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 Gujarat.
Version: 1.0
Date of completion of PDD: 17/07/2010

A.2. Description of the project activity:

Vaayu (India) Power Corporation Private Limited (VIPCPL) is developing 51.2 MW wind farm in the state of Gujarat in India. The project activity involves supply, erection, commissioning and operation of 64 machines of rated capacity 800 KW each. The machines are Enercon E-53 make. The project will generate 115.312 GWh of electricity per year which shall be supplied to the state electricity utility thereby contributing to reducing the energy demand supply gap in the state of Gujarat. The project activity will assist the sustainable growth of the region by providing clean and green electricity to the state electricity grid.

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 106,378 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 'Northern Eastern Western North-Eastern' 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 Gujarat Urja Vikas Nigam Limited (GUVNL) under a long-term power purchase agreement (PPA).

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

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 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 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

[2] http://cdmindia.nic.in/host approval criteria.htm

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.

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.:

Western Region/ Gujarat State

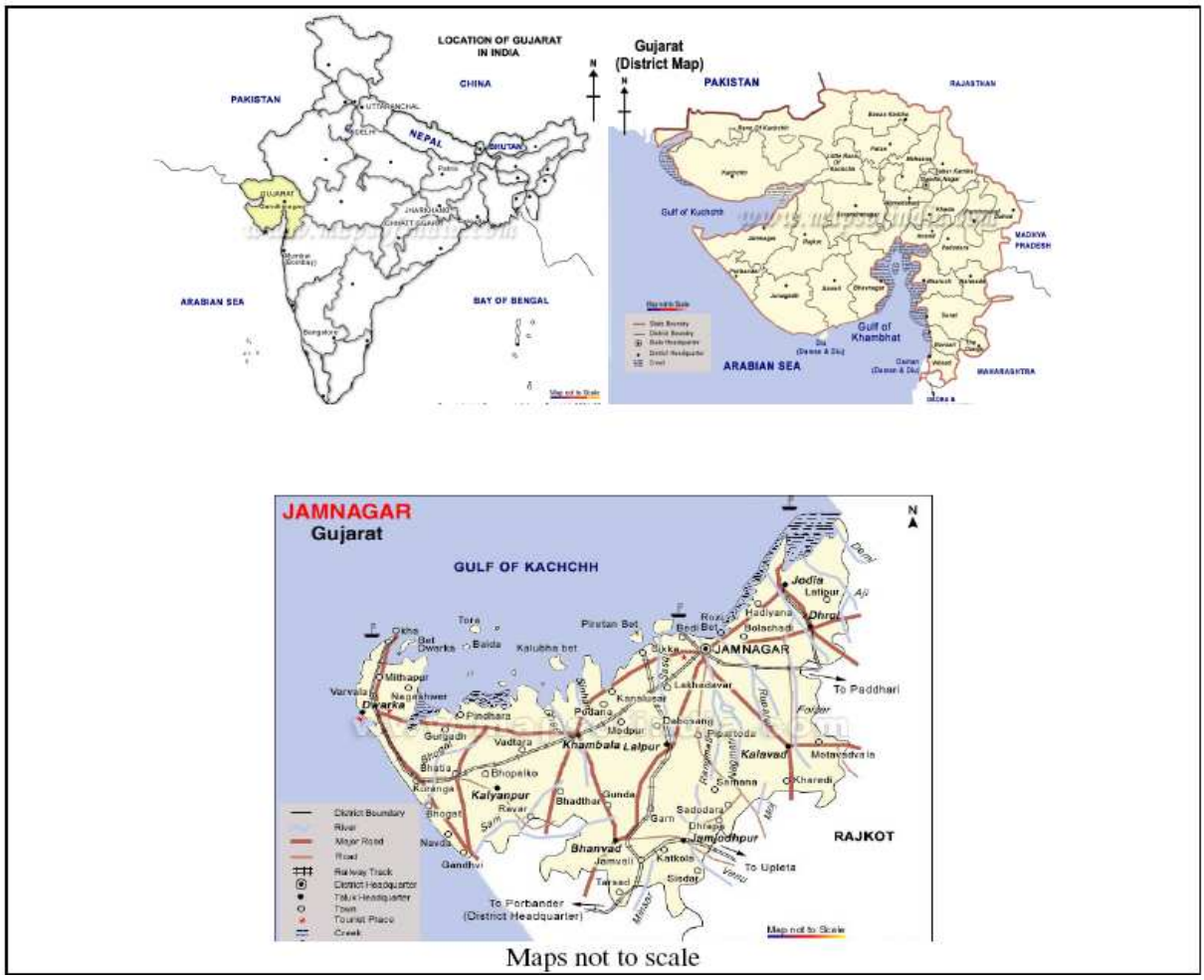
A.4.1.3. City/Town/Community etc:

