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:

Title: Wind power project in Jamnagar District, Gujarat, India
Version: 3.0
Date: 15/10/2012

A.2. Description of the project activity:

Torrent Power Limited is developing a 49.6 MW wind farm in the state of Gujarat in India. The project activity involves the installation of 62 Enercon E-53 wind turbines of 800 kW each.

(1) Purpose of the project activity

The purpose of the project activity is to utilize wind energy for generation of electricity. The project activity will reduce anthropogenic emissions of greenhouse gases (GHG's) in the atmosphere by displacing electricity delivered to the NEWNE grid that would have otherwise been generated by the operation of grid-connected power plants (mainly fossil-fuel based) and by the addition of new generation sources in the grid.

(a) Scenario existing prior to the start of the implementation of the Project activity:

The electricity delivered to the NEWNE grid would have otherwise been generated by the operation of grid-connected power plants (mainly fossil-fuel based) and by the addition of new generation sources in the grid.

(b) Project scenario, including a summary of the scope of activities/measures that are being implemented:

The project activity involves installation of a 49.6 MW wind power project in the state of Gujarat in India. It involves development, supply, erection, commissioning and operation of Enercon E-53 wind turbines of 800 kW each. The project activity will generate approximately 89,506 MWh of electricity per annum which will be exported to the NEWNE grid of India. Some of the advanced features of the E-53 turbine are

- Gearless Design resulting in reduced mechanical stress, increased technical service life of the equipment and lower downtime and associated maintenance costs.
- Synchronous generator drawing much lower quantity of reactive power.
- High-efficiency blade with root spoilers and winglet tips enabling more energy to be extracted from the same swept area.

The detailed description of the technology employed by the project activity is given under section A.4.3.

The WTGs of the project are divided into clusters and each cluster has dedicated metering system (Cluster Meter). Different clusters ultimately lead to the shared Gujarat Energy Transmission Corporation Limited (GETCO) main meter at the Tebhada substation (Main Meter). Electricity monitoring takes place at the Cluster Meters and Main Meter. The other project owners WTGs are also connected to Tebhada substation. The net electricity generation supplied from the project activity to the NEWNE grid will be calculated by apportioning generation recorded at Main Meter in the ratio of generation recorded at Cluster Meters as described in section B.7.2.

(c) Baseline scenario:

According to the applicable methodology 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 following:

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

For the project activity the baseline scenario and the scenario existing prior to the start of the implementation of the project activity are the same.

(2) How the project activity reduces greenhouse gas emissions

As per the baseline scenario for the project activity as described in section B.4, in absence of the project activity equivalent amount of electricity would have been generated by the connected/new power plants in the NEWNE grid, which are predominantly based on fossil-fuels, a more GHG intensive source. Whereas the electricity generation from the project activity (i.e. Wind Turbine Generators (WTGs)) is emission free. The project activity will reduce anthropogenic emissions of greenhouse gases (GHGs) in the atmosphere by displacing electricity delivered to the NEWNE grid that would have otherwise been generated by the operation of grid-connected power plants (mainly fossil-fuel based) and by the addition of new generation sources in the grid.

(3) Contribution to Sustainable Development

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 host country approval eligibility criteria for Clean Development Mechanism (CDM) projects[1]. The contribution of this project activity towards sustainable development is explained below:

[1] Approval Process, NCDMA, MoEF, Govt of India, http://www.cdmindia.in/approval_process.php

Social well being

- **Employment generation:** The proposed project activity leads to alleviation of poverty in the region through direct and indirect employment in India. At the local level, the project activity will lead to the creation of skilled and unskilled jobs throughout the construction and ongoing operation and maintenance of the project. At the national level, employment in turbine and balance of plant component manufacturing will be promoted.
- **Development of infrastructure:** The project activity will lead to the development of supporting infrastructure such as roads, evacuation network, telecommunication network etc. in the wind farm location which will also improve living conditions of local people.

