be applied to the consumption registered by the main meter to arrive the correct delivered energy for the billing purpose for the period of one month upto the time of such test check, computation of the delivered energy for the period thereafter till the next monthly meter reading shall be as per the replaced main meter.

Monitoring roles and responsibilities

The operational and maintenance contract for the project is with Enercon. Enercon is an ISO 9001:2008 certified Quality Management system from Germanischer Lloyd. Enercon follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, finance, construction, commissioning and operation of the wind power project.

The operational and management structure implemented for data monitoring is as follows:



PP will be monitoring the data sent by the O&M contractor and the data for electricity generated by the project activity will be kept as records for the period of 10+2 years i.e. 2 years beyond the term of crediting period. Enercon is O&M contractor and will be responsible for data recording.

The project participant is Vish Wind Infrastructure LLP will be keeping and monitoring the data for electricity generation and calibration reports post project implementation. Enercon (India) Limited will be the O&M contractor who will be having the responsibility of activities such as maintaining electricity generation records, calibration records and maintenance of the WEGs (Wind Energy Generators).

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

Date of completion of baseline study and monitoring methodology: 10/11/2010

Name of responsible person/entity is Vish Wind Infrastructure LLP. Vish Wind Infrastructure LLP is also the project participant, the contact Details are provided in Annex 1.

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:

10/07/2010, being the earliest date of placement of purchase order for the WEG's.

As per the CDM –PDD guideline on starting date "The starting date of a CDM project activity is the earliest of the date(s) on which the implementation or construction or real action of a project activity begins/has begun".
The PP placed the purchased order dated 10/07/2010 on Enercon and therefore has been selected as the project start date.

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

20 years 0 months

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

The project participant has selected the fixed crediting period for the project activity.

C.2.1. Renewable crediting period

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

Not Applicable

C.2.1.2. Length of the first crediting period:

Not Applicable

C.2.2. Fixed crediting period:

The project participant has selected the fixed crediting period of 10 years for the project activity.

C.2.2.1. Starting date:

01/03/2012 or date of registration of project with UNFCCC whichever is later.

C.2.2.2. Length:

10 Years 0 Months.

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

As per the Schedule 1 of Ministry of Environment and Forests (Government of India) notification dated January 27, 1994 and EIA Notification (S.O 1533) dated 14th September 2006, a list of activities that require undertaking environmental impact assessment studies[12] has been provided. EIA is not a regulatory requirement in India for wind energy projects and PP does not expect any adverse impacts of the proposed CDM project activity on the environment.

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

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:

The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. Hence, EIA is not required by the host party.

SECTION E. Stakeholders' comments

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

The comments from local stakeholders were invited through a local stakeholder meeting conducted at Anantpur District in Andhra Pradesh on 7 May 2011 at 10:30 am to 12:30 pm. Personal invitations were sent by EIL dated 28 April 2011 inviting the local stakeholders for the meeting The meeting was presided over by Mr. T. Praveen (Enercon), Mr. Saujanya Kumar (ENERCON-CDM) and Mr. A. V. Bhargava (ENERCON).

E.2. Summary of the comments received:

The local stakeholder consultation meeting had representatives from the nearby villages and representatives of VWILLP and Enercon (EPC and O&M contractor). PP had a direct interaction with the stakeholder asked them to provide their comments & suggestion regarding the project activity. The following queries were raised by the stakeholders during the stakeholder meeting:

S.No.	Villager Name	Question
1	Sivaiah	Whether the electricity generated from this project will directly fed to the local community?
2	G.Suryanarayana Reddy	Will the machines installed create sound and disturb the surrounding?
3	Appayya,	Can the local people will get works relating to project.

Further stakeholders were requested to provide the comments through mail & direct contact details as mentioned in Public notice. Minutes of meeting were recorded on by Enercon officials. Signed minutes of meeting have been provided to DOE.