The Project is spread across villages Chattar, Narmana, Seth Wadala, Jam Ambardi, Mevasa, Dhun Dhoraji, Sadodar, Bodi, Padavala and Machharda in Jamnagar and Rajkot Districts of Gujarat 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 area extends between latitude 21^{O} 55' and 22^{O} 08' North and longitude 70^{O} 05' and 70^{O} 19' East.

Nearest airport and railway station are at Jamnagar city which is located at a distance of approximately 60 kms from the project activity site.



Maps not to scale

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 64-wind energy converters (WECs) 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 activity can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V ± 12.5%. The average life time of

the WEC is around 20 years as per the industry standards; however the project activity is yet to be commissioned. The other salient features of the state-of-art-technology are:

E 53 Specifications

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

	lightning protection
Gear box type	Gear less
Generator type	Synchronous generator
Braking	Aerodynamic
Output Voltage	400 V
Yaw System	Active yawing with 4 electric yaw drives with brake motor and friction bearing
Tower	74 m concrete

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

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.

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

The estimated emission reductions over the 10 year fixed crediting period would be 1,063,780 tCO_2e as per details on annual emission reductions provided below:

Years	Annual estimation of emission reductions in tonnes of CO_2e
*1st year	106,378
2nd year	106,378
3rd year	106,378
4th year	106,378
5th year	106,378
6th year	106,378
7th year	106,378
8th year	106,378
9th year	106,378
10th year	106,378
Total estimated reductions (tonnes of CO_2e)	1,063,780
Total number of crediting years	10
Annual average over the crediting period of estimated	106,378

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

reductions (tonnes of CO_2e)	

*1st year begins from the date of registration, 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 11, EB 52)

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

- Tool to calculate the emission factor for an electricity system – Version 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 Gujarat state grid which in turn forms part of the NEWNE grid. The project activity will displace fossil fuel based electricity generation that would have otherwise been provided by the operation and expansion of the fossil fuel based power plants in NEWNE grid.

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

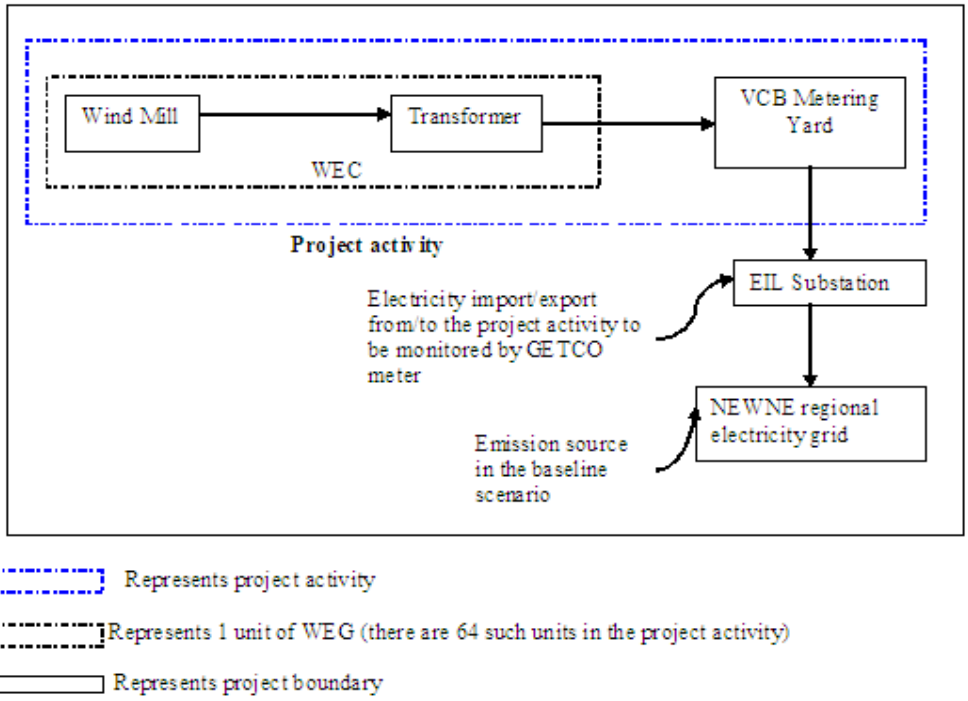
Para No.	Applicability Conditions as per ACM 0002	Applicability to this Project Activity
1.	The project activity is the installation capacity addition, retrofit or replacement of a power plant/unit of one of the following types: • Hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir) • Wind power plant/unit, • Geothermal power plant/unit, • Solar power plant/unit,	The project activity is grid connected renewable power generation from wind.