Economic well being

- **Opportunities for industries:** The generated electricity will be fed into the NEWNE grid thereby improving the grid frequency and availability of electricity and will provide new opportunities for industries and economic activities to be setup in the region resulting in greater local employment and overall development of the region.
- **Less dependence on imported fossil-fuels:** Use of a renewable source of energy reduces the nation's dependence on imported fossil-fuels. Hence, the project activity will minimize the fiscal load on the national economy from these imports.

Environmental well being

- **Reduction in emission of GHG:** The project activity involves use of renewable energ**y** source for electricity generation instead of fossil-fuel based electricity generation which would have emitted GHGs, liquid and/or solid effluents/wastes. Hence, the project activity will reduce the pollution and have positive impact on human health.
- **Conservation of natural resources:** Installation of wind power plant will result in conserving fast depleting natural resources such as coal, oil etc.

Technological well being

- **Technology with advanced features:** The project activity is utilizing gearless synchronous generator based E-53 Enercon make WTGs for generation, which are designed for conditions specific to India. Further the project has many advanced features which are described in detail in section A.4.3.
- 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 CDM project for sustainable development including society/community development in the host country. Please refer to Appendix 1 for the details of the same.

A.3. Project participants:

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

Torrent Power Limited shall be the lead and nodal entity for all communication with CDM – Executive Board and Secretariat. The contact information has been provided in Annex 1. This project activity has been developed as a CDM project and may have other entities from Annex I countries to join as project participants at a later stage. The list of such participants shall be provided as and when identified.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

India

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

State of Gujarat

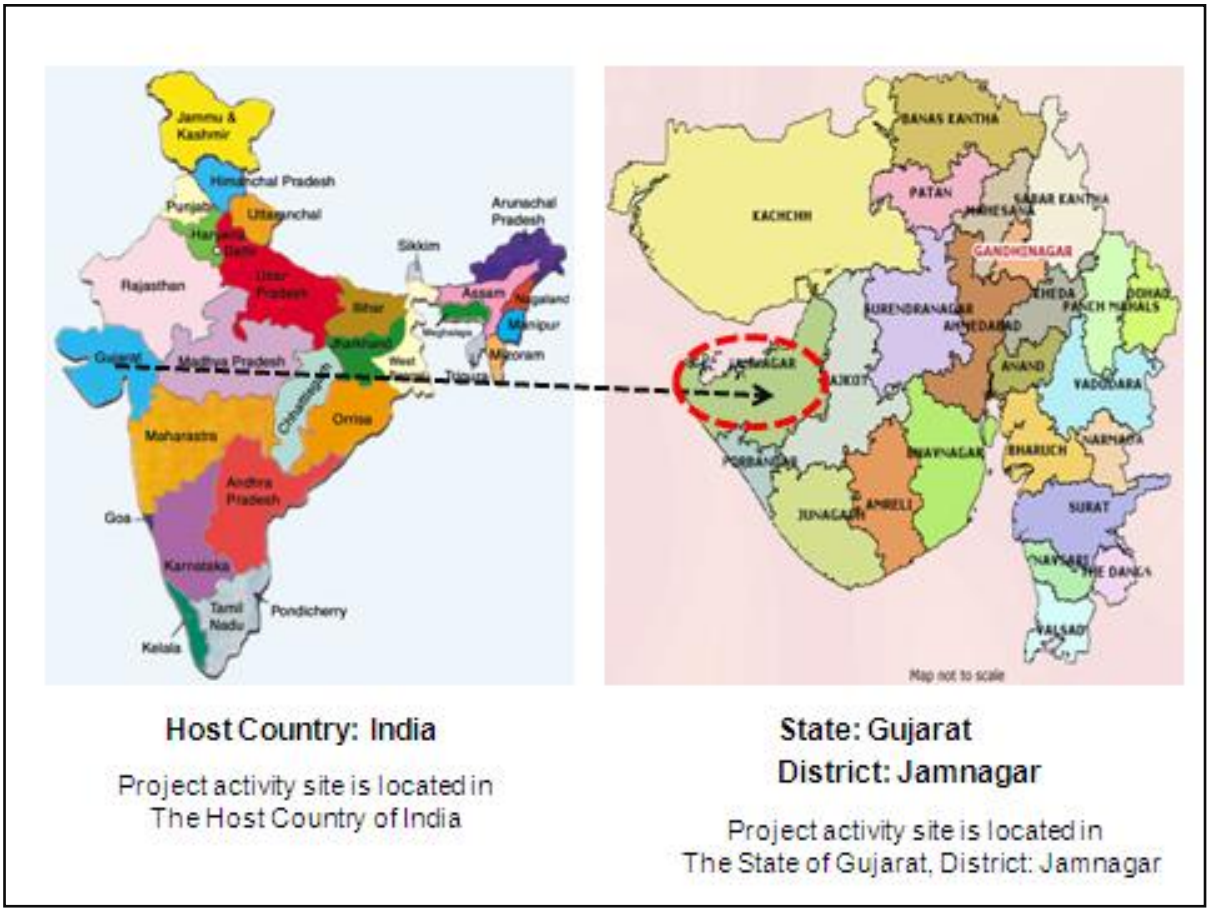
A.4.1.3. City/Town/Community etc.:

