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

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SECTION A. General description of project activity

A.1 Title of the project activity:

Title: Vaayu India Wind Power Project in Jaisalmer, Rajasthan
Version: 5.0
Date of completion of PDD: 04/10/2013

A.2. Description of the project activity:

Vaayu (India) Power Corporation Private Limited (VIPCPL) is developing 50.4 MW wind farm in the state of Rajasthan in India. The project activity involves supply, erection, commissioning and operation of 63 machines of 800 KW each. The machines are Enercon E-53 make. Annually, the project is expected to generate and supply 94.482 GWh of electricity to Rajasthan State Electricity grid which is part of the NEWNE (Northern, Eastern, Western and North-Eastern) grid in India at 21.40% PLF. The clean and green electricity supplied by the project will aid in sustainable growth.

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 87,159 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 the equivalent amount of electricity would have been generated from the connected/ new power plants in the NEWNE grid, which are/ will be predominantly based on fossil fuels[1]. Whereas the electricity generation from operation of Wind Energy Convertors (WEC's) is emission free. 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.

Nature of Project

The Project harnesses renewable resources in the region, thereby displacing non-renewable natural resources and leading to sustainable economic and environmental benefits. Enercon (India) Limited ("Enercon") will be the equipment supplier and the operations and maintenance contractor for the Project. The Project is owned by VIPCPL. The generated electricity will be supplied to Electricity Distribution Company under a long-term power purchase agreement (PPA) for a period of 20 years.

Contribution to Sustainable Development

The National CDM Authority (NCDMA) which is the Designated National Authority (DNA) for the Government of India (GoI) in the Ministry of Environment and Forests (MoEF) has stipulated four

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

indicators for sustainable development in the interim approval guidelines for Clean Development Mechanism (CDM) projects from India[2]. The contributions of this project activity towards these indicators are provided below:

1. **Social well being:**

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

2. **Environmental well being:**

- The project activity employs 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 and contributes to environmental well-being.

3. **Economic well being:**

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

4. **Technological well being:**

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

In addition to this, the project proponent will contribute 2% of the CDM revenue realized from the candidate CDM project for sustainable development including society / community development. PP is aware about the Indian DNA guideline on commitment of 2% of the CDM revenues towards sustainable development and a formal undertaking is being submitted separately.

[2] http://cdmindia.in/approval_process.php

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)	Vaayu (India) Power Corporation Private Limited	No

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

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party (ies):

India

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

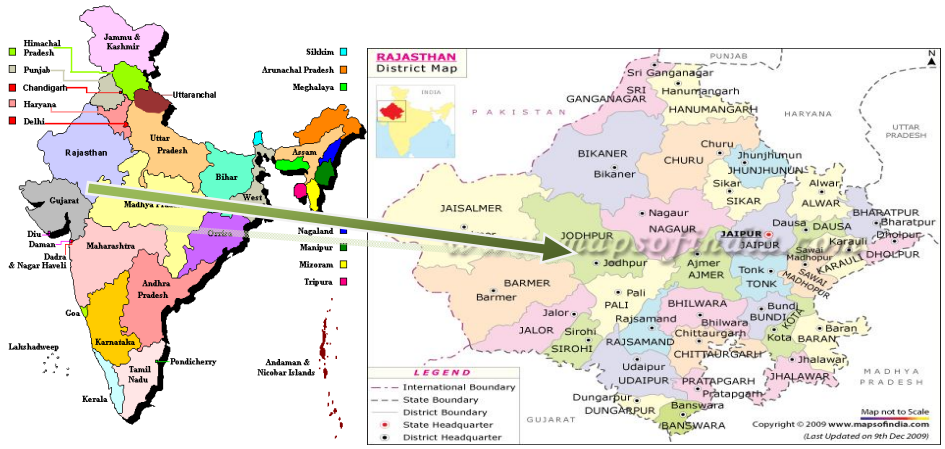
Northern Region/Rajasthan State

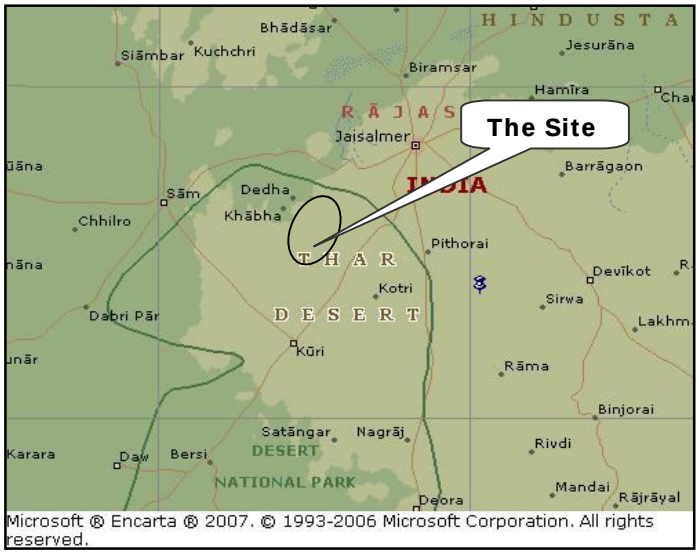
A.4.1.3. City/Town/Community etc:

The Project is spread across Sipla, Pithla, Kotri, Senag, Barna and Khuri villages of Jaisalmer District of Rajasthan state in India.

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

The Project is located in Jaisalmer district in the Indian State of Rajasthan. The wind turbines extend between Latitude N 26°40'25.4" to Latitude N 26°44'48.7" and Longitude E 70°42'13.8" to Longitude E 70°49'23.5". The longitude and latitude details of WECs are provided Appendix 1.





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

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

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

The project activity involves 63-wind energy convertors (WEC's) of Enercon make (800 kW, E-53) with internal electrical lines connecting the project activity with local evacuation facility. The WECs generates 3-phase power at 400V, which is stepped up to 33 KV. The Project can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V ± 12.5%. The average life time of

the WEC is around 20 years as per the industry standards. Out of 63 wind energy convertors (WEC's), 55 WECs have been already commissioned and remaining 8 WECs are expected to be commissioned by end of July 2011. The other salient features of the state-of-art-technology are:

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

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

In the absence of the project activity the equivalent amount of electricity would have been generated from the connected/ new power plants in the NEWNE grid, which are/ will be predominantly based on fossil fuels[3], hence baseline scenario of the project activity is the grid based electricity system, which is also the pre-project scenario. Since the project activity involves power generation from wind, it does not involve any GHG emissions for generating electricity.

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

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

The estimated emission reductions over the 10 years fixed crediting period would be 871,590 tCO2e as per details on annual emission reductions provided below:

Years	Annual estimation of emission reductions in tonnes of CO2e
1/10/2011 to 30/09/2012	87,159
1/10/2012 to 30/09/2013	87,159
1/10/2013 to 30/09/2014	87,159
1/10/2014 to 30/09/2015	87,159
1/10/2015 to 30/09/2016	87,159
1/10/2016 to 30/09/2017	87,159
1/10/2017 to 30/09/2018	87,159
1/10/2018 to 30/09/2019	87,159
1/10/2019 to 30/09/2020	87,159
1/10/2020 to 30/09/2021	87,159
1/10/2021 to 30/09/2022	87,159
Total estimated reductions (tonnes of CO_2e)	871,590
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	87,159

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

A.4.5. Public funding of the project activity:

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

SECTION B. Application of a baseline and monitoring methodology

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

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

Reference: Approved consolidated baseline methodology ACM0002 (Version 12.1.0, EB 58)

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

- Tool to calculate the emission factor for an electricity system – Version 02
- Tool for the demonstration and assessment of additionality – Version 5.2

Further information with regards to the methodology / tools can be obtained at http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

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

The approved consolidated baseline and monitoring methodology ACM0002 Version 12.1.0 is the relevant baseline and monitoring methodology and it is applicable because:

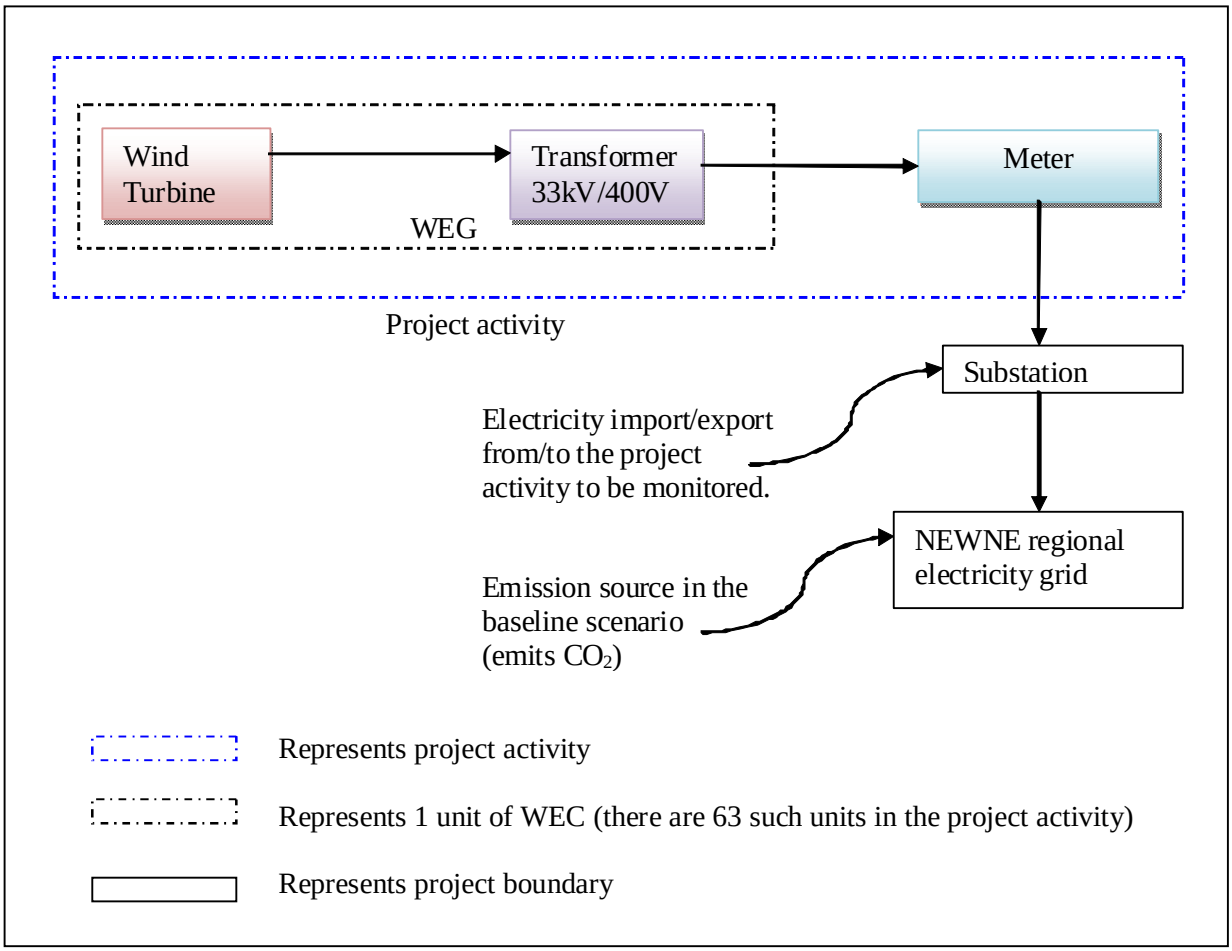
Para No.	Applicability Conditions as per Methodology	Applicability to this Project Activity
1.	The project activity is the installation capacity addition, retrofit or replacement of a power plant/unit of one of the following types: • Hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir) • Wind power plant/unit, • Geothermal power plant/unit, • Solar power plant/unit, • Wave power plant/unit • Tidal power plant/unit.	The project activity is grid connected renewable power generation from wind.
2.	In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 11 to calculate the parameter $EG_{PJ,\ y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity; ;	This condition is not relevant, as the project activity does not involve capacity additions, retrofits or replacements.
3.	In case of hydro power plants:	This condition is not relevant, as the project

	• 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/m^2. • 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/m^2.	activity is not the installation of a hydro power plant.
4.	The methodology is not applicable to the following: • Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants; • Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2.	The project activity does not involve any of the given criteria hence methodology is applicable for the project activity.
5.	In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	The project activity is a new wind power plant. Also no replacement, modification and retrofit measures are implemented here. Hence, this criterion is also not relevant to the project activity.

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

According to the applicable methodology, spatial extent of this project activity includes the project site and all the power plants connected physically to the electricity system that the CDM power project is connected to. The project activity is connected to the network of state transmission utility which falls in NEWNE grid. Thus the project boundary includes all the power plants physically connected to the NEWNE grid.

Flow diagram of the project boundary:



The baseline study of NEWNE grid shows that the main sources of GHG emissions in the baseline are CO_2 emissions from the conventional power generating systems, the other emissions are that of CH_4 and N_2O but both emissions were conservative and are excluded for simplification of the project. The project activity is GHG emission free electricity generation from renewable sources. Following table indicates the sources and gases included in the project boundary:

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

	wind energy conversion system	CH_4	No	No methane generation is expected to be emitted.
		N_2O	No	No nitrous oxide generation is expected to be emitted.

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

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

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

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

The details of India grid system is described in the table below:

S.No.	Electricity Grid (Present)	Electricity Grid (Earlier)	Geographical Areas Covered
1.	NEWNE Grid	Northern	Chandigarh, Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand
		Western	Chhattisgarh, Gujarat, Daman & Diu, Dadar & Nagar Haveli, Madhya Pradesh, Maharashtra, Goa
		Eastern	Bihar, Jharkhand, Orissa, West Bengal, Sikkim, Andaman-Nicobar
		North-Eastern	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura
2.	Southern Grid	Southern	Andhra Pradesh, Karnataka, Kerala, Tamilnadu, Pondicherry, Lakshadweep

Rajasthan state falls under NEWNE grid. The power sector in India including the Northern region largely comprises thermal power stations[4]; as can be seen from the table below[5]:

[4] http://www.cea.nic.in/

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

Sector	Hydro	Thermal				Nuclear	Renew.	Total
		Coal	Gas	Diesel	Total			
State	27055.76	42537.50	3672.12	602.61	46812.23	0.00	2247.68	76115.67
Central	8592.00	29620.00	6638.99	0.00	36258.99	4120.00	0.00	48970.99
Private	1230.00	5491.38	4565.50	597.14	10654.02	0.00	10994.73	22878.75
All India	36877.76	77648.88	14876.61	1199.75	93725.24	4120.00	13242.41	147965.41

It is evident from the above table that the installed capacity in India is predominantly thermal power plants; thermal power generation is GHG intensive and is a major source of CO_2 emissions. In the absence of the project activity equivalent amount of electricity would have been generated from the existing grid connected power plants and planned capacity additions which are also largely fossil fuel based. Thus generation from the project displaces the electricity generated from existing and planned power plant capacities in the southern grid whose emission intensities are represented by the Combined Margin Emission Factor of the NEWNE Grid.

The baseline emissions and emission reductions from the project activity are estimated by multiplying the amount of electricity exported by the project activity to the NEWNE grid with the emission factor of the NEWNE grid calculated as the combined margin (CM) of the operating margin (OM) and build margin (BM) emission factors.

Variable	**Data Source**
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)	Records maintained by project proponents
Parameter	**Data Source**
$\boldsymbol{EF_{grid,OM,y}}$ = Operating Margin Emission Factor (tCO_2/MWh)	CEA Database for CO_2 emission factor, version 5
$\boldsymbol{EF_{grid,BM,y}}$ = Build Margin Emission Factor (tCO_2/MWh)	CEA Database for CO_2 emission factor, version 5
EFy – Grid Emission Factor	Calculated as the weighted average of the operating margin and build margin

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

The project activity has been conceived as a CDM project since its inception. The project start date is 05 December 2009 and the PP has intimated UNFCCC and DNA about the project activity initiative within six months of the start date. The acknowledgement from UNFCCC and email to Indian DNA shall be provided to the DoE for verification.

As per EB 62, Annex 13, the chronology of events leading up to web-hosting of the PDD for global stakeholder consultation and the actions taken by the project proponent to secure CDM status of the project are presented below:

Event	Date
Offer letter for WECs	20th November 2009
Board resolution on project activity	28th November 2009
Purchase order for WECs	5th December 2009
Appointment of validator	26 Feb 2010
Stakeholder consultation meeting	10th Mar 2010
Loan Application	16th March 2010
Intimation to DNA	19th March 2010
Acknowledgement from DNA of India	22nd March 2010
PDD Web hosted for global stakeholder consultation	23 April 2010
Intimation to UNFCCC	27th April 2010
Acknowledgement from UNFCCC	27th April 2010
Loan sanction	30 April 2010

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

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

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

(a) The Project is undertaken without registering it as a CDM activity.

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

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

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

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

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

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

Step 2: Investment Analysis

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

The guidance to investment analysis issued in EB 62, Annex 05 (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. Accordingly, the cost of Equity applicable to the project type has been considered as the benchmark to be compared against equity IRR.

The benchmark Cost of equity for the project is calculated as **16.84%**. The detailed working has been attached as Appendix 1.

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

Key assumptions used for calculating post-tax Equity IRR are set out below:

Assumptions for Financial Model			
Capacity of Machines in kW	800		Enercon Offer dated 20 Nov 2009
Number of Machines	63		Enercon Offer dated 20 Nov 2009
Project Capacity in MW	50.40		Enercon Offer dated 20 Nov 2009
Expected project commissioning date	31-Jul-11		Enercon Offer dated 20 Nov 2009
Project Cost per MW (INR In Millions)	59.32		Enercon Offer dated 20 Nov 2009
Operations			
Plant Load Factor Base Case	21.40%		C-WET Report
Insurance Charges @ % of project cost	0.12%		Quotation received from United India Insurance Company Limited dated 27 October 2009.
Operation & Maintenance Cost base year @ % of project cost	1.30%		Enercon Offer dated 20 Nov 2009
% of escalation per annum on O & M Charges	6.0%		Enercon Offer dated 20 Nov 2009
Service tax	12.36%		Service Tax FY 2009-2010(http://www.cbec.gov.in/budget0910/bhe.pdf)
Tariff			
Base year Tariff for 20 years - INR/kWh	4.28		RERC Order
Generation Based Tariff- INR/kWh	0.50		Generation based incentive are applicable to wind power projects at the rate of INR 0.50 per kWh with cap of INR 6.2 Million per MW (source:http://www.cwet.tn.nic.in/Docu/Grid%20Interactive%20Wind%20Power%20Projects.pdf)
Project Cost	**INR Million**		
Land and Infrastructure, Generator & Electrical Equipments, Mechanical Equipments, Civil Works, Instrumentation & Control, Other			

Project Cost, Pre operative Expenses, etc.			
Total Project Cost	**2,989.82**		Enercon Offer dated 20 Nov 2009
Means of Finance		**INR Million**	
Own Source	30%	896.95	Debt Equity Ratio for the power generation projects in India.
Term Loan	0.70	2,092.88	Debt Equity Ratio for the power generation projects in India.
Total Source		2,989.82	
Terms of Loan			
Interest Rate	11.50%		PLR rate published by RBI dated 30 October 2009
Tenure	10	Years	Normative for power generation Sector India
Income Tax Depreciation Rate (Written Down Value basis)			
on Wind Energy Generators	15%		Income Tax Act; Since the PP has factored GBI under the cash flow statement 80% accelerated depreciation will not be applicable and hence the normative depreciation rate of 15% will be applicable to the project activity.
Book Depreciation Rate (Straight Line Method basis)			
On all assets	4.50%		Straight line Method Adopted
Book Depreciation up to (% of asset value)	90%		
Income Tax			
Income Tax rate	33.99%		Income Tax Act
Minimum Alternate Tax	17.00%		Income Tax Act
Working capital			
Receivables (no of days)	30		RERC Order
O & m expenses (no of days)	90		RERC Order

Price of CER	33.00	Euro	http://www.unctad.org/sections/wcmu/docs/c1em1p08_en.pdf
Conversion rate	69.08	INR	
Escalation	4.19%	Percentage	http://www.oanda.com/currency/historical-rates

Project Cost Break up:

Cost Break up	Cost/Machine	Project Cost
WECs	32.90	2,072.49
Concrete Tower	5.93	373.73
Distribution Transformer	2.48	156.29
Civil works, foundation and electrical lines	1.62	101.93
Erection, commissioning, insurance and other works	1.62	101.93
Land and Transportation charges	1.19	74.75
Transfer of Development right charges	1.73	108.72
	47.458	**2,989.82**

Generation Based Incentive: Generation Based Incentive is applicable to wind power projects at the rate of INR 0.50 per kWh with cap of INR 6.2 Million per MW. The wind power project that claims GBI cannot claim apply accelerated depreciation of 80% as per applicability[6] criteria of generation based incentive. As the project proponent has opted for GBI; the normative depreciation rate of 15% is applied.