	• Wave power plant/unit • Tidal power plant/unit.	
2.	In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition project which use option 2: on the page 10 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: • The project activity is implemented in an existing reservoir, with no change in the volume of reservoir. • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2. • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	This condition is not relevant, as the project activity is not the installation of a hydro power plant.
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	The project activity is a new wind power plant. Also no replacement, modification and retrofit measures are implemented here.

	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".	Hence, this criterion is also not relevant to the project activity.
The description provided in the table above shows that the project activity satisfies the applicable conditions of the methodology, ACM0002. **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 the emission free electricity generation from renewable sources and hence emits no gases in the atmosphere.

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 Activity	Greenfield wind energy conversion system	CO_2	No	The project activity does not emit any emissions.
		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.

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

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

Sector	Hydro	Thermal				Nuclear	Renewable	Total
		Coal	Gas	Diesel	Total			
State	27055.76	42537.5	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 NEWNE 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**
$EF_{OM,\ y}$ = Operating Margin Emission Factor (tCO_2/MWh)	CEA Database for CO_2 emission factor, version 5
$EF_{BM,\ y}$ = 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

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

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

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 Indian DNA shall be provided to the DoE for verification.

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

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

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

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

The guidance to investment analysis issued in EB 51, Annex 58 (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%**.

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
Number of Machines	64		Enercon Offer
Project Capacity in MW	51.20		Enercon Offer
Expected project commissioning date	01-Apr-11		Enercon Offer
Project Cost per MW (Rs. In Millions)	59.34		Calculated
Operations			
Plant Load Factor Base Case	25.71%		C-WET Report
Transformation loss and Transmission Loss up to metering point	3.0%		
Effective PLF	24.94%		Calculated
Insurance Charges @ % of capital cost	0.12%		Normative
Operation & Maintanance Cost base year @ % of capital cost	1.30%		Enercon's offer
% of escalation per annum on O & M Charges	6.0%		Enercon's offer
Tariff			
Base year Tariff for 20 years - Rs./Kwh	3.55		GERC Tariff Order/Draft Order no. 2 of 2009
Project Cost	**Rs Million**		
Land and Infrastructure, Generator & Electrical Equipments, Mechanical Equipments, Civil Works, Instrumentation & Control, Other Project Cost, Pre operative Expenses, etc.			
Total Project Cost	**3,038.08**		Enercon Offer
Means of Finance		**Rs Million**	

Own Source	30%	911.42	Debt Equity Ratio for the power generation projects in India.
Term Loan	70%	2,126.66	Debt Equity Ratio for the power generation projects in India
Total Source		3,038.08	
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	80%		Income Tax Act
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		Billing Cycle
O & m expenses (no of days)	90		Enercon's Offer

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 the 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: 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.

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 25.71%.

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 5.92% 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:

- Capital Cost
- Tariff
- Plant Load Factor
- Debt Equity Ratio
- O&M cost

Capital Cost

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

	10% decrease in Capital Cost	Base Capital Cost	10% Increase In Capital Cost
Post tax Equity IRR	8.31%	5.92%	3.90%

Tariff

Gujarat Electricity Regulatory Commission (GERC) 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 at Rs. 3.55 per Unit. Therefore it is not appropriate to conduct sensitivity on tariff.

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 (Center for Wind Energy Testing-Third party independent source for PLF) is 25.71%. We have conducted sensitivity at a variation of 10% over the base case.

	PLF @ 23.14% (10%	PLF 25.71% (PLF	PLF @ 28.28% (10%

	Decrease over PLF estimated by CWET)	by CWET)	Increase over PLF estimated by CWET)
Post tax Equity IRR	3.71%	5.92%	8.06%

The sensitivity analysis clearly shows even with a higher PLF, the project is not able to generate sufficient returns. It can therefore be concluded that the project is financially not viable without CDM benefits.