The project is located in Jamnagar district and spread across the following geographies:

Sr. No	Taluka	Villages
1.	Bhanvad	Bhangol, Jampur, Morzar, Chokhanda, Shedhakhai, Kabarka
2.	Lalpur	Dharmpur, Kathitad, Tebhda, Govana
3.	Jamjodhpur	Ghunda

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

Project activity site map



The Project is bounded by the following co-ordinates:

Latitude (^{o}N)	**Longitude (^{o}E)**
22^o 15’ 4” N	69^o 45’ 21” E
22^o 14’58” N	70 ^{o} 3’ 20” E
22^o 1’ 00” N	70 ^{o} 3’ 13” E
22^o 1’ 00” N	69 ^{o} 45’ 16” E

The exact geographical co-ordinates for each location are provided in Appendix 3.

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

Scope Number 1, Sectoral Scope - Energy industries (renewable/ non-renewable sources).

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

Purpose of the project activity:

The purpose of the project activity is to utilize wind energy for generation of electricity. The project activity will reduce anthropogenic emissions of greenhouse gases (GHG's) in the atmosphere by displacing electricity delivered to the NEWNE grid that would have otherwise been generated by the operation of grid-connected power plants (mainly fossil-fuel based) and by the addition of new generation sources in the grid.

(a) Scenario existing prior to the start of the implementation of the Project activity:

In the pre-project scenario, there was no activity based on wind energy power generation by the project proponent and an equivalent amount of power generated by the project activity was generated in the NEWNE grid with power projects pre-dominantly based on fossil-fuel which resulted in high levels of GHG emissions.

(b) The scope of activities or measures that are being implemented in the project activity:

The project activity involves installation of a 49.6 MW wind power project in the state of Gujarat in India. It involves development, supply, erection, commissioning and operation of Enercon E-53 wind turbines of 800 kW each. The WTGs generates 3-phase power at 400V, which is stepped up to 33 kV at WTG transformer and further stepped up to 220kV at wind farm substation. The design life of the WTG is 20 years.

The technical specification related to the project is furnished below:

Sr. No	Description	Technical specification
1	Turbine Model	Enercon E-53
2	Rated Power	800 KW
3	Rotor diameter	52.9 m
4	Hub height	75 m
5	Tower	74 m (Concrete)
6	Turbine Type	Direct driven, horizontal axis wind turbine with variable rotor speed.
7	Power regulation	Independent pitch system for each blade
8	Cut-in wind speed	2.5 m/s
9	Rated wind speed	12 m/s
10	Cut-out Wind speed	28 – 34 m/s
11	Extreme Wind speed	59.5 m/s
12	Rated rotational speed	29 rpm

13	Operating range rot. Speed	12 – 29 rpm
14	Orientation	Upwind
15	No. of Blades	3
16	Blade Material	Fibre Glass Epoxy reinforced
17	Gearbox type	Gearless
19	Braking	Aerodynamic
20	Output Voltage	400 V
21	Yaw System	Active yawing with 4 electric yaw drives with brake motor.
22	Power Factor	Near unity power factor at all times
23	Reactive Power Drawl	Minimum drawl (less than 1% of kWh generated) of reactive power from the grid.

