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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

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Title: Wind Power Project in Gujarat, India
Version: 05.0
Date of completion of PDD: 13/09/2012

A.2. Description of the project activity:

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Vish Wind Infrastucture LLP (VWIL) isinstalling36.0 MW wind energy generators in the state of Gujarat in India. The project activity involves supply, erection, commissioning and operation of 45 machines with rated capacity of 800 KW each. All the machines are Enercon E-53 make. The project will generate 77.27GWh 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 contribute to the sustainable development 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 wind energy potential for generation of electricity. The project activity replaces anthropogenic emissions of greenhouse gases (GHG's) into the atmosphere, which is estimated to be approximately 73,608 tCO_{2e} per year, by displacing an 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.

Pre-Project Scenario:

In the absence of the project activity an equivalent amount of electricity would have been generated from the connected/ new power plants in the NEWNE grid, which are predominantly based on fossil fuels[1], whereas no GHG emission takes place from power generation by wind energy converters (WECs). 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 generated electricity would be supplied to Electricity Distribution Company (DISCOM) under a long-term power purchase agreement (PPA).

Contribution to Sustainable Development

[1] http://www.cea.nic.in/reports/monthly/executive_rep/dec10/8.pdf

The National CDM Authority (NCDMA) which is the Designated National Authority (DNA) for the Government of India (GoI) 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.

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, 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]2http://envfor.nic.in/cdm/host_approval_criteria.htm

A.3. Project participants:

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

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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India

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

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Western region – State of Gujarat

A.4.1.3. City/Town/Community etc.:

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District – Kutch
Villages – Nakhatrana Wind Farm Site

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

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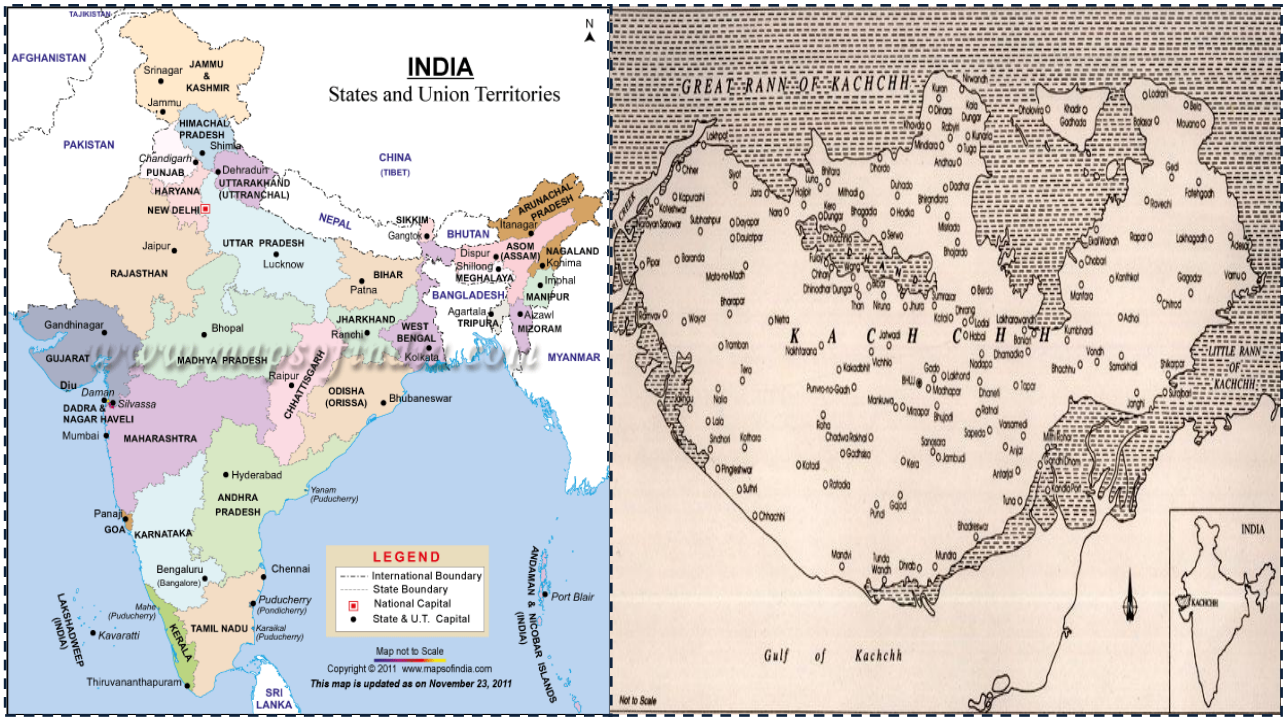
The project lies between latitude N 23^0 21' 57.0" to 23^0 29' 2.3" & longitude 69^0 0' 33.2" to 69^0 8' 28.4" The details of the geographical coordinates of the project locations are provided in the Appendix A. Nearest railway station and airport is at Rajkot which is about 180 km away from the site.



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

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The project activity is considered under CDM category zero-emissions 'Wind Power Project in Gujarat, India' 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 **Sectoral Scope - 1 [Energy industries (renewable/ non-renewable sources)].**

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

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The project activity involves 45 wind energy converters (WECs) of Enercon make (800kW E-53) with internal electrical lines connecting the project activity with local evacuation facility. The average lifetime 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	EnerconE-53
Rated power	800KW
Rotor diameter	52.9m
Hub height	75m
Turbine Type	Direct driven, horizontal axis wind turbine with variable rotor speed.

Power regulation	Independent 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	29rpm
Operating range rot.	12-29rpm
Orientation	Upwind
No of Blades	3
Blade Material	Fibre Glass Epoxy reinforced
Gear box type	Gearless
Generator type	Synchronous generator
Braking	Aerodynamic
Output Voltage	400V
Yaw System	Active yawing with 4 electric yaw drive With brake motor.
Tower	74mconcrete

Transfer of Technology and Know-how to the host party:

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.

Purpose of the Project Activity

Pre-project scenario: No Project Activity
As has been discussed in section A.2 of the PDD, the baseline is same as the pre-project scenario, i.e. continuation of supply of electricity to the NEWNE grid by a conventional source of power generation (Coal, Gas, etc).

Post Project Scenario: Implementation of Project
The proposed project activity would displace an equivalent amount of power from conventional sources and would thus meet the electricity deficit through a clean technology.

The project facility essentially involves:

Components

1. 45WECs of E-53 type supplied by EIL each with a generating capacity of 800 kW
2. Step up transformers (400 V to 33 kV)
3. Transmission lines connecting the generating facility to the local sub-station.

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.

Thus, the baseline scenario is the same as the pre-project scenario (as per the guidelines to complete the PDD, a repeat of the description of the baseline scenarios is not required).

During the operation of WECs no adverse effect on environment takes places this technology is environmentally safe and sound and does not contribute to any GHG emission. Moreover, after the operational lifetime, the disposal of the WECs does not involve any hazardous material.