Debt Equity Ratio

The debt equity ratio envisaged for the project is 70:30, evident from the Detailed Project Report; the same has been considered for Investment Analysis. A sensitivity analysis of IRR to 10% variations in the debt-equity ratio is carried out in the table below:

	10% decrease over base case [68:32]	Base Debt Equity ratio [70:30]	10% Increase over base case [72:28]
Post tax Equity IRR	5.95%	5.92%	5.89%

It may also be noted that at 100% equity, the Equity IRR is 6.59%.

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	6.27%	5.92%	5.56%

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 4 (a): 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 similar scale, and take place in a comparable environment with respect to regular framework, investment climate, access to technology, access to finance etc.

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

Name of Owner	Installed Capacity in Gujarat (MW)	CDM	Web links and Explanations
DLF Limited	150 MW	Yes	The project activity has been registered on 18-Jun-2009. http://cdm.unfccc.int/Projects/DB/BVQI1229917560.71/view
GACL	23.75 MW + 39 MW	Yes	The project is under CDM validation. 23.75 MW: http://cdm.unfccc.int/Projects/Validation/DB/PLJVAOHCZK3WX6GN4QGVAH8C3MGAYP/view.html 39 MW: http://cdm.unfccc.int/Projects/Validation/DB/CBEZRP9HZI993GZEUKGZF6JOGZJB45/view.html
GESC Electricals	20 MW	Yes	References' stating that CDM development for these projects is underway. http://www.gudcltd.com/public/CDM-Bulletin.pdf http://www.docstoc.com/docs/2825129/Section-1-Letter-of-Invitation
Gujarat Gardian	23.2 MW	Yes	Installations under PDD titled "Gujarat Guardian wind power project in the State of Gujarat managed by Enercon India Limited" spread across villages in Satapar, Kuranga and Bamnasa of Jamnagar District of Gujarat state in India http://cdmindia.nic.in/cdmindia/projects/PCN_696_07.pdf
Gujarat NRE Coal Group	22.3 MW, 26.25 MW	Yes	Installations are under the CDM PDDs 1) 22.3 MW Bundled grid connected Wind Power based electricity generation project in Gujarat http://cdm.unfccc.int/Projects/Validation/DB/OW17ZTWQUDGVXQGEO59WCBOC9C6LIR/view.html 2. 26.25 MW wind electricity generation project of Gujarat NRE Coke Limited at Jamnagar and Kachchh http://cdm.unfccc.int/Projects/Validation/DB/2WHFROEPK85ARNQ1TVKJV4WC8ATMAB/view.html 3) GHG abatement project through wind based energy generation, in Kutch, Gujarat http://cdm.unfccc.int/Projects/Validation/DB/3XJDEJWIXD7AE8K5O7RYT5HU1CV2HB/view.html

Gujarat Paguthan Energy Corporation Ltd.	50.4 MW	Yes	The project activity has been registered on 13-feb-2010. http://cdm.unfccc.int/Projects/DB/RWTUV1250689673.15/view
HZL Limited	88.8 MW	Yes	The project activity has been registered on 15-Jan-2009. http://cdm.unfccc.int/Projects/DB/BVQI1211956663.14/view
IOCL	21MW	Yes	The project is under CDM validation: http://cdm.unfccc.int/Projects/Validation/DB/6F92LAJ7ZAGAUDLEMPLC5CKL8KKDS5/view.html
MSPL Group	30MW	Yes	The Project is under CDM validation as part of the project activity - "30 MW wind power project at Surajbari, Gujarat in India" http://cdm.unfccc.int/Projects/Validation/DB/L59OGCJY0XLZUC0W8MMB84A2T4NKNX/view.html
ONGC	51 MW	Yes	The project activity has been registered on 01 March 2010: http://cdm.unfccc.int/Projects/DB/DNV-CUK1249377814.84/view
Patnaik Minerals Pvt Ltd	30.4 MW	Yes	The project is under CDM and part of Wind Power project by PMPL in Gujarat, District Jamnagar and Rajkot by M/s Patnaik Minerals Private Limited http://cdm.unfccc.int/Projects/Validation/DB/GQ56N39MLSZ9QDRL6RUF5YJSFDPD1U/view.html
Ratnamani Metals and Tubes Ltd	17.5 MW	Yes	The project activity has been implemented in phases. The first phase of around 5 MW has been included under two bundled CDM project activities - 1. 22.3 MW Bundled grid connected Wind Power based electricity generation project in Gujarat and 2. 13.7 MW Bundled Grid-connected wind electricity generation in Jamnagar & Kachchh, Gujarat. 1.http://cdm.unfccc.int/UserManagement/FileStorage/X6RZB5RJQDTY6C6PF4A38DSNXH2FL4 2. http://www.sgsqualitynetwork.com/tradeassurance/ccp/projects/452/PDD%20-%2013.7%20MW%20Bundled%20Wind%20Gujarat_Feb2008.pdf Post these bundled projects the second phase consisting of 13.25 MW has been proposed as a separate CDM project activity implemented post January 2007 - 13.25 MW Wind Power Generation by RMTL, in Kutch, Gujarat.