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

The clarifications that were addressed by the representatives of Enercon (Enercon is authorized by the PP to execute all the activities in relation to CDM i.e. project registration and verification including local stakeholder consultation) are listed in the table below:

S.No.	Villager Name	Question	Reply
1	Sivaiah	Whether the electricity generated from this project	Electricity generated by this project will be fed to the state electricity grid which

		will directly fed to the local community?	further distributes the electricity as per the state policy.
2	G.Suryanarayana Reddy	Will the machines installed create sound and disturb the surrounding?	Many companies has installed wind projects in several villages and no such problem has been faced. The sounds from the machines are negligible and carry no significance which effect or have a major concern.
3	Appayya,	Can the local people will get works relating to project.	Yes, there will be opportunities for the vicinity people of project by a proper selection process.

The meeting was very cordial and ended on a positive note. No adverse comments were received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Vish Wind Infrastructure LLP
Street/P.O.Box:	A-9, Veera Industrial Estate, Veera Desai Road, Andheri (West)
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:	
Represented by:	
Title:	Designated Partner
Salutation:	Mr.
Last Name:	Mehra
Middle Name:	
First Name:	Yogesh
Department:	Corporate
Mobile:	+91-9820040301
Direct FAX:	+91-22-67040473/66921175
Direct tel:	+91-22-6692 4848
Personal E-Mail:	yogesh.mehra@enerconindia.net

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project activity does not involve any public funding from parties included in Annex 1.

Annex 3

BASELINE INFORMATION

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

Simple Operating Margin

	Southern Grid (tCO_2e/MWh)
Simple Operating Margin – 2007-08	0.99086
Simple Operating Margin – 2008-09	0.97292
Simple Operating Margin – 2009-10	0.94150
Average Operating Margin of last three years	0.96843

Build Margin

	Southern Grid (tCO_2e/MWh)
Build Margin- 2009-10	0.76340

Combined Margin Calculations

	Weights	**Southern Grid (tCO_2e/MWh)**
Operating Margin	0.75	0.96843
Build Margin	0.25	0.76340
Combined Margin		0.91717

Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm (CEA data base version 6.0)

Annex 4

MONITORING INFORMATION

Metering procedure:-

- Metering system for the project activity consists of cluster metering system at 33kV. Each cluster point will have one main and one check meter (33kV metering point). All the clusters of the project activity will exclusively be connected to WEGs of the project activity i.e. there will be no WEGs of other project owners that are connected to these clusters. Summation of meter reading for all the clusters (connecting 8 machines) will provide total electricity generated by the project activity.

- In addition to cluster meters there are two set of main & check meter at Enercon Pooling sub-station (132kV metering point/Bulk metering point) where all the WEGs of project activity and non-project activity are connected.

- The procedures for metering and meter reading will be as per the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD.

- Monthly Joint Meter Reading will be recorded at all the meters will be done by Discom utility/APCPDCL in the presence of PP's representative (Enercon).

- Joint meter reading recorded at cluster metering point indicates the values of export & import by the WEGs of project activity connected to 33 kV metering point. There will be individual Joint meter reading for individual cluster metering point.

- Joint meter reading recorded at 132kV metering point at Enercon pooling sub-station indicates the values of export & import by the all the WEGs of project activity and WEGs of non-project activity connected to 132 kV metering point.

Metering Equipment details:-

- All main and check meters are two-way tri-vector meters capable of recording import and export of electricity and under the control of state electricity utility.

- All main and check meters are of 0.2% of accuracy class.

- All the main meter and check meters are calibrated by state utility once in five year and records are available with PP.

QA/QC procedure:-

QA/QC procedures will be as implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD.

In case the meters are found to operate outside the permissible limits, the meters will be either replaced immediately or calibrated. Whenever a main meter goes defective, the consumption recorded by the check meter will be referred.