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

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The estimated emission reductions over the 10 year fixed crediting period would be 736,080 tCO2e as per details on annual emission reductions provided below:

Years	Annual estimation of emission reductions in tonnes of CO_2e
*Year 1	73,608
Year 2	73,608
Year 3	73,608
Year 4	73,608
Year 5	73,608
Year 6	73,608
Year 7	73,608
Year 8	73,608
Year 9	73,608
Year 10	73,608
Total estimated reductions (tonnes of CO_2e)	736,080
Total number of crediting years	10
Annualaverageoverthecreditingperiodofestimatedreductions(tonnesofCO_2e)	73,608

*The crediting period would commence from the application date for registration

A.4.5. Public funding of the project activity:

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

[3] http://www.cea.nic.in/reports/monthly/executive_rep/dec10/8.pdf

SECTION B. Application of a baseline and monitoring methodology

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

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

Reference: Approved consolidated baseline methodology ACM0002 (Version 12.3.0, EB 66)

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

- Tool to Calculate the Emission Factor for an Electricity System – Version 02.2.1, Annex 19, EB 63
- Tool for the Demonstration and Assessment of Additionality – Version 06.0.0, Annex 21, EB 65
- Guidelines on the Assessment of Investment Analysis – Version 05, Annex 5, EB 62

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:

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The Project is a wind based zero emission power project connected to the NEWNE electricity grid.The project activity involves installation of a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant) The Project will displace fossil fuel based electricity generation that would have otherwise been provided by the operation and expansion of the fossil fuel based power plants in NEWNE electricity grid.

The approved consolidated baseline and monitoring methodology ACM 0002, Version 12.3.0 is the choice of the baseline and monitoring methodology and it is applicable because:

Sl. No.	Applicability Criteria as per ACM 0002	Applicability to Project Activity
1	This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity is grid connected greenfield renewable power generation from wind where no renewable power plant was operated prior to the implementation of the project activity.
2	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 or tidal power plant/unit	The project activity is the installation of a wind power plant and does not involve capacity additions, retrofits or replacements.
3	In the case of capacity additions, retrofits or replacements (except for capacity addition projects for which the electricity	The project activity is a Greenfield wind power generation

	generation of the exisiting power plant(s) or unit(s) is not affected): 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 addition or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity:	and does not involve any capacity addition. Hence, this criterion is not relevant.
4	In case of hydro power plants: • The project activity is implemented in an existing reservoir, with no change in the volume of any of the reservoir; or • 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 4W/m^2after the implementation of the project activity: or • The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4W/m2 after the implementation of the project activity.	The project activity is clean energy generation from wind and does not involve installation of a hydro power plant.
5	In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2after the implementation of the project activity: • The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2; • All reservoirs and hydro power plants are located at the same river and were designed together to function as an integrated project that collectively constitutes the generation capacity of the combined power plant; • The water flow between the multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • The total installed capacity of the power units, which are driven using water from the reservoirs with a power density lower than 4 W/m^2, is lower than 15MW; • The total installed capacity of the power units, which are driven using water from reservoirs with a power density lower than 4 W/m2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	The project activity is clean energy generation from wind and does not involve installation of a hydro power plant.
6	The methodology is not applicable to the following: • Project activities that involve switching from fossil	The project activity does not involve any of the given criteria

	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; • A hydro power plant that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the reservoir is less than 4W/m^2.	mentioned here.
7	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. Therefore, this is not a relevant criteria for the project activity.

The description provided in the table above shows that the project activity satisfies the applicable conditions of the methodology, ACM0002 version 12.3.0.

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

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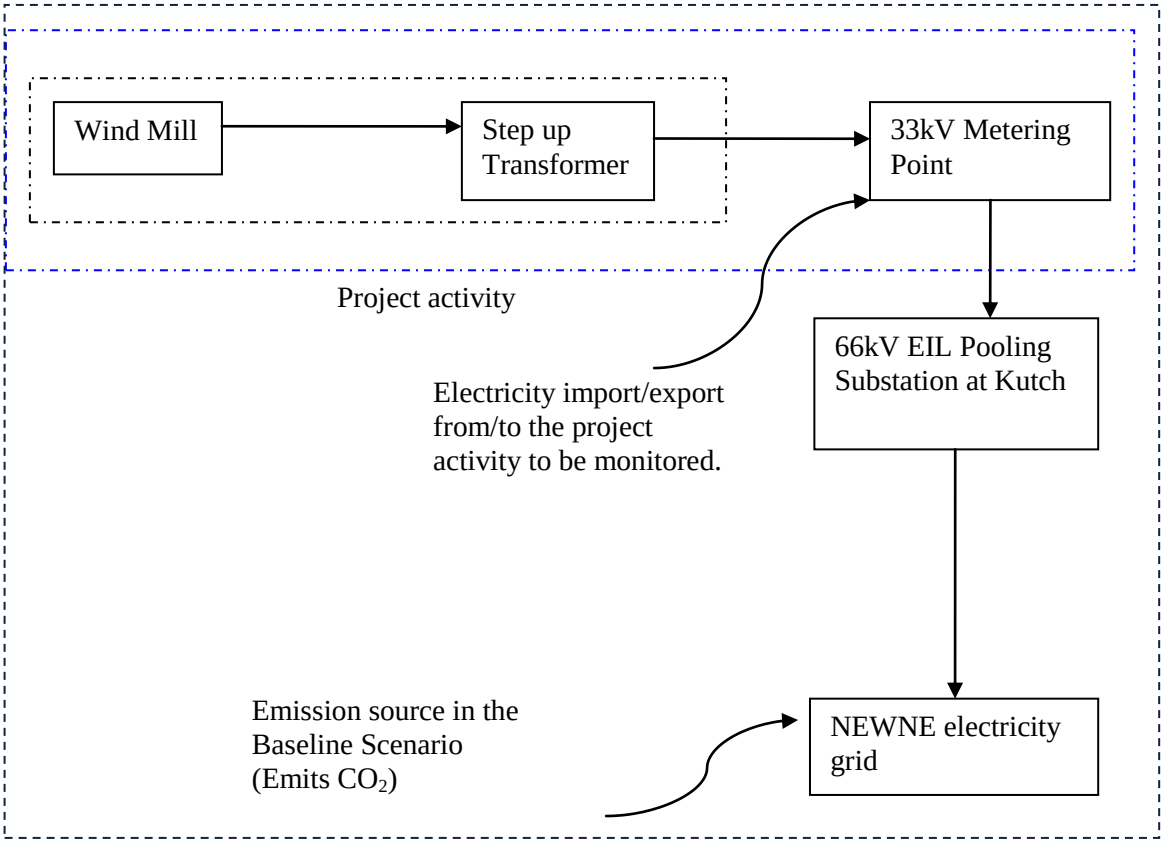
According to the applicable methodology, spatial extent of this project activity includes the project site and all the power plants connected physically to the electricity system that the CDM power project is connected to. The project activity is connected to the network of state transmission utility which falls under NEWNE grid. Thus the project boundary includes all the power plants physically connected to the NEWNE grid. Project activity is connected to 66kV Dharampur substation at Kutch developed by Enercon (India) Limited.

The schematic diagram of the Project Boundary is as follows:



Represents project activity

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

Represents 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	CO_2 emissions from electricity generation in fossil fuel fired power plants	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source

	that are displaced due to the project activity	N_2O	No	Minor emission source
Project Activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	No	The project activity is a wind power project and thus these emission sources are not applicable to the project activity.
		CH_4	No	
		N_2O	No	
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	The project activity is a wind power project and thus these emission sources are not applicable to the project activity.
		CH_4	No	
		N_2O	No	
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	The project activity is a wind power project and thus these emission sources are not applicable to the project activity.
		CH_4	No	
		N_2O	No	

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

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According to ACM0002 version 12.3.0, *"If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:*

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system."