			http://cdm.unfccc.int/Projects/Validation/DB/FQOM561A0WJL6VAG2NT568TNPCLZCG/view.html
SREI	24.8 MW	Yes	Installations under the PDD titled "Green House Gas Abatement through installation of a wind power project for export to the Grid." The PP name in the PDD is given as India Power Corporation Limited (IPCL), SREI is Finance providers, and have the major stakes of the projects. http://cdm.unfccc.int/Projects/Validation/DB/K0ZTRSQUQH8WZN76AA11ZAZW16BPNH/view.html
Surajbari Windfarm Development Pvt Ltd	16.5MW	Yes	The project activity is under CDM validation. http://cdm.unfccc.int/Projects/Validation/DB/51AZ1NLK643Y7W70DT6EH6HSR6HV54/view.html
TPCL	12MW September 2008 17.6MW March 2009	Yes	The project is under CDM validation: http://cdm.unfccc.int/Projects/Validation/DB/V3VLCQGE9AP9TX41VS9FJI8UKLMBOA/view.html
Aarvee Denims & Exports Ltd	18 MW	Yes	The project is under CDM validation http://cdm.unfccc.int/Projects/Validation/DB/FLUB2VU6RT4P2MU7QAE0L176AYBVLX/view.html
Indian Petrochemicals Co. Ltd	15.315 MW	No	The project was commissioned phase-wise in March 1997, the regulatory environment prevailing at that time and the policies applicable for wind energy were different from those existing at the time of the start of the proposed project activity. Thus this project cannot be compared to the proposed project activity.

It can be seen that, without exception, all private investors in the state of Gujarat 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 Gujarat are CDM projects

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 11) Emission Reductions are calculated as:-

$ER_y = BE_y – PE_y$ …….. (1)

Where:

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

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

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

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

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:

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

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:

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

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

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

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 922.52 tCO_2e/GWh.

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/planning/c%20and%20e/Government%20of%20India%20website.htm

Estimation of Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 11, there will be no project emissions in the project activity

$$PE_y = 0 \quad \text{..... (4)}$$

Estimation of Leakage Emissions

As per ACM0002 Version 11, no leakage has been considered for the calculation of emission factor

$$LE_y = 0 \quad \text{..... (5)}$$

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 Regional 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:	1.00438
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 Regional 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:	0.67518
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:	$EF_{grid,,CM,y}$
Data unit:	tCO_2e/MWh
Description:	Combined Margin Emission Factor of NEWNE Regional 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_{OM} and 0.25 for EF_{BM} are applicable as per ACM0002. Combined Margin Emission Factor (EFy or $EF_{CM,y}$) : 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:

Emission reductions from the project activity are equal to the baseline emissions as project emissions and leakage are nil.

Baseline emission factor (Combined Margin) (EFy)
= 0.92252 tCO_2e/MWh

Annual electricity supplied to the grid by the Project (EGy) is calculated as:
= 51.2 MW (Capacity) x 25.71% (PLF) x 8,760 (hours) MWh
= 1,15,312.44 MWh

Annual Baseline Emissions Reduction: $ERy = EF_{grid,CM,y} * EG_{PJ,y}$
= 0.92252 tCO_2e/MWh x 115312.44 MWh
= 1,06,378 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)
1st year*	0	106,378	0	106,378

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)
2nd year	0	106,378	0	106,378
3rd year	0	106,378	0	106,378
4th year	0	106,378	0	106,378
5th year	0	106,378	0	106,378
6th year	0	106,378	0	106,378
7th year	0	106,378	0	106,378
8th year	0	106,378	0	106,378
9th year	0	106,378	0	106,378
10th year	0	106,378	0	106,378
Total (tonnes of CO_2e)	0	1,063,780	0	1,063,780

*1st year begins from the date of registration, 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:

Data / Parameter:	$EG_{PJ,y}$
Data unit:	MWh
Description:	Net Quantity of Electricity exported to the grid
Source of data to be used:	Share certificate issued by GETCO
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1,15,312.44 MWh/year
Description of measurement methods and procedures to be applied:	The procedures for metering will be as per the provisions of the power purchase agreement. The WECs of a single customer (VIPCPL in this case) at a particular site are connected to dedicated Vacuum Circuit Breaker metering yards (VCB) which ultimately lead to the shared main GETCO meter (also known as revenue meter) at the substation maintained by Enercon (India) Limited. Data monitoring takes place at the metering points in VCB metering yards and GETCO meter at the substation. The net electricity supplied to the grid by the wind farm is calculated by GEDA on the basis of GETCO main meter reading and the meter readings taken at individual VCB metering yards after adjusting transmission loss. For adjustment of transmission loss, the electricity metered at the GETCO meter is proportionally divided by GEDA among the customers connected to the revenue meter on the basis of the prorata readings taken at the VCB end.

	The net electricity generated by the project activity is taken directly from the share certificate issued by GETCO on monthly basis.
QA/QC procedures to be applied:	Annual calibration of all the meters will be undertaken and faulty meters will be duly replaced immediately.
Any comment:	The data will be archived for the entire crediting period plus two years.

Data / Parameter:	$EG_{VCB, Export}$
Data unit:	kWh
Description:	Electricity export recorded at the Vacuum Circuit Breaker (VCB)
Source of data to be used:	Daily generation is recorded by Enercon (India) Limited and are provided to GEDA on monthly basis.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This reading is adjusted for transmission loss by GEDA for computing net electricity exported by the project activity and is not directly used for calculation of emission reductions.
Description of measurement methods and procedures to be applied:	The individual WECs of the project owners at a particular site connect to a meter at the VCB metering yard. Each project owner have exclusive VCB metering yard.
QA/QC procedures to be applied:	Annual calibration of all the meters will be undertaken and all faulty meters will be duly replaced immediately.
Any comment:	The data will be archived for the entire crediting period plus two years.

Data / Parameter:	$EG_{VCB, Import}$
Data unit:	kWh
Description:	Electricity import recorded at the Vacuum Circuit Breaker (VCB)
Source of data to be used:	Daily generation is recorded by Enercon (India) Limited and are provided to GEDA on monthly basis.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This reading is adjusted for transmission loss by GEDA for computing net electricity imported by the project activity and is not directly used for calculation of emission reductions.
Description of measurement methods and procedures to be applied:	The individual WECs of the project owners at a particular site connect to a meter at the VCB metering yard. Each project owner have exclusive VCB metering yard(s).
QA/QC procedures to be applied:	Annual calibration of all the meters will be undertaken and all faulty meters will be duly replaced immediately.
Any comment:	The data will be archived for the entire crediting period plus two years.

Data / Parameter:	$EG_{GETCO, Export}$

Data unit:	kWh
Description:	Net Electricity export recorded at Enercon Substation
Source of data to be used:	Joint Meter Reading (JMR)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This reading is used for calculation of transmission loss by GEDA and is not directly used for calculation of emission reductions.
Description of measurement methods and procedures to be applied:	The meter reading is taken jointly by the representatives of Enercon and GEDA/GETCO in the form of JMR
QA/QC procedures to be applied:	Annual calibration of all the meters will be undertaken and all faulty meters will be duly replaced immediately.
Any comment:	The data will be archived for the entire crediting period plus two years.

Data / Parameter:	$EG_{GETCO, Import}$
Data unit:	kWh
Description:	Net Electricity import recorded at Enercon Substation
Source of data to be used:	Joint Meter Reading (JMR)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This reading is used for calculation of transmission loss by GEDA and is not directly used for calculation of emission reductions.
Description of measurement methods and procedures to be applied:	The meter reading is taken jointly by the representatives of Enercon and GEDA/GETCO in the form of JMR
QA/QC procedures to be applied:	Annual calibration of all the meters will be undertaken and all faulty meters will be duly replaced immediately.
Any comment:	The data will be archived for the entire crediting period plus two years.

B.7.2 Description of the monitoring plan:

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

Enercon (India) Limited is the O&M contractor for the project activity. Enercon (India) Limited will be responsible for 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.

The 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.

The project activity will have exclusive VCB metering yard(s) and the meter readings taken at these metering points will be provided by the representatives of Enercon to GEDA. These meters will be sealed by GEDA and will also be calibrated annually.