In case both main and check meters are found not to be working in the accuracy range during the calibration test, both the meters shall be replaced immediately and the correction will be applied to the consumption registered by the main meter to arrive the correct delivered energy for the billing purpose for the period of one month upto the time of such test check, computation of the delivered energy for the period thereafter till the next monthly meter reading shall be as per the replaced main meter.

The empirical formulas applied for computing net electricity supplied to the grid is detailed in B.7.2

Appendix 1

CALCULATION OF BENCHMARK COST OF EQUITY

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 worldwide. 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 51 (paragraph 12) states that in cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity are appropriate benchmarks for equity IRR. Benchmarks supplied by relevant national authorities are also appropriate if the DOE can validate

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 cannot 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 cannot 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.

Accordingly, the cost of equity applicable to the project type has been considered and calculation of cost of equity is described as follows:-

Cost of Equity:

The expected return on equity has been determined using the Capital Asset Pricing Model (CAPM)[13]. The CAPM economic model is used worldwide to determine the required/expected return on equity based on potential risk of an investment. The CAPM framework is the Nobel award winning work of financial economist Dr. William Sharpe.

$Ke = Rf + B \times (Rm - Rf)$

where:

Ke = Rate of return on equity capital;

Rf = Risk-free rate of return;

B = Beta;

Rm – Rf = Market risk premium;

[13] 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

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[14], 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 risk free rate is published by Reserve Bank of India. (Web-link: http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/26CT_BUL110610.pdf)

The applicable risk free rate is 8.38%.

Market Risk Premium:

The most common approach for estimating the market 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 market risk premium has been calculated as the difference in compounded annual return bewteen the BSE-Sensex and the risk free rate applicable at the time of investment decision. We have calculated long term market return for Sensex, BSE-100, BSE-200 & BSE-500 and being conservative minimum value out of BSE Sensex, BSE-100, BSE-200 and BSE-500 has been choosen. BSE-200 has the minimum value of 15.77% and same has been selected for the calcualtion of market risk premium. The detailed calculations are presented in the attached excel sheet.

The applicable market risk premium = 15.77%- 8.38%

= 7.39%.

Beta:

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.

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

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.

Since the project activity is 100% equity financed that's why Unlevered Beta has been used while calculating the benchmark.

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	Raw Beta	Unlevered Beta
Tata Power Co Ltd	1.032	**0.73**
BF Utilities Ltd	1.950	**1.07**
Neyveli Lignite Corporation	1.635	**1.24**
Reliance Infrastructure Ltd	1.955	**1.60**
Gujarat Inds Power Co Ltd	1.365	**0.79**
	Average	**1.09**

Source: Bloomberg, Beta snapshots are provided in Appendix 2.

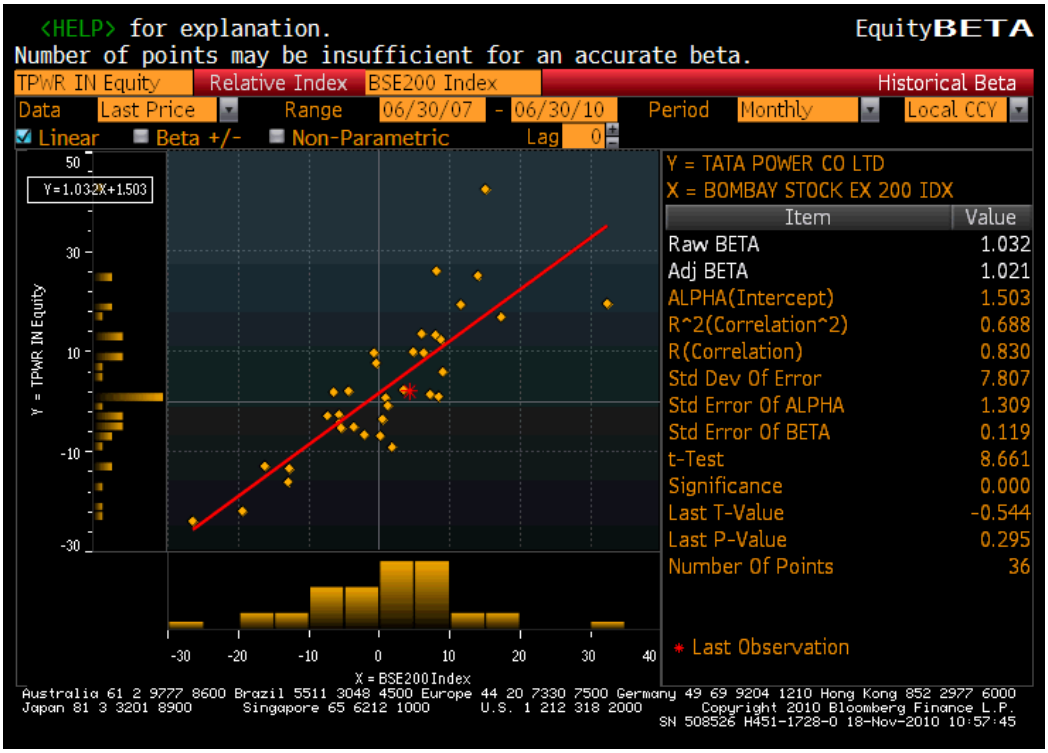
Calculation of Benchmark cost of equity:-