The project activity is the installation of a new power generating facility utilizing the kinetic energy of wind to produce electricity and supply the same to the grid. In the absence of the project activity, the equivalent amount of electricity would have otherwise been supplied by the operation of grid-connected power plants and by the addition of new generation sources.

According to the approved baseline and monitoring methodology ACM0002, version 12.3.0, the baseline emissions are calculated as:

$$\mathbf{BE_y = EG_{PG,y} * EF_{grid,CM,y}}$$

BEy = 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)

The project is a Greenfield renewable energy power plant and thus
$EG_{PJ,y} = EG_{facility,y}$

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

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

Calculation for $EF_{grid,CM,y}$is given in Section B.6.1.

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

Sl.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, Dadra & 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	27065	44977	4046.12	602.61	49625.73	0.00	2701	79391.85
Central	8565.40	31165	6702.23	0.00	37867.23	4560	0.00	50992.63
Private	1233.00	8056.38	6307.50	597.14	14961.02	0.00	12819.99	29014.01

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

[5] http://www.cea.nic.in/reports/monthly/executive_rep/dec10/8.pdf

All India	36863.40	84198.38	17055.85	1199.75	102453.98	4560	15521.11	159398.49

It is evident from the above table that the installed capacity in India is predominantly thermal power plants (64.27%); thermal power generation is GHG intensive and is a major source of CO2 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**
$EF_{grid,OM,y}$ = Operating Margin Emission Factor (tCO2/MWh)	CEA Database for CO2 emission factor, version 6
$EF_{grid,BM,y}$ = Build Margin Emission Factor (tCO2/MWh)	CEA Database for CO2 emission factor, version 6
EF_y = 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):

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Demonstration of prior consideration

The project activity has been conceived as a CDM project since its inception. As per EB 62, Annex 13, B. New project activities, Point 2,

"The Board decided that for project activities with a starting date on or after 02 August 2008, the project participant must inform a Host Party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months of the project activity start date and shall contain the precise geographical location and a brief description of the proposed project activity, using the standardized form F-CDM-Prior Consideration. Such notification is not necessary if a project design document (PDD) has been published for global stakeholder consultation or a new methodology proposed to the Executive Board for the specific project before the project activity start date."

The project start date is 1st August, 2011 and the PP has intimated UNFCCC and DNA on 11/01/2012 about the project activity initiative which is within six months of the start date. Therefore it complies with the "GUIDELINES ONTHEDEMONSTRATION ANDASSESSMENT OF PRIOR CONSIDERATION OF THE CDM", version04, EB62, Annex13. The acknowledgement from UNFCCC and email to Indian DNA has been provided to the DoE for verification. The table below demonstrates the same:

CDM Trails	**Dates**
Board Resolution	15/07/2011
Purchase Order of WECs	01/08/2011
Prior consideration sent to UNFCCC & NCDMA	11/01/2012

Additionality
According to decision 17 /CP.7 paragraph 43, a project will be defined additional if the anthropogenic GHG emissions from the source are reduced below that would have occurred in the absence of the registered project activity and that either the project is facing barriers or is not viable / profitable for the investor.

Within the scope of the adopted baseline methodology, the additionality of the project activity has been demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" (Version 06.0.0 from EB 65). The tool prescribes the following steps for proving additionality of a project.

Step1. Identification of alternatives to the project activity consistent with current laws and Regulations

Sub-step 1a: Define alternatives to the project activity:
The alternative for the project activity is pre-defined in "Demonstration and assessment of additionality". (Version 06.0.0, EB 64, Annex 21) as:
(a) The proposed project activity undertaken without being registered as a CDM project activity;
(b) Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario that deliver outputs services (e.g., cement) or services (e.g. electricity, heat) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology;
(c) If applicable, continuation of the current situation (no project activity or other alternatives undertaken).
Alternatives (a) and (c) above have been identified as realistic and credible alternative scenario(s) to the project activity.

Therefore, 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:

P1: The project activity not implemented as a CDM project;
P2: The continuation of the current situation, i.e. to use all power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance. The additional power generated under the project would be generated in existing and new grid-connected power plants in the electricity system;

As per ACM0002, version 12.3.0, *"If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:*

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the .Tool to calculate the emission factor for an electricity system."

National Policies relevant to the baseline of project activity are as below:

1) "Baseline CO_2 database" Version 07– Central Electricity Authority
2) Electricity Act 2003

The Electricity Act, 2003 provides an enabling framework for accelerated and more efficient development of the power sector. The Act seeks to encourage competition with appropriate regulatory intervention. Competition is expected to yield efficiency gains and in turn result in availability of quality supply of electricity to consumers at competitive rates.

The Section 3 (1) of the Electricity Act 2003 requires the Central Government to formulate, inter alia, the National Electricity Policy in consultation with Central Electricity Authority (CEA) and State Governments. The provision is quoted below:

"The Central Government shall, from time to time, prepare the National Electricity Policy and tariff policy, in consultation with the State Governments and the Authority for development of the power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy".

Further, as per section 5.2.12 of the National Electricity Plan:

Even with full development of the feasible hydro potential in the country, coal would necessarily continue to remain the primary fuel for meeting future electricity demand. The National Electricity Plan also emphasizes the use of other fossil fuel like gas, LNG, Lignite, other imported fossil fuels in meeting the future electricity need.

It further emphasize on the Renovation and Modernization (R&M) of the low performing thermal power stations in the country. This will enable to achieve improved PLF of the thermal power plant.

The implementation of the National Electricity Plan is clearly evident from the installed capacity in the project boundary i.e. the NEWNE Grid:

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:

Investing in wind power is not a mandatory requirement in the region. Also, there are no legal and regulatory requirements that prevent alternatives (a) and (b) from occurring. As discussed in the Sub-step

1a), the laws respective to the power sector in India are mainly:

i) National Electricity Act, 2003
ii) National Electricity Policy, 2005
iii) Integrated Energy Policy, 2006

All the above mentioned policies do not restrict or compel any entity/organization for the selection of fuel for power generation. In addition, it is not mandatory for any project developers to invest in renewable energy projects in India.

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.

Step 2: Investment Analysis

Sub-step 2a: Determine appropriate analysis method

In accordance with the additionality tool version 06.0.0, sub-step 2(a), *"If the CDM project activity and the alternatives identified in Step 1 generate no financial or economic benefits other than CDM related income, then apply the simple cost analysis (Option I). Otherwise, use the investment comparison analysis (Option II) or the benchmark analysis (Option III)."*

Since the project activity earns revenues from sale of generated electricity, option I cannot be considered.

Further in accordance with paragraph 19 of the Guidance to Investment Analysis version 05, *"If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate"*

The baseline to the project activity is the electricity generated by grid connected power plants, represented by the combined margin emissions of the NEWNE grid. Therefore, the benchmark approach is appropriate.

The Project Proponent proposes to use **Option III – Benchmark Analysis** and the financial indicator is identified as *post-tax* equity IRR (Since the project activity involves 100% equity participation).

The guidance to investment analysis issued in EB62, Annex5 (paragraph12) 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.

Sub-step 2b: Apply benchmark analysis

The tool for demonstration and assessment of additionality [para-5,substep2(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.

As per para 15 of EB 61 Annex 13, "*if the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors*". The project proponent has chosen option a (values as provided in Appendix A of the guidance on assessment of investment analysis version 5). As per para 7 of the appendix A, "*in situations where an investment analysis is carried out in nominal terms, project participants can convert the real term values provided in the table below to nominal values by adding the inflation rate. The inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period*".