Debt Equity Ratio: This is the first investment by Vaayu (India) Power Corporation Private Limited and there are no existing debts in the company. Hence the debt equity ratio of 70:30 envisaged for the project activity as per detailed project report has been considered. In addition a sensitivity analysis on the debt equity ratio has been carried out to strengthen the investment analysis.

Interest rate: Since this is the first investment by Vaayu (India) Power Corporation Private Limited and there are no existing debts in the company, therefore we have taken the Prime lending rate as interest rate for investment analysis form the data published by Reserve bank of India that is publically available.

[6] http://www.cwet.tn.nic.in/Docu/Grid%20Interactive%20Wind%20Power%20Projects.pdf

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 Center for Wind Energy Testing (a Government of India Agency). The plant load factor for the project site as determined by CWET is 21.40%.

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 7.88% i.e. less than the benchmark.

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

Sensitivity Analysis

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

- Project Cost
- Tariff
- Plant Load Factor
- Debt Equity Ratio
- O&M cost
- Loan Tenure

Project Cost

In accordance with the investment guidance, the additionality for the project activity is demonstrated at the time of decision making. The project proponent has considered it appropriate to conduct the sensitivity at the variation of +/- 10% of the project cost.

	10% decrease in Project Cost	Base Project Cost	10% Increase In Project Cost
Post tax Equity IRR	5.67%	7.88%	10.56%

The equity IRR crosses the benchmark at Project cost variation of 27.24%. The actual project cost is 2772 Million INR as per purchase order which essentially means that variation in project cost provided in offer and purchase order is less than 10%. Therefore, the variation of 27.24% is not realistic.

Tariff

Rajasthan state electricity commission has fixed the tariff for the period of 20 years (Lifetime) for the wind power projects. The tariff for the entire life of the project activity is fixed an INR 4.28 per Unit. Therefore it is not appropriate to conduct sensitivity on tariff.

The equity IRR crosses the benchmark at tariff of INR/kWh 6.02 (electricity tariff increase by 40.66%) which is not realistic as the PP has already executed long term power purchase agreement for the period of 20 years (full technical life of the project activity) at INR/kWh 4.28.

The tariff as per executed PPA is 4.22 INR/kWh for the entire project. However conservatively we have used the tariff of 4.28 INR/kWh for investment analysis. Hence this parameter is not considered sensitive in case of project activity.

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.

CWET Data: The PLF estimated by CWET (Centre for Wind Energy Testing-Third party independent source for PLF) is 21.40%.

	PLF @ 19.26% (10% Decrease over PLF estimated by CWET)	PLF 21.40% (PLF by CWET)	PLF @ 23.54% (10% Increase over PLF estimated by CWET)
Post tax Equity IRR	5.57%	7.88%	10.17%

The equity IRR will cross the benchmark at PLF of 29.84 which is 39.45% higher than the base PLF, which is not a reasonable assumption. The sensitivity analysis clearly shows even with a higher PLF (+10% over base case), the project is not able to generate sufficient returns. It can therefore be concluded that the project is financially not viable without CDM benefits.

Debt Equity Ratio

This is the first investment of the Vaayu (India) Power Corporation Pvt. Ltd. This company is floated to make investment into power sector. The PP has envisaged the debt equity ratio of 70:30 in its detailed project report. The PP has conducted sensitivity at the variation of 10% over the base debt equity ratio. Even at 100% equity, the Equity IRR is 7.97%.

	10% decrease over base case (68:32)	Base Debt Equity ratio (70:30)	10% Increase over base case (72:28)
Post tax Equity IRR	7.86%	7.88%	7.89%

O&M Cost

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

	10% decrease in O&M cost	Base O&M Cost	10% Increase In O&M cost

Post tax Equity IRR	8.23%	7.88%	7.52%

Even with zero O&M cost the equity IRR does not cross the benchmark. The project does not cross the benchmark even at 100% variation in O&M cost.

Loan Tenure

Sensitivity is conducted considering the loan tenure of 8 and 12 years.

Loan Tenure	8 years	10 Years	12 years
Post tax Equity IRR	8.04%	7.88%	7.71%

At the time of investment decision the loan repayment period was assumed as 10 years for the project activity. The loan repayment period of 10 years is accepted norm for power sector projects and is envisaged by Central Electricity Regulatory Commission and State Electricity Regulatory Commission. However, in actual the PP was able to secure loan from IDFC for period of 12 years. To capture the deviation, the sensitivity analysis at loan tenure of 12 years has been done; the equity IRR for 12 years loan tenure is 7.71% which is less than the benchmark.

Outcome of Step 2: 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

Step 3: Barrier analysis

Not Opted for.

Step 4: Common practice analysis

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

The additionality tool version 5.2 describes similar project activities are those that rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing etc.

In light of the above definition, all large scale wind projects, (greater than 15 MW) set up by a single project proponent in the state of Rajasthan, have been analyzed. In India there are 114 individual investors who have wind installations greater than 15 MW. Out of these customers, the once which have installation greater than 15 MW in the State of Rajasthan have been produced below.

Name of Owner	Total Capacity in Rajasthan (MW)	CDM	Web links and Explanation

Rajasthan State Mines & Mineral Ltd.	67.300	Yes	It is under 4 CDM PDDs 1) 14.8 MW small-scale grid connected wind power project in Jaisalmer state Rajasthan, India by RSMML http://cdm.unfccc.int/Projects/DB/BVQI1139048635.42/view 2) 22.5 MW grid connected wind farm project by RSMML in Jaisalmer, India. http://cdm.unfccc.int/Projects/DB/BVQI1201770524.09/view 3) 15MW Grid connected renewable energy generation by RSMML http://cdm.unfccc.int/Projects/DB/DNV-CUK1243661243.16/view 4) 22.5 MW grid connected Wind Energy Project of RSMML" of Rajasthan State Mines and Minerals Limited in Jaisalmer District, Rajasthan State http://cdm.unfccc.int/Projects/Validation/DB/Y3O8IX2VXOH6L1WCZP48IC1UM74CU3/view.html
Enercon Wind farms Hindustan P. Ltd.	60.000	Yes	PDD titled "Enercon Wind Farm (Hindustan) Ltd in Rajasthan" http://cdm.unfccc.int/Projects/DB/SGS-UKL1181742063.57/view
Rajasthan Ren. Energy Corp. Ltd.	36.45	Yes	It is under 2 CDM PDDs 1) 10.2 MW Grid Connected Wind Farm project by RRECL in Jaisalmer, India. http://cdm.unfccc.int/UserManagement/FileStorage/62MTX5WDKKBC2WS06RBD0P10SK20TZ 2) 25 MW Grid Connected Wind Farm project by RRECL in Jaisalmer, India. http://cdm.unfccc.int/UserManagement/FileStorage/QPGDS3PM9B0B667ZEI1KIU6XYNE8MH
DLF Home Developers	33.000	Yes	PDD titled "Wind Power based electricity generation project in India by DLF Home Developers Limited" http://cdm.unfccc.int/Projects/Validation/DB/34CAG54CUL49MILW9S0SKWCWU38SSX/view.html
Enercon Wind Farms (Raj) Pvt. Ltd.	24.000	Yes	PDD titled "Bundled wind energy power projects (2003 policy) in Rajasthan" http://cdm.unfccc.int/Projects/DB/SGS-UKL1181738388.43/view
Power Finance Corp.	24.000	Yes	PDD titled "Bundled Wind power project in Jaisalmer (Rajasthan in India) managed by Enercon (India) Ltd" **** http://cdm.unfccc.int/UserManagement/FileStorage/QHZU5CN321RNIWYQQ8DGK5HHYO9BBC
Hindustan Pertoleum Corporation Ltd.	21.250	Yes	PDD titled "Bundled grid-connected electricity generation using wind energy by Hindustan Petroleum Corporation Limited." http://cdm.unfccc.int/UserManagement/FileStorage/3VMQRC5EO6G7AB028WZUPDJ1SK9Y4X
Modern Road Makers Pvt. Ltd.	20.000	Yes	PDD titled "MRMPL Wind Power Project " http://cdm.unfccc.int/Projects/Validation/DB/AERX8YCUI2RBEAK41JC7IF8SN67G1P/view.html

K S Oils Ltd.	15.500	Yes	It is under 2 CDM PDDs 1) 7.5 MW Wind Power project in Jodhpur, Rajasthan http://cdm.unfccc.int/Projects/Validation/DB/RA6L3V9EWLLXCYTDYOJIEE1QYAKT31/view.html 2) 8 MW Wind power project by K.S Oils Limited http://cdm.unfccc.int/Projects/Validation/DB/9K96F1AVNBCPWHZA103MFZZAEFC345/view.html

**** The WECs in this PDD is listed as those of Enercon Wind Farm (Jaisalmer) Ltd, however it is to be noted that these windmills are under a lease agreement with PFC and majority stake lies with PFC and hence the WECs are listed as under Power Finance Corp.*

It can be seen that, without exception, all investors in the state of Rajasthan with installations greater than 15 MW have developed these projects as CDM projects. In addition, all similar activities over 15 MW in size in the state of Rajasthan are CDM projects.