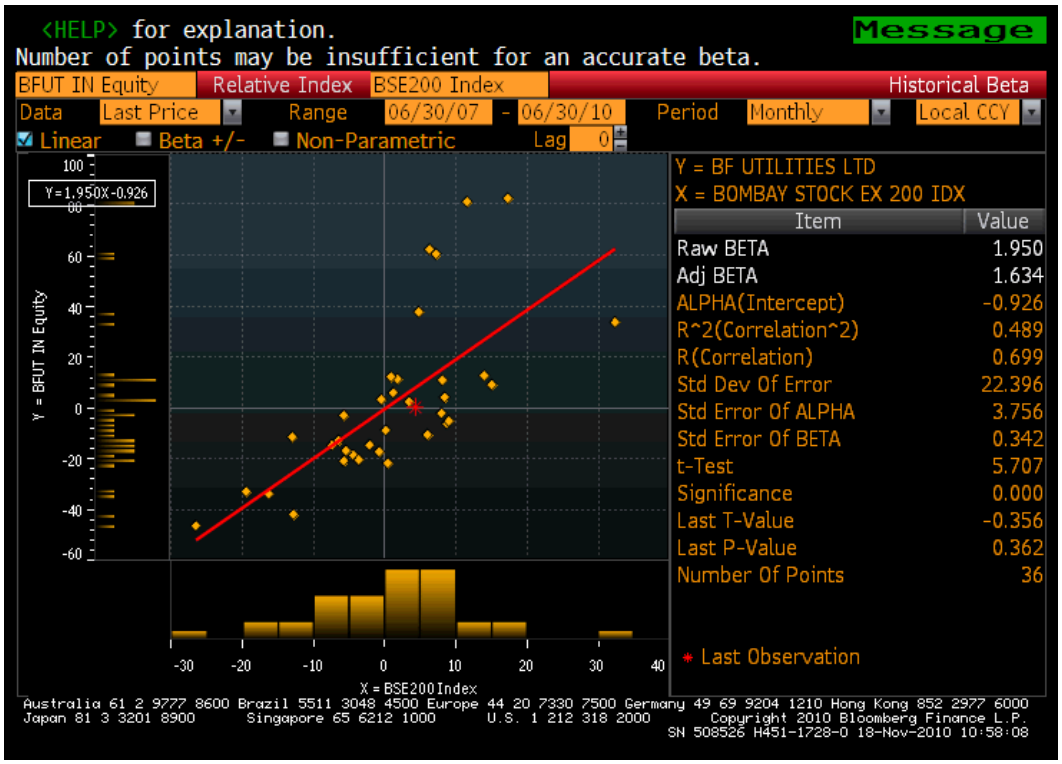
$$Ke = Rf + B \times (Rm - Rf)]$$

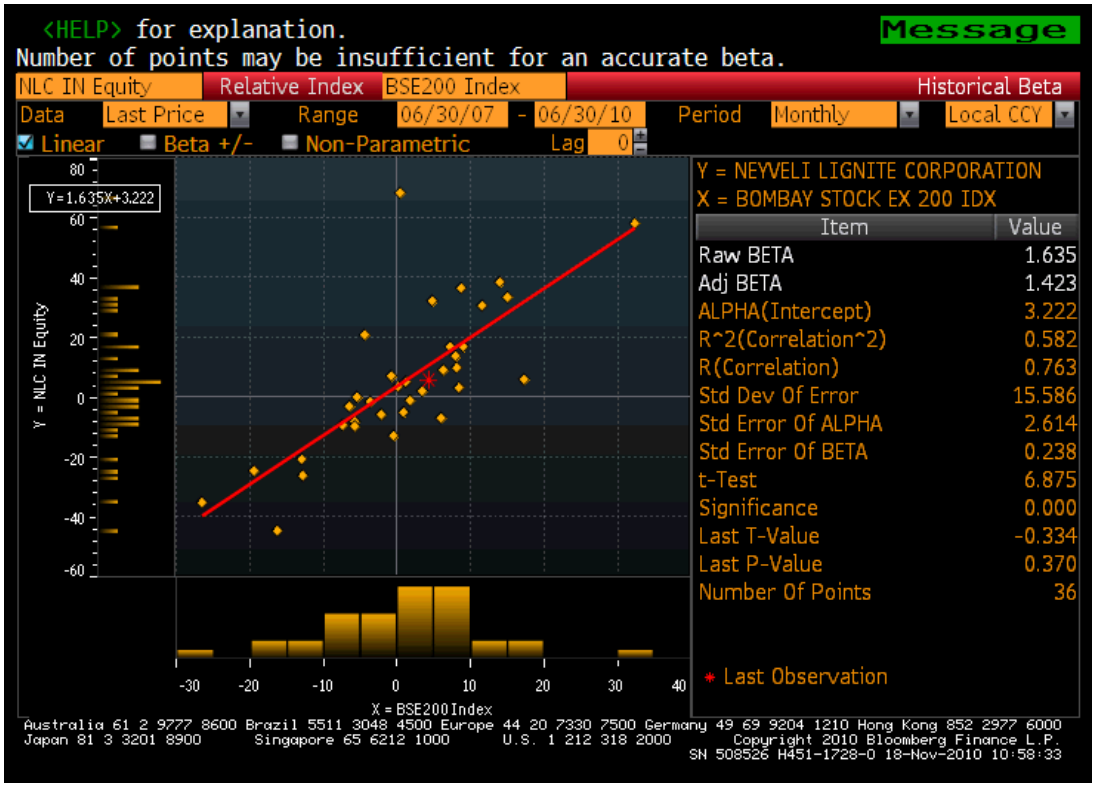
Therefore, cost of equity benchmark, Ke = 8.38% + 1.09 * 7.39% = **16.40%**