As the analysis has been carried out in nominal terms, the default value of expected return on equity (given in real terms in EB 61 Annex 13) has been adjusted with the inflation.

PP referred the book 'Corporate Finance, Theory and Practice (2nd Edition, 2009) by Aswath Damodaran. In Chapter 11 of the book titled 'Investment Analysis with Inflation and Exchange Rate Risk on page 320, the same equation is mentioned for converting real into nominal values.

According to the Reserve Bank of India
Nominal Benchmark = {(1+ Real Benchmark[6])*(1+Expected Inflation Rate[7]) – 1}
={(1+11.75%)*(1+5.4%) – 1}
=17.78%

Nominal Benchmark calculated on the above mentioned approach comes out to be 17.78%.

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:

Capacity of Machines in kW	800	Enercon offer dated 12/07/2011
Total Number of Machines	45	Enercon offer dated 12/07/2011
Location of Project	**Kutch**	Enercon offer dated 12/07/2011
Project Capacity in MW	36.00	Enercon offer dated 12/07/2011
Expected project commissioning date	31-March-12	Enercon offer dated 12/07/2011
Project Cost per MW (Rs. In Millions)	57.61	Calculated
Operations		
Plant Load Factor	24.50%	Third party PLF assessment report
Insurance Charges @ % of capital cost	0.12%	Third party quotation

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

[7]http://rbi.org.in/scripts/PublicationsView.aspx?id=13050

Operation & Maintenance Cost base year @ % of capital cost	1.30%	Enercon offer dated 12/07/2011
% of escalation per annum on O & M Charges	6.0%	Enercon offer dated 12/07/2011
Service Tax on O&M expenses	10.3%	Income Tax Act (Financial Year 2011-12); Service tax @10% adding a gross education cess of 3%
Tariff		
Tariff 2010-11 (Rs./kWh)	3.56	GERC order Dated 30.01.2010, Pg 26
Tariff for after 10 years(Rs./kWh)	3.56	GERC order Dated 30.01.2010, Pg 26
Project Cost	**INR Million**	
Land and Infrastructure, Generator & Electrical Equipments, Mechanical Equipments, Civil Works, Instrumentation & Control, Other Project Cost, Pre operative Expenses, etc.	53.06	Enercon offer dated 12/07/2011
Total Project Cost	**2073.90**	Enercon offer dated 12/07/2011
Salvage Value	**255.15**	As per CERC order dt. 03.12.2009 - Pg 27 http://www.cercind.gov.in/2010/November/Signed_Order_256-2010_RE_Tariff_FY_11-12.pdf
Depreciable Value	**2020.83**	Calculated
Means of Finance		
Own Source	100%	As per Board Resolution
Term Loan	0%	
Total Source	2073.90	
Book Depreciation Rate (Straight Line Method basis)		
On all assets	4.50%	As per Company Act
Book Depreciation up to (% of asset value)	90%	
Income Tax		
Income Tax rate	30.90%	http://indiabudget.nic.in/ub2011-12/fb/bill91.pdf Pg, 35, para 25 (I)

Alternate Minimum Tax (AMT)	19.05%	http://businessworldindia.com/bw/2011_04_02_Alternate_Minimum_Tax__A_New_Form_Of_MAT_For_LLPs.html
Life of the Plant	20	As per Manufacturer Information
Working capital		
Receivables (no of days)	30	Billing Cycle
O & m expenses (no of days)	90	Enercon offer dated 22/03/2011

Debt Equity Ratio: The project activity is on 100% equity investment.

Plant Load Factor: As per EB 48, annex 11, Plant load factor provided by independent third party source can be used for investment analysis. Plant load factor for the project activity is taken from True Wind International Certification. The plant load factors for the project site as determined by third party verifier are 24.5% at Kutch site.

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 9.29%.

Sub-step 2d: Sensitivity analysis (only applicable to Options II and III): Sensitivity Analysis
As per para 20 of Annex 13,EB 61-
"Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets. Where a DOE considers that a variable which constitute less than 20% has a material impact on the analysis they shall raise a corrective action request to include this variable in the sensitivity analysis."
Under consideration of the above criteria, the sensitivity parameters are as –
1. O&M Cost
2. PLF
3. Project Cost
4. Tariff
Above are the parameters that constitute more than 20% of either total project costs or total project revenues.

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

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

Capital Cost

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

Capital Cost	10% decrease over base case	Base case - INR 1234.22 Million	10% increase over base case
Post tax Equity IRR	10.67%	9.29%	8.10%

Tariff:. The projects developed under APPC tariff (Average Pooled Power Purchase Cost) structure are eligible for RECs (Renewable Energy Certificates). The project activity under consideration has been proposed under APPC tariff structure. As per paragraph 6 of Annex 3, EB 22, national and/or sectoral policies or regulations that give comparative advantages to less emissions intensive technologies over more emissions-intensive technologies can be termed as E - policies. The national policy on REC provides comparative advantage to less carbon intensive technologies and it came in existence after 11 November 2001. Therefore, REC is an E - policy.

As per paragraph 3 of Annex 32, EB 53, the assessment has to be conducted to gauge the impact of national and sectoral policies for suitability of tariff and to judge whether the policy/policies are E+ policies or E- policies. Considering the fact that REC is an E - policy, PP has not considered the REC impact during the investment analysis and has used tariff of 3.56 INR/kWh approved by GERC (Gujarat Electricity Regulatory Commission) as per the tariff order no. 1 2010 which would have otherwise been used for demonstrating additionality in the absence of the E- policy. Since, the tariff approved by GERC is fixed for 20 years, it is not appropriate to conduct sensitivity on tariff. However, PP has conducted the sensitivity analysis for tariff as given below:

Tariff	10% decrease over base tariff after 10 years	Base tariff after 10 years-INR. 3.50/KWh	10% Increase over base tariff after 10 years
Post tax Equity IRR	7.66%	9.29%	10.78%

Plant Load Factor: The PLF estimated by third party is 24.5%. We have conducted sensitivity at a variation of 10% over the base case.

PLF	10% decrease over base PLF	Base PLF	10% increase over base PLF
Post tax Equity IRR	7.66%	9.29%	10.78%

The sensitivity analysis clearly shows even with 10% 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.

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

O&M Cost	10% decrease in O&M cost	Base O&M Cost	10% increase in O&M cost
Post tax Equity IRR	9.54%	9.29%	9.01%

The result of the analysis done is as

Parameters	Breaching Value	
PLF	65.70%	Effective PLF shall go up by 65.7% which is equivalent to effective PLF value of 40.60% which is unlikely to happen as third party assessment report provides a maximum value of PLF as 24.5%. The PLF is not in control of PP and sensitivity has been conducted and results were found to be below benchmark value.
O&M	-453.00%	It is very unlikely that O&M cost shall reduce by 478.00% against the offer. The O&M contractor for the project shall be Supplier of WECs as per the offer and offer gives a maximum escalation of 6% per annum on O&M charges. Thus, it is very unlikely that these charges will come down than as given in supplier offer values.
Project Cost	-43.50%	PP has considered the project cost as the project cost mentioned in the supplier offer during the investment analysis. The project cost as per purchase order (PO)is INR 1912.5 Million as per purchase order which is 7.78% lower than project cost mentioned in supplier offer. The sensitivity on project cost is conducted at the variation of +/- 10% which is greater than the actual gap between the project cost provided in Offer and Purchase order. For threshold limit, the project cost shall go down by around 43.50% which is not relevant based on the purchase order. As, the PO has been released and financial commitments have been fixed, it is very unlikely that project cost will change in future.
Tariff Rate	65.70%	The tariff rate is determined by State Regulatory, which is fixed for lifetime of the WTG, but although PP has done sensitivity analysis on that too. It is impossible the tariff is raised by 65.70% which is equivalent to the tariff of INR 5.89 which is unlikely to happen in future also.