For common practice analysis only the state of Rajasthan is being considered as reason of common practice analysis, since in India the regulatory framework is different for different states and tariff policy and other regulations are state specific and are governed by state electricity regulatory commission.

Sub-steps 4a is satisfied.

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

From sub-step 4a it is clear that similar activities are not widely observed or commonly carried out and that all similar projects have been undertaken only as CDM projects. Therefore Sub-step 4b is not applicable. Based on the above considerations, the project activity is considered to be additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to the approved methodology ACM0002 (Version 12.1.0) 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	Project Leakage in year *y* (t CO_2e/yr)

Estimation of Baseline Emissions:

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project

electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$ ..... (2)

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

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

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

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

$EG_{PJ,y} = EG_{facility,y}$ ..... (3)

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

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

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

STEP 1: Identifying the relevant electricity systems:

The Indian electricity system is divided into 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.

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 Northern regional electricity grid, the NEWNE 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: CO_2 Baseline Database for the Indian Power Sector – Central Electricity Authority

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

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

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

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

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

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

The CEA database uses 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:

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

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:

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

Where:

$EF_{EL,m,y}$	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,m,y}$	Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,I,y}$	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
m	All power units serving the grid in year y except low-cost / must-run power units
i	All fossil fuel types combusted in power unit m in year y
y	The relevant year as per the data vintage chosen in step 3

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

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

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

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

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

STEP 6: Calculate the build margin emission factor:

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

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

Where:

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

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

STEP 7: Calculate the combined margin emissions factor:

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

$$\mathbf{EF}y = w_{OM} * \mathbf{EF_{grid,OM,}}y + w_{BM} * \mathbf{EF_{grid,BM,}}y \quad \text{..... (d)}$$

Where:

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

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

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

Using the values for operating and build margin emission factor provided in the CEA database and their respective weights for calculation of combined margin emission factor, the baseline carbon emission factor (CM) is 0.92252 tCO_2e/MWh.

Details of Baseline data:

Data of operating for the three financial years from 2006-07, 2007-08 and 2008-09 and Build Margin for 2008-09 has been obtained from -

The CO_2 Baseline Database for the Indian Power Sector
Ministry of Power: Central Electricity Authority (CEA)
Version 5
Key baseline information is reproduced in Annex 3.
The detailed excel sheet is available at:
http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Estimation of Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 12.1.0, there will be no project emissions in the project activity

$PE_y = 0$ …… (4)

Estimation of Leakage Emissions

As per ACM0002 Version 12.1, no leakage has been considered for the calculation of emission factor

$LE_y = 0$ …….. (5)

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

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

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO_2e/MWh
Description:	Operating Margin Emission Factor of NEWNE Electricity Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector", version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	1.00498
Justification of the choice of data or description of measurement methods and procedures actually applied:	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002.
Any 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 NEWNE Electricity Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.6752
Justification of the choice of data or description of measurement methods and procedures actually applied:	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002.
Any Comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	EFy or $EF_{grid,CM,y}$
Data unit:	tCO_2e/MWh
Description:	Combined Margin Emission Factor of NEWNE Electricity Grid
Source of data used:	The "CO_2 Baseline Database for Indian Power Sector" version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	In case of wind power projects default weights of 0.75 for $EF_{grid,OM,y}$ and 0.25 for $EF_{grid,BM,y}$ are applicable as per ACM0002. Combined Margin Emission Factor ($EF_{grid,CM,y}$): 0.92252 Refer Annex – 3 for comprehensive calculation of Combined Margin Emission Factor.
Justification of the choice of data or description of measurement methods and procedures actually applied:	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002, and Tool to Calculate the emission Factor for an Electricity System.
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:

Ex-ante calculation of emission reductions is equal to ex-ante calculation of baseline emissions as project emissions and leakage are nil.
Baseline emission factor (Combined Margin) ($EF_{grid,CM,y}$)
= 0.92252 tCO_2e/MWh

Annual electricity supplied to the grid by the Project (**$EG_{PJ,}$**y)
= 50.4 MW (Capacity) x 21.4% (PLF) x 8,760 (hours) MWh
= 94,482MWh

Annual Baseline Emissions Reduction: ERy = EFy * $EG_{PJ,}$y
= 0.92252 tCO_2e/MWh x 94 482MWh
= 87,159 tCO_2e

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

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
1/10/2011 to 30/09/2012	0	87,159	0	87,159
1/10/2012 to 30/09/2013	0	87,159	0	87,159
1/10/2013 to 30/09/2014	0	87,159	0	87,159
1/10/2014 to 30/09/2015	0	87,159	0	87,159
1/10/2015 to 30/09/2016	0	87,159	0	87,159
1/10/2016 to 30/09/2017	0	87,159	0	87,159
1/10/2017 to 30/09/2018	0	87,159	0	87,159
1/10/2018 to 30/09/2019	0	87,159	0	87,159
1/10/2019 to 30/09/2020	0	87,159	0	87,159
1/10/2020 to 30/09/2021	0	87,159	0	87,159
Total (tonnes of CO_2e)	0	871,590	0	871,590

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

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

B.7.1 Data and parameters monitored:

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Data / Parameter:	**EG_y**
Data unit:	MWh (Mega-watt hour)
Description:	Net electricity supplied to the grid by the Project Activity

Source of data to be used:	The break-up sheet based on Joint Meter Reading (JMR).
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 (EG_y) = 50.4 MW (Capacity) x 21.4% (PLF) x 8,760 (hours) MWh = 94,482MWh
Description of measurement methods and procedures to be applied:	Allocation plan for calculating net electricity supplied to the grid is given in section B.7.2. Refer Annex – 4 for an illustration of the provisions for measurement methods.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by Discom pursuant to the provisions of the power purchase agreement and there will be no additional QA/QC procedures. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures. The monitoring frequency of the data parameter will be on monthly basis.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$E_{Controller Export}$
Data unit:	MWh (Mega-watt hour)
Description:	Summation of electricity generated by the project activity WECs recorded at respective LCS meters.
Source of data to be used:	Monthly operating logs recorded in electronic format by EPC contractor
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	The value is recorded continuously by the online monitoring station. This reading can also be seen in the electronic panel installed inside the WEC tower. The LCS meter do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WEGs. In case there is any mismatch in the energy values recorded by the Panel meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report. The operations and maintenance staff will attend to the problem immediately in order to identify and correct the error.
QA/QC procedures to be applied:	This data parameter will be logged electronically on a monthly basis by EPC contractor on its online portal. The value of this parameter shall be compared with the value of EG_y and the conservative approach would be taken by the PP for estimating the net electricity supplied value for the calculation of emission reduction.
Any comment:	The data will be archived electronically for crediting period + 2 years.

Data / Parameter:	$\sum_{Project} E_{WECExport}$
Data unit:	MWh (Mega-watt hour)
Description:	Summation of electricity exported to the grid by all the WECs (63 machines) included in the project activity.
Source of data to be used:	The break-up sheet based on Joint Meter Reading (JMR).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be directly used for estimation of emission reduction.
Description of measurement methods and procedures to be applied:	$\sum_{Project} E_{WECExport}$ denotes summation of the electricity exported to the grid by a WECs included in the project activity. The value is calculated based on the formula mentioned in section B.7.2.
QA/QC procedures to be applied:	The value is calculated and can be cross checked from the invoices raised on the state utility. The monitoring frequency of the data parameter will be on monthly basis.
Any comment:	The data will be archived for crediting period + 2 years.

Data / Parameter:	$\sum_{Project} E_{WECImport}$
Data unit:	MWh (Mega-watt hour)
Description:	Summation of electricity imported from the grid by all the WECs (63 machines) included in the project activity.
Source of data to be used:	The break-up sheet based on Joint Meter Reading (JMR).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be directly used for estimation of emission reduction.
Description of measurement methods and procedures to be applied:	$\sum_{Project} E_{WECImport}$ denotes the summation of electricity imported from the grid by a WECs included in the project activity. The value is calculated based on the formula mentioned in section B.7.2.
QA/QC procedures to be applied:	The value can be cross checked from the invoices raised on the state utility. The monitoring frequency of the data parameter will be on monthly basis.
Any comment:	The data will be archived for crediting period + 2 years.

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

B.7.2 Description of the monitoring plan:

Approved monitoring methodology ACM0002 Version 12.1.0 Sectoral Scope: 1, "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources", by CDM - Meth Panel is proposed to be used to monitor the emission reductions.

Enercon (India) Limited is EPC contractor for the project activity. Enercon (India) Limited will be responsible for the maintaining all the monitoring data on behalf of VIPCPL in respect of the project activity. Enercon (India) Limited has implemented the management structure for managing the monitored data.

This approved monitoring methodology requires monitoring of the following:

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

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

The Project is operated by Enercon (EPC contractor for the project activity) 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.

The break-up sheet reflecting net electricity supplied by the project activity to the grid is prepared by EPC contractor based on the allocation procedure explained below. Based on this break-up sheet, tariff Invoice is raised by PP to DISCOM.

$E_{JMRExport}$ = Electricity exported, as recorded by the main meter at the substation

$E_{JMRImport}$ = Electricity imported, as recorded by the main meter at the substation

$E_{ControllerExport}$ = Summation of electricity generated by the project activity WECs recorded at respective LCS meters.