Appendix 2

BETA SNAPSHOTS FROM BLOOMBERG






<HELP> for explanation.
Message
Number of points may be insufficient for an accurate beta.
NLC IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
06/30/07
- 06/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=1.635X+3.222
Y = NLC IN Equity
X = BSE200 Index
Y = NEYVELI LIGNITE CORPORATION
X = BOMBAY STOCK EX 200 IDX
Item
Value
Raw BETA 1.635
Adj BETA 1.423
ALPHA(Intercept) 3.222
R^2(Correlation^2) 0.582
R(Correlation) 0.763
Std Dev Of Error 15.586
Std Error Of ALPHA 2.614
Std Error Of BETA 0.238
t-Test 6.875
Significance 0.000
Last T-Value -0.334
Last P-Value 0.370
Number Of Points 36
* Last Observation
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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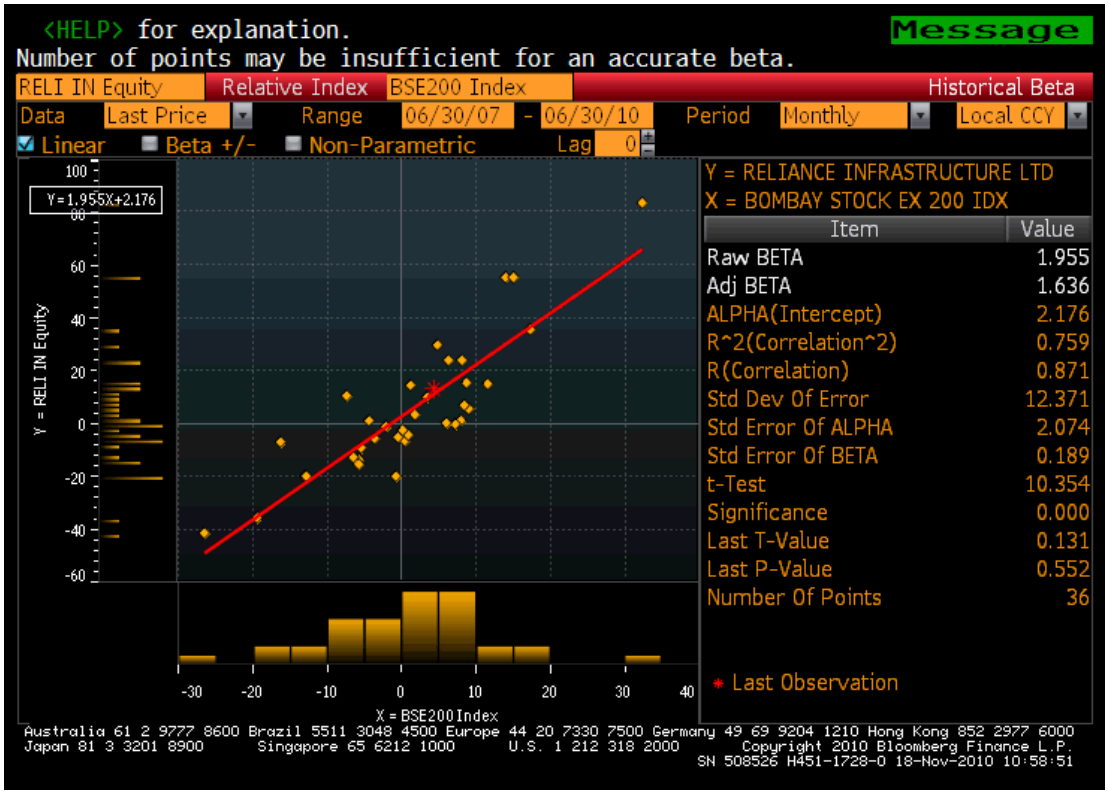
SN 508526 H451-1728-0 18-Nov-2010 10:58:33