It's evident that the variation of +/- 10% of Sensitive parameters doesn't results into the crossing of benchmark. Although 3 parameters i.e project cost, O&M cost & Tariff shall remain fix throughout the life time, thus there is no any probability of them to breach the benchmark while only PLF can vary which is not in control of the investor.

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 financially/economically attractive.

Step 3: Barrier analysis:

Not Opted for.

Step 4: Common Practice Analysis
As per Demonstration and assessment of additionality, Version 6.0.0

Measure: As per paragraph 6 of Annex 21, EB 65, the project activity falls under the following measure:
"(b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies);"

For measures that are listed in paragraph 6:

Step 1: *Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.*

Project Capacity	Applicable Range (±50%)
36 MW	18- 54 MW

Step 2: *In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities and projects activities undergoing validation shall not be included in this step;*

The Host country, i.e., India has been considered as the applicable geographical area for this project as per the default option as mentioned in the Tool"Demonstration and assessment of additionality", Version 6.0.0. In this step all plants (N_{all}) that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Publically available data from Directory Indian Wind Power 2011has been taken and based on that data, there are 26 wind power projects which fall in the applicable range for this project activity.

Hence, $N_{all} = 26$

Step 3: *Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.*

Within plants identified in Step 2, $\mathbf{N_{diff}}$ has been identified as per the definition of **Different technology** as mentioned in Methodological tool "Demonstration and assessment of additionality", Version 6.0.0.
"Different technologies in the context of common practice are technologies that deliver the same output and differ by at least one of the following (as appropriate in the context of the measure applied in the proposed CDM project and applicable geographical area):

a) Energy source/fuel;
b) Feed stock;

c) Size of installation (power capacity):
1. *Micro (as defined in paragraph 24 of Decision 2/CMP.5 and paragraph 39 of Decision 3/CMP.6);*
2. *Small (as defined in paragraph 28 of Decision 1/CMP.2);*
3. *Large;*

d) Investment climate in the date of the investment decision, inter alia:
1. *Access of technology;*
2. *Subsidies or other financial flow;*
3. *Promotional policies;*
4. *Legal regulations;*

e) Other features, inter alia:
1. *Unit cost of output (unit costs are considered different if they differ by at least 20%);"*

Out of the 26 projects included in N_{all}, 23 projects are installed in different states of India other than Gujarat. Each state in India provides different investment climate for projects, in terms of tariff & legal regulations, as determined by respective State Electricity Regulatory Commission (SERC) from time to time.

Thus, 23 wind power projects within the applicable geographical area and within the applicable output range are part of N_{diff}.
The total no of projects in N_{diff} is = 23
Hence, N_{all}-N_{diff}= 3

Step 4: Step 4: Calculate factor F=1-N_{diff}/N_{all} representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

F = 1-N_{diff}/N_{all}
F = 1-(23/26)
F = 0.11

The proposed project activity is a common practice within a sector in the applicable geographical area if both the following conditions are fulfilled:
(a) the factor F is greater than 0.2, and
(b) N_{all}-N_{diff} is greater than 3.

Outcome of Step 4: The proposed project is not common practice as the factor F<0.2&N_{all}-N_{diff}= 3, thus satisfying the criteria mentioned in the methodological tool "Demonstration and assessment of additionality", Version 06.0.0.

Hence from the above additionality tool we can conclude that the Project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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According to the approved methodology ACM0002 (Version 12.3.0) Emission Reductions are calculated as:-

$ER_y = BE_y – PE_y-LE_y$ …….. (1)

Where:

ER_y = Emission reductions in year *y* (t CO2e/yr)
BE_y= Baseline Emissions in year *y* (t CO2e/yr)
PE_y= Project Emissions in year *y* (t CO2e/yr)
LE_y= Leakage Emissions in year *y* (t CO2e/yr)

Estimation of Baseline Emissions:
Baseline emissions include only CO2 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:
BEy = 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)

Calculation of $EF_{grid,CM,y}$

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. As per "Tool to calculate Emission Factor for electricity system" Version 02.2.1, the steps of calculation are as follows:

STEP 1: Identifying the relevant electricity systems:

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

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 NEWNE 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):
Project participants have the option of choosing between the following two options to calculate the operating margin and build margin emission factor:
Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

Option I is chosen 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:

	2006-07	**2007-08**	**2008-09**	**2009-10**	**2010-11**
NEWNE	18.5%	19.0%	17.4%	15.9%	17.6%
South	28.3%	27.1%	22.8%	20.6%	21.0%
India	20.9%	21.0%	18.7%	17.1%	18.4%

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 simple operating margin method can 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_2Baseline 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:

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

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 (tCO_2/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:

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

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)
EGm,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

Simple Operating Margin (tCO_2/MWh) (incl. Imports)

Year	tCO_2/MWh (NEWNE)
2008-2009	1.0065
2009-2010	0.9777
2010-2011	0.9706

Simple Operating Margin = Generation Weighted average of the simple operating margin
= 0.9841(tCO_2/MWh)

STEP 5: Calculate the build margin:

According to the "Tool to calculate the emission factor for an electricity system",(Version 02.2.1), EB63,Annex 19. 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 the20% 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.

In terms of vintage of data, between one of the following two options shall be chosen:

Option 1: For the first crediting period, calculate the build margin emission factor *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. For the second crediting period, the build margin emission factor

should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, *ex post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex-ante*, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$\mathbf{EF_{grid,BM,y}} = \frac{\sum_m EG_{m,y} x EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad \textbf{……..(c)}$$

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.

Option 1 as described above is chosen in the project activity.

Year	**2010-11**
Build Margin CO_2Emission Factor (tCO_2e / MWh)	0.8587

STEP 6: Calculate the combined margin emissions factor:

As per Tool to calculate the emission factor for an electricity system, version 2.2.1
The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:
(a) Weighted average CM; or
(b) Simplified CM.
The weighted average CM method (option A) should be used as the preferred option.

Combined Margin – The combined margin is the weighted average of the simple operating Margin and the build margin. In particular, for intermittent and non-dispatchable generation types such as wind and solar photovoltaic, the Tool to calculate the emission factor for an electricity system, version 2.2.1, allows to weigh the operating margin and Build margin at 75% and 25%, respectively**.**

The baseline emission factor $EF_{CO_2,\ grid,y}$ is calculated as the weighted average of the Operating Margin emission factor (EF_{OM}) and the Build Margin emission factor (EF_{BM}).

$EF_{CO_2,\ grid,y} = wOM * EF_{grid,OM,y} + wBM * EF_{grid,BM,y}$…… (d)

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO2 emission factor in year y (tCO2/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, Version 12.3.0, 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 0.9527(tCO_2 / MWh).

Details of Baseline data:

Data of operating for the three financial years from 2008-09, 2009-10 and 2010-11 and Build Margin for 2010-11 has been obtained from -

The CO_2 Baseline Database for the Indian Power Sector Ministry of Power: Central Electricity Authority (CEA) Version 07
Key baseline information is reproduced in Annex 3.