$\sum E_{ControllerExport}$ = Electricity exported by all the WECs (project & non-project WECs) connected to the main meter at the substation, recorded at respective LCS meters.

$\sum_{Project} E_{WEC,Export}$ = Summation of electricity exported to the grid by all the WECs (63 machines) included in the project activity.

$\sum_{Project} E_{WEC,Import}$ = Summation of electricity imported from the grid by all the WECs (63 machines) included in the project activity.

Electricity exported by WECs of project activity (63 machines) is apportioned on the basis of electricity exported recorded at the LCS Meter of project activity WECs and the electricity exported at the main meter and mentioned in the JMR. The export multiplication factor is calculated as follows-

$$\text{Export Multiplication factor} = \frac{E_{JMR,Export}}{\sum E_{Controller,Export}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Thus the total energy exported by WECs of the project activity (63 machines) to the grid is given by the equation-

$\sum_{Project} E_{WEC,Export}$ = Export Multiplication factor x $E_{Controller,Export}$ ……..(2)

As the LCS meter doesn't record import, the apportioning of energy imported by WECs of project activity (63 machines) is also done on the basis of electricity exported recorded at the LCS Meter of project activity WECs and the electricity imported at the main meter and mentioned in the JMR. The import multiplication factor is calculated as follows-

$$\text{Import Multiplication factor} = \frac{E_{JMR,import}}{\sum E_{Controller,Export}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Thus the total energy imported by WECs of the project activity (63 machines)from the grid is given by the equation-

$\sum_{Project} E_{WEC,Import}$ = Import Multiplication factor x $E_{Controller,Export}$ ……..(4)

The net electricity exported by the WECs of the project activity is given by the equation-

$EG_y = \sum_{Project} E_{WEC,Export} - \sum_{Project} E_{WEC,Import}$ - ……..(5)

The summation is done for the WECs belonging to the project activity
As per Clause 219 of Annex 5 of EB 65, "Project participants shall report in the revised PDD the impacts of the proposed or actual changes to the registered CDM project activity on the following:

(a) The applicability and application of the applied methodology under which the project activity has been registered;

(b) Compliance of the monitoring plan with the applied methodology;
(c) The level of accuracy and completeness in the monitoring of the project activity;
(d) The additionality of the project activity;
(e) The scale of the project activity."

The revised monitoring plan complies with the above-mentioned criteria as:

(a) The applicability and application of the applied methodology under which the project activity has been registered is not impacted by the proposed revision in monitoring plan;
(b) The revised monitoring plan is in compliance with the applied methodology;
(c) The revised monitoring plan is more accurate and complete because of the explanation given below:

As per the registered monitoring plan, the apportioning has to be done by PP & the monitoring parameters $E_{WEC\ Export}$ & $E_{WEC\ Import}$ have to be calculated based on the generation data of other project activities connected to the same substation. Since the generation data of other project activities is only available with the EPC contractor, apportioning cannot be done by PP and these parameters have accordingly been removed in the revised monitoring plan.

As per revised monitoring plan, value of EG_y is sourced from breakup sheet prepared by EPC Contractor, based on which invoice is raised by PP to the DISCOM. Hence, $E_{JMR,\ Export}$ & $E_{JMR,\ Import}$ cannot be used as monitoring parameters and have been removed from Section B.7.1. Thus the revised monitoring plan is complete, accurate and in line with actual metering and monitoring arrangement finalised by DISCOM in consultation with State Electricity Regulatory Commission.

(d) The revised monitoring plan does not affect additionality of the project activity;

The revised monitoring plan does not affect scale of the project activity.

Action plan for monitoring of 2% CER revenue contributed towards sustainable development

Vaayu (India) Wind Power Corporation Private Limited (VIPCPL) is committed to contribute a minimum of 2% of the CER revenue accrued every year for sustainable development activities for the local population.

VIPCPL will undertake an annual review process of the actual CERs accrued and the price transacted. On the basis of the actual price and exchange rate, VIPCPL will commit 2% of the revenue for sustainable development activities in the local areas.

As part of the annual review, VIPCPL will undertake informal discussions with the locals at the project site and commit the revenue towards society / community developmental activities in areas that are of most concern to the local population. These areas could include health, education, sanitation, skill development, infrastructure development, etc. The annual review process will detail the exact activities that would be undertaken using the 2% revenue and the detailed mode of implementation of the proposed activity.

VIPCPL commits that a CSR team will be appointed to oversee the activities towards sustainable development and also that the activities are undertaken and concluded in a timely manner each year.

The table below provides an estimation of the revenue that would be committed every year for sustainable development activities.

Year	Estimation of total emission reduction (tCO_2e)	Estimated CER Price*	Exchange rate	Estimation of CER Revenue generated by the project (INR)	Estimation of minimum revenue commitment for sustainable development (INR)**
		(Euro)	(Euro to INR)*		
1	87,159	33.00	69.08	198,691,143	3,973,823
2	87,159	33.00	71.97	207,012,502	4,140,250
3	87,159	33.00	74.99	215,682,368	4,313,647
4	87,159	33.00	78.13	224,715,335	4,494,307
5	87,159	33.00	81.40	234,126,611	4,682,532
6	87,159	33.00	84.81	243,932,039	4,878,641
7	87,159	33.00	88.36	254,148,127	5,082,963
8	87,159	33.00	92.06	264,792,074	5,295,841
9	87,159	33.00	95.92	275,881,799	5,517,636
10	87,159	33.00	99.93	287,435,971	5,748,719

*Estimation of CER revenue has been done based on the envisaged price of CER at the time of revenue realization and the present conversion rate from Euro to INR.

** The revenue committed will vary every year as per the actual CERs generated, the CER price that is actually transacted and the prevailing exchange rate at the time of transaction.

Training and maintenance requirements:

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

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

Date of completion: 15/02/2010

Name of responsible person/entity: Vaayu (India) Power Corporation Pvt. Ltd. (details are given in Annex-1) and their advisors.

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:

05/12/2009, being the date of placement of purchase order for the wind energy convertors.

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

20 years

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

C.2.1. Renewable crediting period

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

C.2.1.2. Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/10/2011, or date of registration whichever is later.

C.2.2.2. Length:

10 years and 0 months

SECTION D. Environmental impacts

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

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 1st December 2009, a list of activities

that require undertaking environmental impact assessment studies[7] 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.

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 Service office "Enercon (India) Ltd.", village Gorera in District Jaisalmer at Rajasthan on 10th Mar 2010.
A newspaper advertisement was placed in national newspaper "Times of India" on 19th Feb 2010 and the same was placed in local newspaper "Nafa Nuksan" on 24th Feb 2010 inviting the local stakeholders for the meeting. The personal invitations dated 23rd Feb 2010 were also sent to the local villagers.

E.2. Summary of the comments received:

The meeting was presided over by Mr. Ashish Kumar (EIL-Jaisalmer), Mr. Puneet Katyal (EIL-CDM), Mr. Himanshu Bhatnagar (EIL-CDM), Ms Anushree Mishra (EIL-CDM) and Mr. Nitin Sridhar (EIL- Jaisalmer). Mr. Navin Kumar welcomed the gathering and introduced the company. Mr. Himanshu Bhatnagar briefed the agenda initiative to the stakeholders. Mr. Prem Singh village Sarpanch (Chief) of Sipla village was selected as the chairperson of the meeting. Mr. Puneet Katyal briefed about project activity of Vaayu (India) Power Corporation Private Limited (VIPCPL), reasons for setting up the project, costs and benefits of setting up the project and role of project in mitigating the emissions of green house gases in the atmosphere. Mr. Himanshu Bhatnagar briefed the gathering about the environmental hazards faced by the society in the present scenario and highlighted the importance of CDM and clean energy. He invited Ms Anushree Mishra to explain about the project activity and discuss the benefits of wind power project in the mitigation of global warming. The Chairperson, Mr. Prem Singh appreciated the management of VIPCPL for proposing pollution free technology for power generation. Mr. Ashish Kumar then delivered the vote of thanks and appreciated the villagers for their active participation.

[7] http://envirotrends.net/admin/images/The%20EIA%20(Amendment)%20Notification%202009-Notified%20on%201st%20December%202009.pdf

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 by Enercon representatives
1	Mr. Kishna Ram	Enquired whether the project will have any project boundaries?	The infrastructure developed like roads across the wind farm shall be accessible to the villagers.
2	Mr. Babu Ram	Asked how Wind farms would help in mitigating climate change?	Wind power is a clean, renewable source of energy, which produces no greenhouse gas emissions or waste products. Fossil fuel based power stations are the largest emitters of carbon dioxide. Hence, shifting from fossil fuel based power generation to renewable sources of power will help in mitigating carbon dioxide emissions and global warming.
3	Mr. Shiv Ram	Asked whether the wind projects harm local property values?	There would not be any negative impact on the property values due to the presence of wind farms. In fact the development of wind farms will subsequently increase the property value owing to the overall development in the region.
4	Mr. Prem Singh	Enquired whether the electricity generated from this project will be directly fed to the local community?	The electricity generated will be supplied to the state electricity grid which further distributes the electricity as per the state policy.
5	Mr. Kishna Ram	Enquired whether the Wind turbine would affect the nearby animals and bird?	The infrastructure of Wind Turbines is safe and will not affect the nature.
6	Mr. Bhagwan Singh	Enquired about the direct and indirect benefits to them from the proposed project activity?	The project would generate local job opportunities to skilled labours, which would help in the overall socio-economic development of the region.
7	Mr. Shivram	Enquired whether wind turbines move away rain clouds	The clouds are much higher than the height of the wind turbines and it is absolutely unlikely that it would cause the

			problem. This has already been established by various studies undertaken in this aspect.