Enercon substation have main meter(s) known as GETCO meters (also known as revenue meter) which is connected to wind turbines installed by the project proponent and wind turbines installed by other project owners. Gujarat Electricity Development Authority (GEDA) apportions the net electricity supplied to the grid at the Enercon substation to all the project owners after adjusting transmission loss to the meter readings taken at dedicated VCB metering yards of different project owners.

The net electricity generated by the project owners is provided by GETCO in the share certificate of electricity generated. The value of the net electricity generated by the project activity will be taken directly by the project proponent from the share certificate provided by GETCO for calculation of emission reductions.

If during meter testing the main meter at the Enercon substation is found beyond the permissible limit of error, the meter reading will be taken from the main meter located at the utility (GETCO) substation at Moti Panelli after addition of average historical transmission losses.

If during meter testing the meter at VCB metering yard is found beyond the permissible limit of error, the sum of panel meter (LCS meter) readings located at each wind turbine of the project activity will be provided to GEDA for purpose of apportioning net electricity supplied to the grid. 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 WEGs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report.

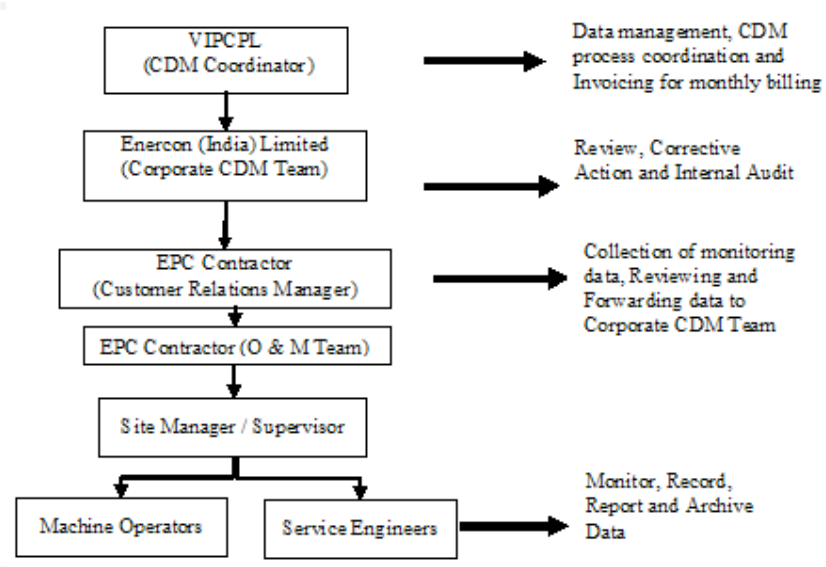
The Project is operated by Enercon (O&M contractor for the project activity) and managed by the PP. The operational and maintenance contract for the project is with Enercon. Enercon is an ISO 9001:2000 certified Quality Management system from Germanischer Lloyd. Enercon follows the documentation practices 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 accuracy of monitoring parameter is ensured by adhering to the calibration and testing of the metering equipment once each year. Enercon is Operation and Maintenance contractor for the project activity and provides the daily generation report to the Project proponent. The project proponent also maintains the records of daily generation report and joint meter report.

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.

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



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: 17/07/2010

Name of responsible person/entity: Vaayu (India) Power Corporation Private Limited (Project Participant).

The details are given in Annex-1.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

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

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

20 years

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

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

C.2.1. Renewable crediting period

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

Not Applicable

C.2.1.2. Length of the first crediting period:

Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/04/2011, being the expected date of Commissioning of the Project or the date of Project registration with UNFCCC whichever occurs 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 14th September 2006, a list of activities that require undertaking environmental impact assessment studies[6] has been provided. EIA is not a

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

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:

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The comments from local stakeholders were invited through a local stakeholder meeting conducted at Jamnagar District in Gujarat on 9 February 2010. A local newspaper advertisement was placed in Naubat on 23 January 2010 inviting the local stakeholders for the meeting. The personal invitations were also sent to the local villagers. The meeting was presided over by Mr. Mayur Dave (EIL-Baroda), Mr. Puneet Katyal (EIL-CDM), Mr. Rohit Joshi (EIL-CDM), Ms Anushree Mishra (EIL-CDM) and Mr. Alpesh Patel (EIL- Jamnagar).

E.2. Summary of the comments received:

Mr. Mayur Dave welcomed the gathering and introduced the company. Mr. Rohit Joshi briefed the agenda initiative to the stakeholders. Mr. Kanti Bhai village Sarpanch (Chief) of Chattar village was selected as the chairperson of the meeting.