Estimation of Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 12.3.0, there will be no project emissions in the project activity

PEy = 0 …… (4)

Estimation of Leakage Emissions

As per ACM0002 Version 12.3.0, no leakage has been considered for the calculation of emission factor

LEy = 0 …….. (5)

The details on OM, BM and CM estimates as provided by the CEA are shown in Annex3.

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

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO2e/MWh
Description:	Operating Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data used:	"CO2 Baseline Database for Indian Power Sector", version7 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO2 Baseline Database for Indian Power Sector" is available at http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver7.pdf
Value applied:	0.9841
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, Version 12.3.0.
Any comment:	The value is calculated one x-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO2e/MWh
Description:	Build Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data used:	"CO2 Baseline Database for Indian Power Sector" version 7 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO2 Baseline Database for Indian Power Sector" is available at http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver7.pdf
Value applied:	0.8587
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, Version 12.3.0.
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:	tCO2e/MWh
Description:	Combined Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data used:	The "CO2 BaselineDatabaseforIndianPowerSector"version7published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO2 Baseline Database for Indian Power Sector" is available athttp://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver7.pdf

Value applied:	In case of wind power projects default weights of 0.75for $EF_{grid,OM}$ and 0.25 for $EF_{grid,BM}$ are applicable as per ACM0002, Version 12.3.0. **Combined Margin Emission Factor (EF_y or $EF_{CM,y}$) = 0.9527** 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, Version 12.3.0, 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 are calculated as follows:
$ER_y = BE_y – PE_y – LE_y$

Where:

ER_y = Emission reductions in year y (t CO2e/yr)
BE_y = Baseline emissions in year y (t CO2/yr)
PE_y = Project emissions in year y (t CO2e/yr)
LE_y = Leakage emissions in year y (t CO2e/yr)

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)
= 0.9527 tCO2e/MWh

Annual electricity supplied to the grid by the Project ($EG_{PJ,y}$) is calculated as:
= [36 MW (Capacity) x 24.5% (PLF) x 8,760 (hours)]MWh

= 77,263MWh

Annual Baseline Emissions Reduction: $ER_y = EF_y * EG_{PJ,y}$
= 0.9527tCO2e/MWh x 77263 MWh
= 73,608tCO2e

Whereas,

PE_y = 0 tCO2e
LE_y = 0 tCO2e

Therefore,
$ER_y = BE_y – PE_y - LE_y$
= 73,608– 0 – 0
= 73,608tCO2e/yr

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

>>

Year	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage (tCO_2e)	Emission reduction (tCO_2e)
Year 1	73,608	0	0	73,608
Year 2	73,608	0	0	73,608
Year 3	73,608	0	0	73,608
Year 4	73,608	0	0	73,608
Year 5	73,608	0	0	73,608
Year 6	73,608	0	0	73,608
Year 7	73,608	0	0	73,608
Year 8	73,608	0	0	73,608
Year 9	73,608	0	0	73,608
Year 10	73,608	0	0	73,608
Total (tonnes of CO_2e)	**736,080**	**0**	**0**	**736,080**
Total number of crediting years	**10**			
Annual average over the crediting period	**73,608**	**0**	**0**	**73,608**

*1st yearbeginsfromthe application date for 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:	**$EG_{PG,y}(EG_{facility,y})$**
Data unit:	MWh (Mega-watt hour)
Description:	Quantity of net electricity supplied to the grid in year *y*
Source of data to be used:	Sharing certificate issued by GETCO/GEDA.
Value of data	77,263MWh
Description of measurement methods and procedures to be applied:	Continuous monitoring and monthly recordings take place. The net electricity supplied by the project activity is taken directly from the share certificate issued by GETCO on monthly basis and will be directly used to estimate the emission reduction. This can be further cross-checked with the invoice receipt.

	Measurement procedure: The WECs of a single customer (VWIL, in this case) are divided into clusters and each cluster has dedicated metering system. Different clusters are connected to different Vacuum Circuit Breaker (VCB) metering yards, which ultimately lead to the shared main GETCO meter (also known as revenue meter) at the substation at Lalpur (Dharampur), maintained by Enercon (India) Limited (EIL). Data monitoring takes place at the cluster metering points and GETCO main meter at the EIL substation. The net electricity supplied to the grid by the wind farm is calculated by GEDA on the basis of GETCO main meter reading (with accuracy class 0.2s) and the meter readings taken at individual cluster meters after adjusting transmission loss. For adjustment of transmission loss, the electricity metered at the GETCO meter is proportionally divided among the customers connected to the same revenue meter on the basis of the pro-rata readings taken at the cluster meters metering point. This is done by GEDA. The meter reading at GETCO main meter at EIL substation is taken jointly by the representatives of Enercon and GEDA/GETCO in the form of Joint Meter Reading (JMR). The net electricity generated by the project activity is taken directly from the share certificate issued by GETCO on monthly basis.Net electricity supplied to the grid can be cross checked from the invoices raised by the PP. Further details on the apportionment have been explained in the section B.7.2.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by GUVNL pursuant to the provisions of the power purchase agreement and there will be no additional QA/QC procedures. Calibration of energy meters take place once annually.
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:

>>

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

Since, the ex-ante approach has been followed for the project activity, monitoring of the emission factor value is not required. The sole parameter to be monitored is the amount of net electricity supplied by the project activity to the grid.

Measurement procedures of the net electricity supplied to the grid by the project activity

The project activity will have various clusters and each cluster has exclusive dedicated metering arrangement. These cluster meters will be sealed by GEDA. The meter readings taken at these cluster metering points will be provided by the representatives of Enercon to GEDA.

All these cluster meters are connected to the GETCO Main meter (also known as revenue meter) at the substation, maintained by Enercon. The main meter reading (GETCO meter) is taken jointly by the representatives of Enercon and GEDA/GETCO in the form of JMR.

Gujarat Electricity Development Authority (GEDA) then apportions the net electricity supplied to the grid at the Enercon substation by all the project owners after adjusting transmission loss to the meter readings taken at dedicated cluster meters of different project owners. The electricity from Enercon substation is finally supplied to the utility's substation.

The net electricity generated by the project owner will be taken directly from the share certificate as provided by GETCO/GEDA (after apportionment) to the project proponent and will be used for calculation of emission reduction.

QA/ QC procedures

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 substation after addition of average historical transmission losses.

If during meter testing, the cluster meters are 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 of the 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 apportionment for the project activity will be done as follows

The allocation plan for the project activity is given below:-

$EG_{GETCO, Export}$= Electricity exported, as recorded by the main meter at Enercon substation
$EG_{GETCO, Import}$= Electricity imported, as recorded by the main meter at Enercon substation
$EG_{VCB, Export}$= Electricity exported by the project activity, as measured at VCB metering yard
$EG_{VCB, Import}$ = Electricity imported by the project activity, as measured at VCB metering yard
$EG_{VCB, WF, Export}$= Electricity exported by all the project owners connected to Enercon substation, as measured at VCB metering yard
$EG_{VCB, WF, Import}$ = Electricity imported by all the project owners connected to Enercon substation, as measured at VCB metering yard
$EG_{PJ,export,y}$= Electricity exported by the project activity to the grid, calculated
$EG_{PJ,import,y}$= Electricity imported from the project activity to the grid, calculated
$EG_{BL,y}$= Net Electricity exported by the project activity to the grid, calculated

Electricity Exported to the Grid by the project activity

$$EG_{BL,export,y} = EG_{GETCO, Export} \text{ X } EG_{VCB, Export}/EG_{VCB, WF, Export}$$

Electricity Imported from the Grid by the project activity

$EG_{BL,Import,y} = EG_{GETCO, Import} X EG_{VCB, Import}/EG_{VCB, WF, Import}$

Net Electricity Exported to the grid by the project activity

$EG_{BL,y} = EG_{BL,export,y} - EG_{BL,Import,y}$

The apportioning procedure for the project activity is done by GEDA (Gujarat Energy Development Agency) based on the meter readings of the various cluster meters of various project owners connected to Enercon substation and GETCO main meter reading recorded at Enercon substation, connecting all the machines of the project activity and other project developers. The meter readings at cluster meters and at Enercon substation are directly monitored and hence, the apportioning of the electricity is done based on the meter reading that are directly measured.