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

No negative comments were received from the villagers.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Vaayu (India) Power Corporation Private Limited
Street/P.O.Box:	Plot No. 33, Daman Patalia Road
Building:	
City:	Bhimpore
State/Region:	Daman (UT)
Postfix/ZIP:	396210
Country:	India
Telephone:	+91-260-2220624, 2220628
FAX:	+91-260-2221508
E-Mail:	yogesh.mehra@enerconindia.net
URL:	
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	Mehra
Middle Name:	
First Name:	Yogesh
Department:	Corporate
Mobile:	+91-98200 40301
Direct FAX:	+91-260-2221508
Direct tel:	+91-22-22-6702 2832 extn. 7111
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 NEWNE Region Electricity Grid as published in the CEA database are as follows:

Simple Operating Margin

	NEWNE Grid (tCO_2e/GWh)
Simple Operating Margin – 2006-07	1.0085
Simple Operating Margin – 2007-08	0.9999
Simple Operating Margin – 2008-09	1.0066
Average Operating Margin of last three years	1.0050

Build Margin

	NEWNE Grid (tCO_2e/GWh)
Build Margin- 2008-09	0.6752

Combined Margin Calculations

	Weights	**NEWNE Grid (tCO_2e/GWh)**
Operating Margin	0.75	1.00498
Build Margin	0.25	0.6752
Combined Margin		0.92252

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

Annex 4

MONITORING INFORMATION

Metering

- There is a main & back meter at DISCOM substation with an accuracy class of 0.2s, to which the project & non project activity WECs are connected.[8]

- There is a secondary back up meter installed at Enercon Pooling substation, although the secondary back up meter reading is not used by DISCOM for calculating the generation.

- The electricity supplied to the grid is metered at DISCOM substation. Representatives of DISCOM and Enercon jointly take the main/back up meter readings and sign the meter reading on monthly basis.

- The allocation of the net electricity supplied to the grid by the project activity is done based on the joint meter readings taken at the DISCOM substation & LCS meter readings of individual WECs . Apportioning procedure is applied by the EPC contractor, the details of which have been explained in Section B.7.2.

- Based on this apportioning procedure, break up sheet indicating the net electricity supplied to the grid by the project activity is prepared by EPC contractor, based on which the PP raises invoice for payments. The copy of the invoice raised by PP to DISCOM would be used for cross checking the net electricity supplied by project activity as indicated in the break up sheet.

- The meters will be jointly inspected/tested once in a year as per the provisions of PPA. The main and the backup metering systems will be sealed in presence of representatives of Enercon and RRVPN/Jodhpur Discom. Joint inspection and testing will also be carried out as and when difference in monthly meter readings exceeds the sum of maximum error as per accuracy class of main and back up meters.

Metering Equipment and Metering Arrangement Information

- The meters are two-way meter and measure the electricity import and export and give the net electricity.

- As per the Power Purchase Agreement entered into with the electricity distribution utility, there will be two meters, one main meter and one backup meter. Both meters would be two-way export import meters that measure both export and import of electricity and provide net electricity exported to the grid.

- 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 backup meter will be referred.

[8] The physical location of main/backup meter is subject to change in future based on the decision of DISCOM, which is beyond the control of PP .

- If main as well as back up metering system becomes defective, the details of the malfunctioning along with date and time and snaps shot parameters along with load survey will be retrieved from the main meter. The exact nature of the malfunctioning will be determined after analyzing the data so retrieved and the consumption recorded by the main meter will be adjusted accordingly.

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

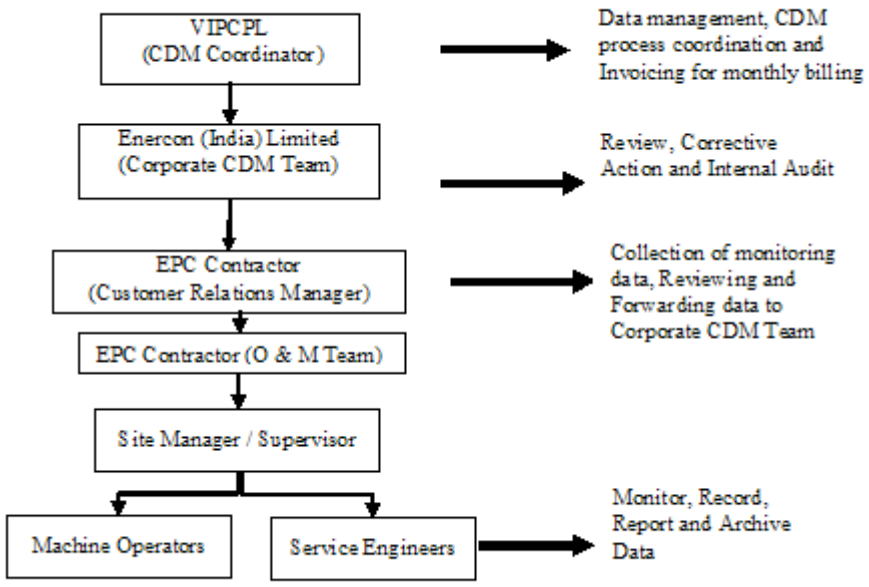
- Both main and back up meters will be calibrated annually.

- The LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WECs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report. The operations and maintenance staff will attend to the problem immediately in order to identify the error and correction factor will be determined.

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

PP will be monitoring the data sent by the EPC 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 EPC contractor and will be responsible for data recording.

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



A representative schematic diagram for the wind farm is provided in Appendix 3.

Appendix 1: Calculation on Cost of Equity

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 51states 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 and cost of Equity is appropriate benchmark for equity IRR.

It is also worthwhile to note that the captioned project is a Greenfield wind power generation project that generates and supplies electricity to the state grid, therefore the project 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.

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[9], Stern School of Business, New York University, describes that the yield rates are suitable indicators of risk free rates when the time horizon for the investment is long term.

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

http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/27CT_BUNOV09.pdf

The applicable risk free rate is 7.98%.

Risk Premium:

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

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

The market return can be calculated from the following available indices: (1) BSE-Sensex, (2) BSE-200 and (3) BSE-500 (4) BSE 100. Minimum market return of the available indices is for BSE 200 and hence conservatively we have used BSE 200 market return for computation of the benchmark.

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

The applicable risk premium is 7.58%.

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. 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.

Therefore, we have considered beta values of all major 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.). The use of this Beta value is therefore considered conservative, as it does not add for the higher risk of non conventional energy.

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

The table below summarises the beta values:

Company Name	Beta
Cese Ltd.	1.11
Gujarat Industries	0.96
Tata Power	1.03
RELI	1.57
Energy Dev	1.19
Average	1.17
Period: Five years up to October 2009 from Bloomberg	

Calculation of Benchmark Cost of Equity: The expected return on equity has been determined using the Capital Asset Pricing Model (CAPM)[10]. 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 x (Rm - Rf)

where:

Ke = Rate of return on equity capital;

Rf = Risk-free rate of return;

B = Beta;

Rm – Rf = Market risk premium;

Cost of Equity = Risk Free Rate + Beta x Market risk premium

= 7.98% + 1.17 x 7.58%

= 16.84%

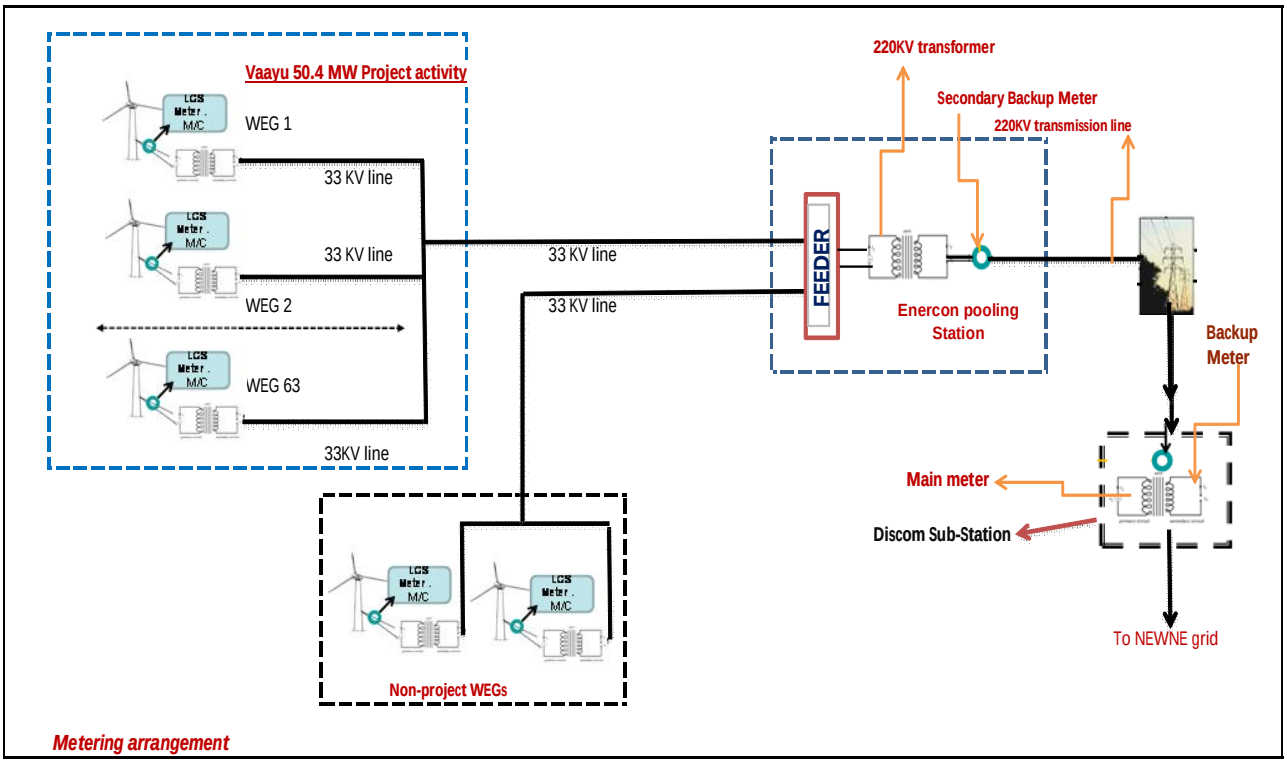
[10] The Capital Asset Pricing Model (CAPM) was published in 1964 by William Sharpe, for his work on CAPM Sharpe received the Nobel Prize in 1990. http://www.investopedia.com/articles/06/CAPM.asp