Ms Anushree Mishra 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 Rohit Joshi gave a presentation on global warming and its impacts, Kyoto Protocol, CDM and role of wind power in mitigating the global warming. He invited Mr. Puneet Katyal who explained about the project activity and discussed the benefits of wind power project in the mitigation of global warming.

The Chairperson, Mr. Kanti Bhai appreciated the management of VIPCPL for proposing pollution free technology for power generation. Mr. Mayur Dave then delivered the vote of thanks and appreciated the villagers for their active participation.

The meeting was very cordial and ended on a positive note. No adverse comments were received. Villagers gave suggestion that the panchayat would be taken into loop while implementing the project activity.

The following queries were raised by the stakeholders:

1. Whether VIPCPL shall provide any compensation for Gauchar Land (Land used for grazing)?
2. How Wind farms would help in mitigating climate change?
3. Whether the wind projects harm local property values?
4. Whether the electricity generated from this project will be directly fed to the local community?
5. The direct and indirect benefits to them from the proposed project activity?
6. Whether wind turbines move away rain clouds?

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

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

S.No.	Villager Name	Question	Reply by Enercon representatives
1	Mr. Wali Bhai	Enquired whether VIPCPL shall provide any compensation for Gauchar Land (Land used for grazing)?	There is a provision by Enercon (India) Limited to provide adequate compensation package to the panchayat for the acquisition of Gauchar land.
2	Mr. Nanji Mauji Bhai	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. Sharad Bipin	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. Sardharakantilal	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. Ramesh Gordhan	Enquired about the direct and indirect benefits to them from the proposed project activity?	The project would generate local job opportunities, which would help in the overall socio-economic development of the region. Additionally, a number of Corporate Social Responsibility initiatives would be undertaken, which would be identified based on the specific needs of the local populace.
6	Mr. Jairamkokul	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.

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

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Vaayu (India) Power Corporation Private Limited
Street/P.O.Box:	Plot No. 33, Daman Patalia Road
Building:	
City:	Bhimpore
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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 Grid as published in the CEA database version 5 are as follows:

Simple Operating Margin

	NEWNE Grid (tCO_2e/MWh)
Simple Operating Margin – 2006-07	1.00848
Simple Operating Margin – 2007-08	0.9999
Simple Operating Margin – 2008-09	1.00655
Average Operating Margin of last three years	1.00438

Build Margin

	NEWNE Grid (tCO_2e/MWh)
Build Margin- 2008-09	0.67518

Combined Margin Calculations

	Weights	NEWNE Grid (tCO_2e/MWh)
Operating Margin	0.75	1.00438
Build Margin	0.25	0.67518
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

Meter Reading

- The net electricity supplied to the grid will be taken directly from the share certificate for net electricity generated provided by GETCO.
    - The meter reading is taken jointly at GETCO meters by representatives of Enercon and GEDA/GETCO located at Enercon substation. The GETCO meters are connected to the wind turbines of the project activity and the wind turbines of the other project owners. Therefore GETCO provides the share certificate that apportions the net electricity generated by the project owners.
    - The VCB meters are provided exclusively to all the project owners having installed wind turbines at the wind farm. The meter readings from these meters are used by GEDA for purpose of apportioning.

Meter Testing

- The main meter at Enercon Substation will be jointly inspected once in a year.
- If during meter testing the main meter at the Enercon substation is found beyond the permissible limit of error, the meter reading will be taken from the main meter located at the utility (GETCO) substation at Moti Panelli after addition of average historical transmission losses.
- The main meter at utility substation will also be calibrated once in each year.
- The meters at VCB metering yard connected to the wind turbines of the project activity will be sealed by GEDA and will also be calibrated annually.
- If during meter testing panel meter, the meter at VCB metering yard is found beyond the permissible limit of error, the sum of LCS meter reading located at each wind turbine of the project activity will be provided to GEDA for purpose of apportioning net electricity supplied to the grid.
- 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 WEGs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report.
- Billing for the failure Period will be adjusted from the month of preceding test.

Data recording

- The meter recording at the main meter at Enercon substation and the meters at VCB metering yards of the project activity will be done each month.
- The panel meter (LCS meter) reading is recorded continuously by the online monitoring system.
- All the monitored data will be recorded and filed electronically and in hard format for 2 years beyond the crediting period i.e. 10+2 years.