In case the billing date does not match with the date of registration of the CDM project activity, the apportioning of net electricity exported to the grid for the specific number of days will be calculated from LCS (panel meter) meter readings and the cluster meter reading for the WTGs as described below.

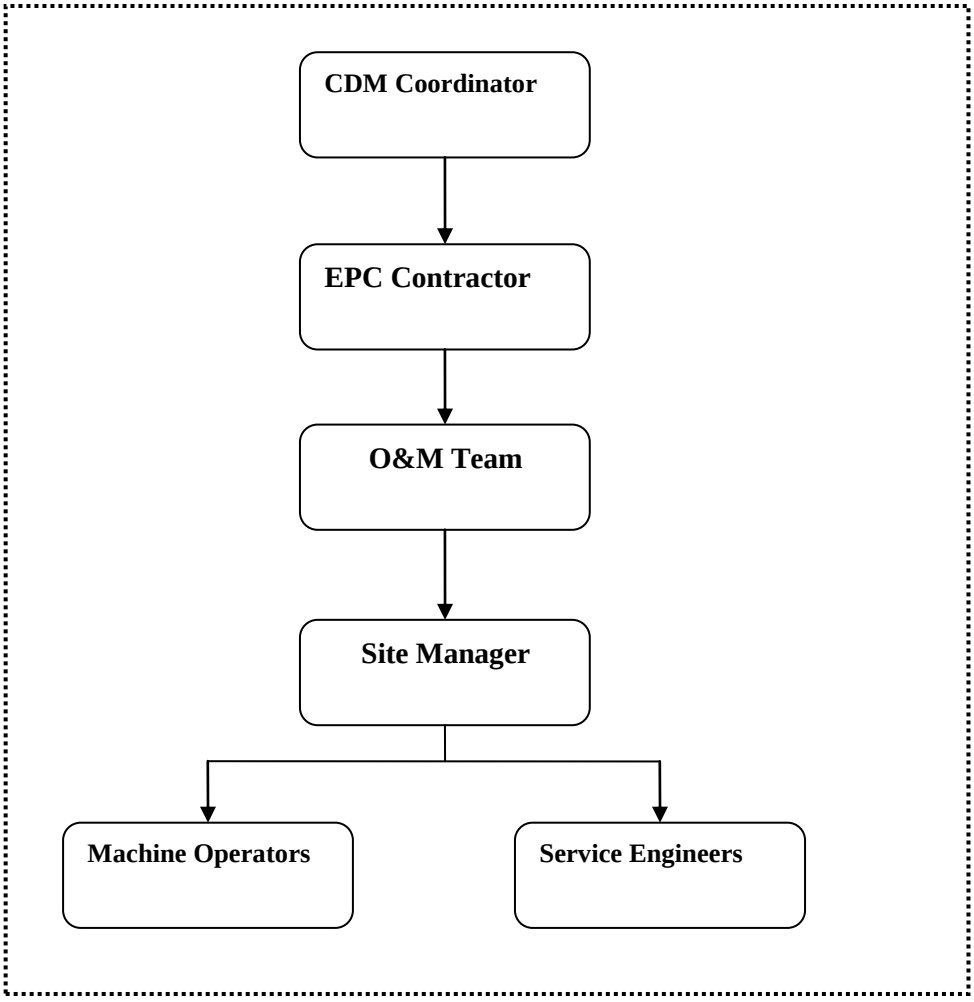
$EG_{BL,y,partmonth} = EG_{BL,y} X LCS_{reading,partmonth} / LCS_{reading,partmonth}$

$LCS_{reading,partmonth}$ is meter reading of LCS meters of WTGs of the project activity for the entire month

$LCS_{reading,partmonth}$ is meter reading of LCS meters of WTGs of the project activity from date of registration till end of that month

Enercon (India) Limited (EIL) is the O & M contractor for the project activity and will be responsible for maintaining all the monitoring data on behalf of VWIL for the project activity.

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



Enercon is an ISO 9001:2008certified 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 starting from the identification of the site, wind resource assessment, logistics, finance, construction, commissioning and operation of the wind power project. The accuracy of the monitoring parameter is ensured by adhering to the calibration and testing of the metering equipment as mentioned above.

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.

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):

>>

Dateofcompletion:20/01/2012

Name of responsible person/entity: Vish Wind Infrastructures LLP (Project Participant).The details are given in Annex 1 of this document.

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:

>>

01/08/2011, being the date of placement of purchase order for the wind energy generators.

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

>>

20yearsand0months

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

C.2.1. Renewable crediting period:

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

>>Not Applicable

C.2.1.2. Length of the first crediting period:

>>

Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

01/10/2012

C.2.2.2. Length:

>>

10 years and 00 months

SECTION D. Environmental impacts

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

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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[8] 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. Further MoEF published two other amended notification dated, 11th Oct 2007[9]& 01st December 2009[10] and these amendment doesn't provide any change in regulatory requirement for Wind power project related to EIA.

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 stakeholder meeting has been scheduled in the month of February on date 17th February, 2012 at Rasaliya Village of Bhuj District.
The invitation was sent via local newspaper "Kutch Uday" in the local language on 1st February, 2012
The Chairman of the meeting was Mr. Rajash Shankar Bhado & villagers from near villages.
The welcome speech was given by Mr .Bhupendra Verma, representative of the Enercon (India) Ltd, he told villagers about the project &its significance; he also told villagers about the CDM benefits & answered the queries raised by the villagers.
The representative of the company Mr. Suraj Joshi thanked the village participants and other stakeholders who have spent their valuable time and shown interest in stakeholder meet of this project. He also requested cooperation from all the stakeholders for successful execution and operation of wind mills so that all can contribute to overall sustainable development of the region.

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

[9] http://www.fedmin.com/html/not-11-10-07.pdf

[10] http://mnre.gov.in/notification/env-notifn.pdf

E.2. Summary of the comments received:

>>

The stakeholder meeting was scheduled in the month of February on date 17th February, 2012.
No comment was received from the local stakeholders prior to the meeting. The consultation meeting had representatives from the nearby villages and representatives of VWIL and Enercon (EPC and O&M contractor). Following stakeholders are identified for the project activity:

- Representatives of local community
- Village Panchayat head
- Employees from wind farm developer (Enercon)

The agenda of meeting was as follows:

1. Welcome address and introduction
2. Project profile
3. CDM, social issues and environmental issues
4. Suggestions and opinions
5. Queries by stakeholders and response by the respective authority
6. Vote of thanks

7. Lunch

The following queries were raised by the stakeholders:

1. Is there any effect on the cattle grazing near by the project after 4 to 5 years down the line from the commencement of project?
2. Will the machines installed create sound and disturb the surrounding?
3. Can the local people get works relating to project?