Appendix 2: Geo-coordinates of Project Activity

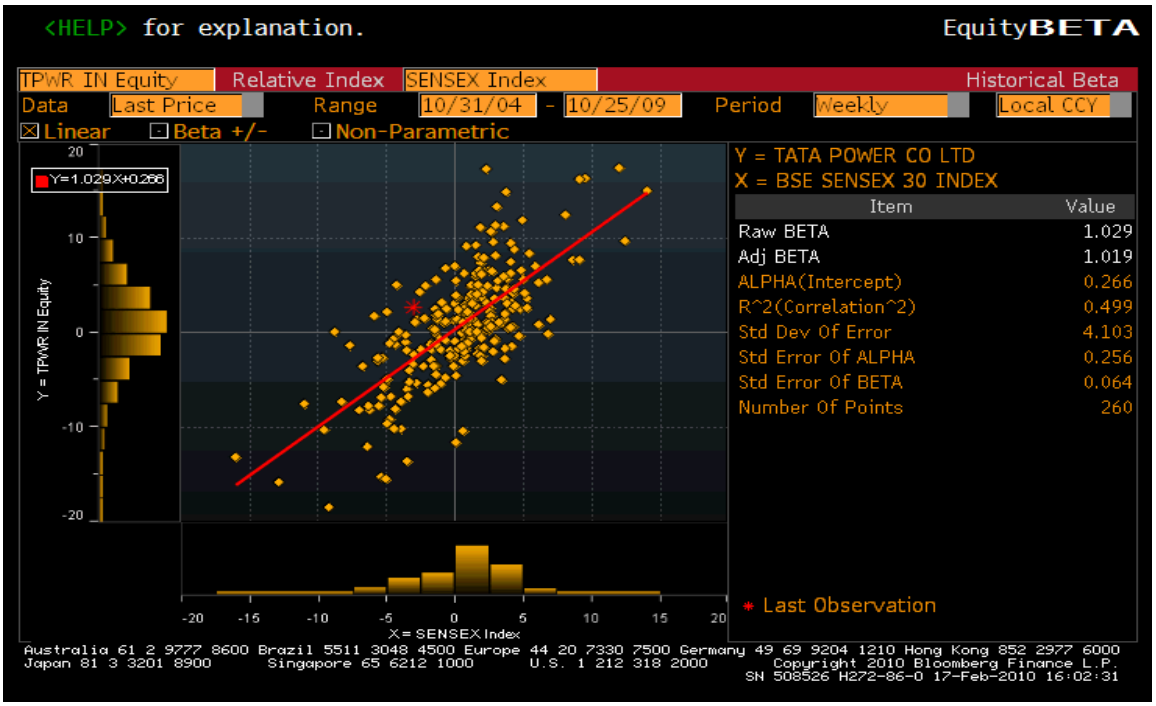
	Site: - Sipla (VIPCL), Jaisalmer.							
			Latitude			Longitude		
Sr. No	Loc. No.	Village	Deg.	Minute	Second	Deg.	Minute	Second
1	2	Khuhri	26	40	25.4	70	44	21.9
2	3	Barna	26	40	33.2	70	44	18.6
3	4	Barna	26	40	33.8	70	44	11.2
4	5	Barna	26	40	27.2	70	43	58
5	6	Barna	26	40	39.7	70	43	57.1
6	7	Barna	26	40	35.8	70	43	47.2
7	8	Barna	26	40	35.5	70	43	39.6
8	9	Barna	26	40	58	70	44	3.5
9	10	Sipla	26	41	14.8	70	44	27.3
10	110	Senag	26	42	0.7	70	48	28.8
11	13	Barna	26	41	48.8	70	44	20.1
12	14	Barna	26	41	49.3	70	44	11.2
13	15	Barna	26	40	45.6	70	43	31.6
14	16	Barna	26	40	43.6	70	43	24.2
15	17	Barna	26	41	0.4	70	43	26.1
16	23	Barna	26	41	37	70	42	50.3
17	24	Barna	26	41	44.7	70	42	44.7
18	25	Barna	26	41	49.2	70	42	37.1
19	29	Barna	26	42	5.7	70	42	27.3
20	30	Barna	26	42	9.7	70	42	37.7
21	32	Barna	26	42	18.6	70	42	52.6
22	33	Barna	26	42	18.7	70	43	10.8
23	38	Sipla	26	42	24.6	70	43	28.8
24	39	Sipla	26	42	23.7	70	43	36.8
25	40	Sipla	26	42	22.9	70	43	44.9
26	72	Khuhri	26	41	53.3	70	45	50.8
27	79	Pithla	26	42	40.3	70	46	11.5
28	80	Pithla	26	42	44.6	70	46	3.2
29	87	Pithla	26	42	53.1	70	46	24.9
30	88	Kotri	26	42	43.1	70	46	31.3
31	93	Senag	26	42	18.4	70	46	55.6
32	99	Senag	26	42	0.9	70	47	39

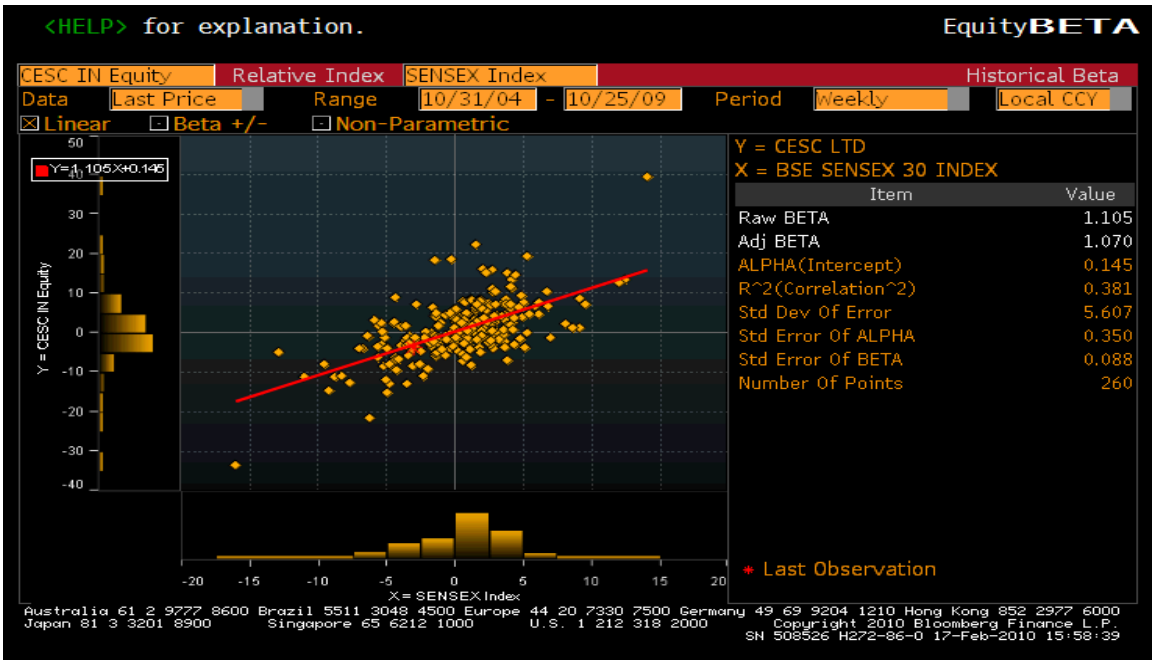
33	101	Senag	26	42	27.4	70	47	39
34	102	Senag	26	42	33.1	70	47	30.8
35	103	Kotri	26	42	22.5	70	47	49.1
36	106	Kotri	26	42	25.4	70	48	15.2
37	107	Kotri	26	42	16.8	70	48	22
38	114	Senag	26	41	39	70	48	6.1
39	115	Kotri	26	41	42.2	70	48	16.2
40	117	Kotri	26	41	35.3	70	48	31
41	118	Senag	26	41	36.4	70	48	39.1
42	123	Pithla	26	42	19.5	70	49	11.2
43	124	Pithla	26	42	2	70	49	10.1
44	125	Pithla	26	41	54.2	70	49	15.6
45	144	Pithla	26	43	43.5	70	45	56.4
46	148	Pithla	26	44	3.9	70	46	3.1
47	150	Pithla	26	44	21	70	46	8.5
48	151	Pithla	26	44	20.9	70	45	59
49	152	Pithla	26	44	32.9	70	46	22.6
50	157	Pithla	26	44	48.7	70	46	4.5
51	158	Pithla	26	44	36	70	45	52
52	159	Pithla	26	44	40.9	70	45	46.8
53	503(S)	Pithla	26	41	11.5	70	48	38.9
54	504(S)	Pithla	26	41	19.3	70	48	35
55	505(S)	Kotri	26	41	19.3	70	48	27.4
56	507(S)	Kotri	26	42	20.7	70	46	34.8
57	508(S)	Kotri	26	42	22.8	70	46	27.1
58	512(S)	Kotri	26	42	40.8	70	47	1.9
59	513(S)	Kotri	26	42	35.2	70	47	9
60	514(S)	Kotri	26	42	32	70	47	21.9
61	520(S)	Senag	26	42	44.3	70	48	7.3
62	521(S)	Senag	26	42	38.2	70	48	19.2
63	525(S)	Senag	26	41	50.6	70	49	23.5