<HELP> for explanation.
Message
Number of points may be insufficient for an accurate beta.
RELI IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
06/30/07
- 06/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=1.955X+2.176
Y = RELI IN Equity
X = BSE200 Index
Y = RELIANCE INFRASTRUCTURE LTD
X = BOMBAY STOCK EX 200 IDX
Item
Value
Raw BETA 1.955
Adj BETA 1.636
ALPHA(Intercept) 2.176
R^2(Correlation^2) 0.759
R(Correlation) 0.871
Std Dev Of Error 12.371
Std Error Of ALPHA 2.074
Std Error Of BETA 0.189
t-Test 10.354
Significance 0.000
Last T-Value 0.131
Last P-Value 0.552
Number Of Points 36
* Last Observation
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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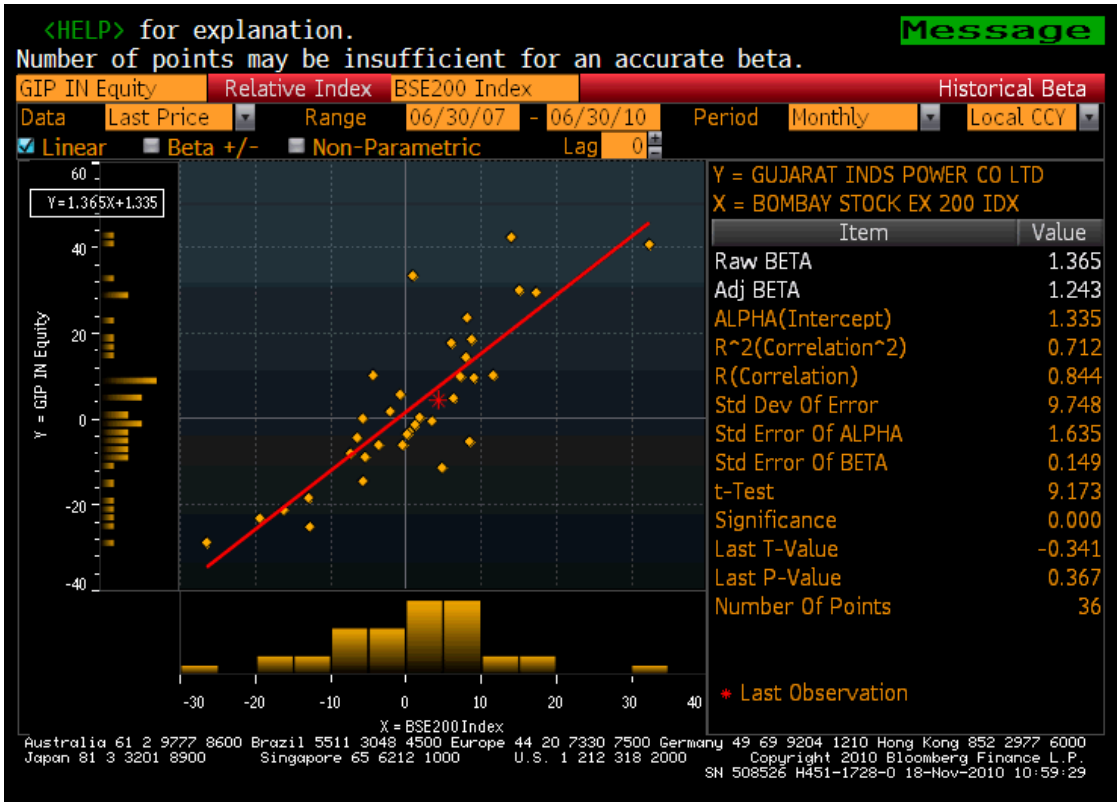
SN 508526 H451-1728-0 18-Nov-2010 10:58:51


<HELP> for explanation.
Message
Number of points may be insufficient for an accurate beta.
GIP IN Equity
Relative Index
BSE200 Index
Historical Beta
Data
Last Price
Range
06/30/07
- 06/30/10
Period
Monthly
Local CCY
Linear
Beta +/-
Non-Parametric
Lag
0
Y=1.365X+1.335
Y = GIP IN Equity
X = BSE200 Index
Y = GUJARAT INDS POWER CO LTD
X = BOMBAY STOCK EX 200 IDX
Item
Value
Raw BETA 1.365
Adj BETA 1.243
ALPHA(Intercept) 1.335
R^2(Correlation^2) 0.712
R(Correlation) 0.844
Std Dev Of Error 9.748
Std Error Of ALPHA 1.635
Std Error Of BETA 0.149
t-Test 9.173
Significance 0.000
Last T-Value -0.341
Last P-Value 0.367
Number Of Points 36
Last Observation
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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