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:

Sl.No.	Villager Name	Question	Reply
1.	Dhiraj Joshi	Is there any effect on the cattle grazing near by the project after 4 to5 years down the line from the commencement of project?	There is no relation between the project activity and cattle grazing. Cattle can continue to graze near the WTG sites in the coming years as well.
2.	Oshman	Will the machines installed create sound and disturb the surrounding?	Many companies have installed wind projects in several villages and no such problem has been faced. The sound from the machines is negligible and carries no significant effect or has a major concern.
3.	Ajit Sing Daka	Can the local people will get works relating to project.	Yes, there will be opportunities for the people living in the nearby areas of project by a proper selection process.

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

>>

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

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Vish Wind Infrastructure LLP
Street/P.O.Box:	A-9, Veera Desai Road
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E-Mail:	yogesh.mehra@enerconindia.net
URL:	
Represented by:	
Title:	Director
Salutation:	Mr
Last name:	Mehra
Middle name:	
First name:	Yogesh
Department:	
Mobile:	+91-9820040301
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Direct tel:	+91-22-22-67022832extn.7111
Personal e-mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I Parties for the proposed project activity.

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 (tCO2e/MWh)
Simple Operating Margin - 2008-09	1.0065
Simple Operating Margin - 2009-10	0.9777
Simple Operating Margin - 2010-11	0.9706
Average Operating Margin of last three years (t CO_2e/MWh)	**0.9841**

Build Margin

	NEWNE Grid (tCO2e/GWh)
Build Margin- 2010-11	**0.8587**

Combined Margin Calculations

	Weights	**NEWNE Grid (tCO2e/MWh)**
Operating Margin	0.75	0.9841
Build Margin	0.25	0.8587
Combined Margin		**0.9527**

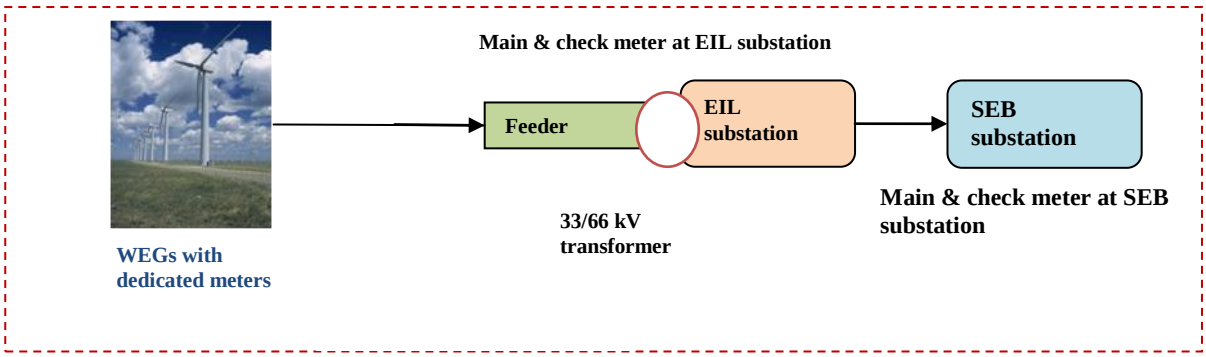
Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at www.cea.nic.in under CO_2 baseline database, version 07.

Annex 4

MONITORING INFORMATION

Metering

1. The electricity supplied to the grid will be metered at the substation of the utility. Representatives of Gujarat UrjaVikas Nigam Limited (GUVNL) and Enercon will jointly take the main reading and sign the meter reading on the first day of every month. Simultaneously, the joint meter reading at backup metering system will also be taken by representatives of GUVNL and Enercon.
2. The allocation of the electricity supplied noted at utility substation is done based on LCS meter readings retrieved by the central monitoring system.
3. 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 Gujarat State Electricity Board. 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

1. The meters are two-way meter and measure the electricity import and export and give the net electricity. 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.
2. 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.
3. 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.
4. The main meter readings are apportioned based upon the LCS meter readings of individual WECs to compute net electricity supplied from individual WECs. The LCS meter readings are archived electronically on continuous basis. Joint meter reading at the EB substation and at the pooling

substation of Enercon 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.

5. 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 and correct the error.

Detailed metering information has been provided in the section B.7.2**.**

Testing

1. Main meter (accuracy class 0.2s) at Enercon Substation will be tested and calibrated once in a year.
2. The main meter at utility substation will also be calibrated once in each year by utility.
3. All cluster meters connected to the Enercon substation will be calibrated once in three years as per the provisions fixed with utility.

Data recording

1. The meter recording at the main meter at Enercon substation and the cluster meters of the project activity will be continuously monitored and will be recorded on monthly basis.
2. The panel meter (LCS meter) reading is recorded continuously by the online monitoring system.
3. 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.

Appendix A

Sl. No.	Loc. No.	Latitude			Longitude		
		Deg.	Min.	Sec.	Deg.	Min.	Sec.
1	52	23	26	7.6	69	8	28.4
2	53	23	26	16.4	69	8	25.8
3	54	23	26	22.3	69	8	19.6
4	55	23	26	9.7	69	8	14.2
5	82	23	27	19.8	69	6	55.7
6	86	23	27	38.8	69	6	25.6
7	97	23	29	2.3	69	7	5.8
8	98	23	28	55.7	69	6	48.5
9	99	23	28	59.0	69	6	29.7
10	103	23	28	50.9	69	6	21.7
11	104	23	28	39.6	69	6	23.9
12	106	23	28	32.7	69	6	13.9
13	107	23	28	26.7	69	6	22.0
14	111	23	28	4.4	69	5	0.4
15	125	23	28	43.7	69	4	9.2
16	126	23	28	36.5	69	4	14.6
17	127	23	28	15.6	69	3	30.3
18	128	23	28	6.7	69	3	36.9
19	129	23	28	1.5	69	3	43.5
20	130	23	28	13.4	69	3	55.5
21	131	23	28	5.4	69	3	59.4
22	132	23	27	53.5	69	3	47.8
23	133	23	27	44.0	69	3	53.7
24	134	23	27	36.6	69	4	10.2
25	135	23	27	17.8	69	4	43.2
26	136	23	26	32.3	69	4	35.9
27	143	23	25	38.0	69	4	58.8
28	157	23	24	26.4	69	5	29.4
29	160	23	24	1.7	69	5	12.9
30	161	23	23	55.3	69	5	18.4
31	162	23	23	48.3	69	5	25.3
32	163	23	23	28.5	69	4	56.7
33	164	23	23	19.3	69	5	0.0
34	172	23	22	6.0	69	6	15.7
35	173	23	21	57.0	69	6	17.6
36	208	23	24	1.2	69	3	48.7
37	209	23	24	5.0	69	3	7.4
38	215	23	24	53.2	69	2	16.6
39	220	23	24	23.4	69	1	47.1

40	243	23	26	41.1	69	0	47.5
41	244	23	26	42.3	69	0	33.2
42	264	23	26	1.1	69	3	13.0
43	268	23	26	26.8	69	2	47.6
44	269	23	26	33.7	69	2	42.8
45	273	23	26	33.8	69	2	59.0

- - - - -