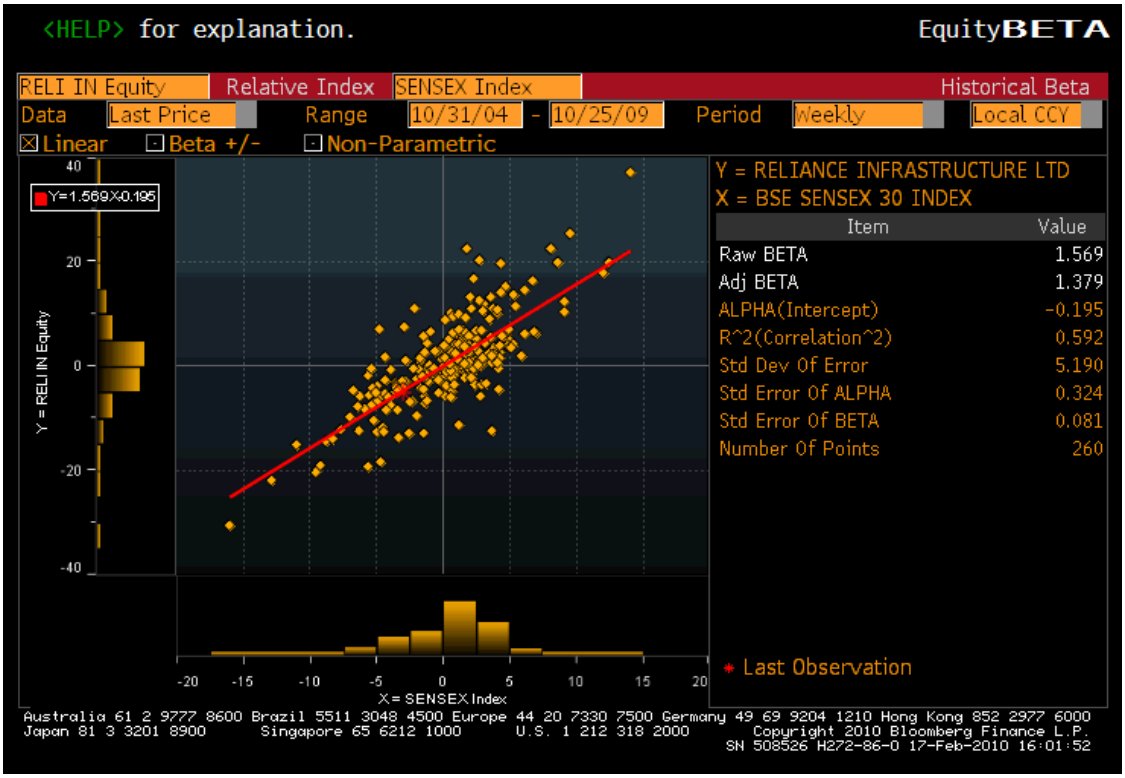
Appendix 3: Schematic diagram for the wind farm showing location of main, backup and LCS meters in the wind farm



Appendix 4: The Beta Snapshots






<HELP> for explanation.
EquityBETA
RELI IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
10/31/04
10/25/09
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Y=1.569X-0.195
Y = RELI IN Equity
X= SENSEX Index
Y = RELIANCE INFRASTRUCTURE LTD
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA 1.569
Adj BETA 1.379
ALPHA(Intercept) -0.195
R^2(Correlation^2) 0.592
Std Dev Of Error 5.190
Std Error Of ALPHA 0.324
Std Error Of BETA 0.081
Number Of Points 260
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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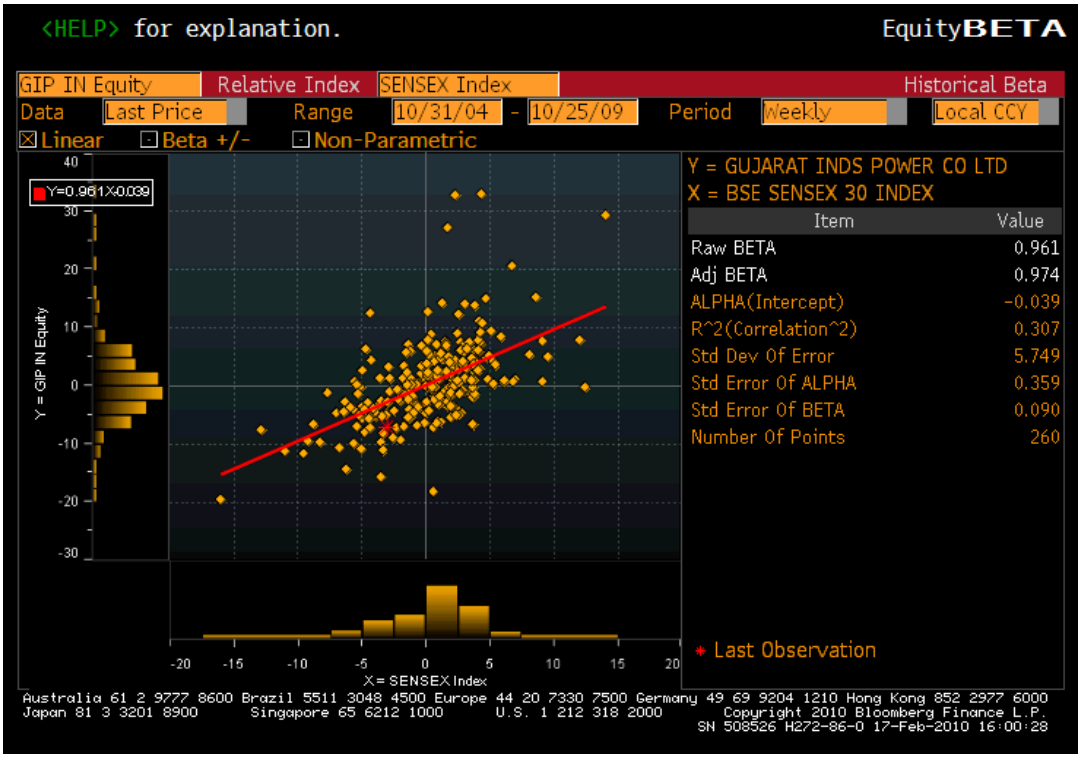
SN 508526 H272-86-0 17-Feb-2010 16:01:52


<HELP> for explanation.
EquityBETA
GIP IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
10/31/04
10/25/09
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Y=0.961X-0.039
Y = GIP IN Equity
X = SENSEX Index
Y = GUJARAT INDS POWER CO LTD
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA 0.961
Adj BETA 0.974
ALPHA(Intercept) -0.039
R^2(Correlation^2) 0.307
Std Dev Of Error 5.749
Std Error Of ALPHA 0.359
Std Error Of BETA 0.090
Number Of Points 260
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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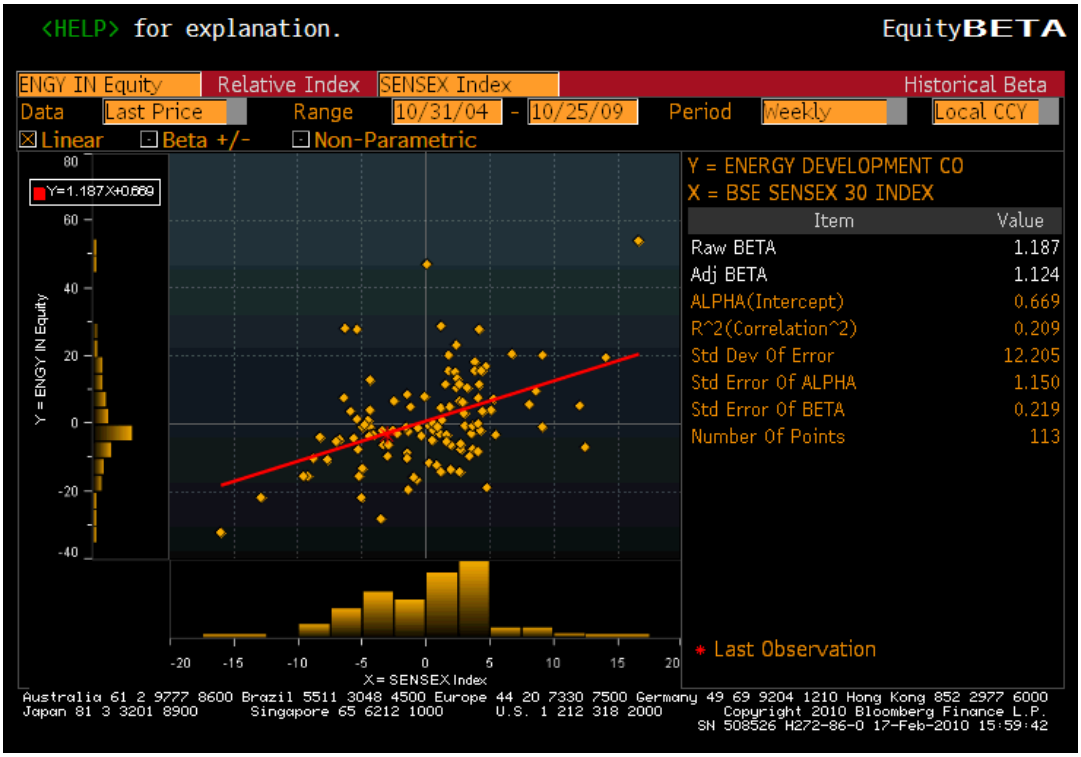
<HELP> for explanation.
EquityBETA
ENGY IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
10/31/04
10/25/09
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Y=1.187X+0.669
Y = ENGY IN Equity
X = SENSEX Index
Y = ENERGY DEVELOPMENT CO
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA 1.187
Adj BETA 1.124
ALPHA(Intercept) 0.669
R^2(Correlation^2) 0.209
Std Dev Of Error 12.205
Std Error Of ALPHA 1.150
Std Error Of BETA 0.219
Number Of Points 113
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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