Some of the advanced features of the E-53 turbine are:

Gearless Design. The gearless mechanism has fewer rotating components resulting in reduced mechanical stress, increased technical service life of the equipment and lower downtime and associated maintenance costs. Additionally, the synchronous generator employed in the E-53, draws a much lower quantity of reactive power as compared to the induction generator used in conventional wind turbines.

Blade Technology. The blade design features a high-efficiency blade with root spoilers and winglet tips. Such a design enables more energy to be extracted from the same swept area when compared with a conventional blade design and reduces noise from the blade tips.

Further, the WTGs are designed to suit Indian wind conditions.

The WTGs of the project are divided into clusters and each cluster has dedicated metering system (Cluster Meter). Different clusters ultimately lead to the shared GETCO main meter at the Tebhada substation (Main Meter). Electricity monitoring takes place at the Cluster Meters and Main Meter. The other project owners WTGs are also connected to Tebhada substation. The net electricity generation supplied from the project activity to the NEWNE grid will be calculated by apportioning generation recorded at Main Meter in the ratio of generation recorded at Cluster Meters as described in section B.7.2. The monitoring equipments, their locations are described in detail in section B.3, section B.7.1, section B.7.2 and Annex 4.

The technology used in the project activity is environmentally safe and sound and there is no technology transfer to the host party involved.

The project activity involves power generation from wind energy, hence there are no GHG emissions involved with the generation of electricity in the project activity.

(c) Baseline scenario:

According to the applicable methodology 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 following:

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

Thus, in the absence of the project activity, the equivalent amount of electricity delivered to the NEWNE grid would have been generated by the operation of grid-connected power plants (mainly fossil-fuel based) and by the addition of new generation sources in the grid. The baseline scenario is described in detail in section B.4.

For the project activity under consideration the baseline scenario and the scenario existing prior to the start of the implementation of the project activity are same.

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

The estimated emission reductions over the 7 year renewable crediting period would be 596,967 tCO_2 as per details on annual emission reductions provided below:

Years	Annual estimation of emission reductions in tonnes of CO_2e
*Year 1	85,281
Year 2	85,281
Year 3	85,281
Year 4	85,281
Year 5	85,281
Year 6	85,281
Year 7	85,281
Total estimated reductions (tonnes of CO_2 e)	**596,967**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	**85,281**

* 1st Year begins from 05/11/2012 or the date of registration of project activity whichever is later.

A.4.5. Public funding of the project activity:

No public funding or Official Development Assistance (ODA) used for the project activity.

SECTION B. Application of a baseline and monitoring methodology

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

Title: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"
Reference: Approved consolidated baseline methodology ACM0002 (Version 12.3.0, 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
- Tool for the demonstration and assessment of additionality – Version 06.0.0

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

The project activity is an emission free wind energy based power generation source. The project activity will reduce anthropogenic emissions of greenhouse gases (GHGs) in the atmosphere by displacing electricity delivered to the NEWNE grid that would have otherwise been generated by the operation of grid-connected power plants (mainly fossil-fuel based) and by the addition of new generation sources in the grid.

The choice of the approved consolidated baseline and monitoring methodology ACM0002, version 12.3.0 for application to this project activity has been justified below:

Sr No.	Applicability Conditions as per ACM0002	Applicability to this 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	The project activity is installation of a new grid connected wind energy based power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant).

	(d) involve a replacement of (an) existing plant(s).	
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, • Tidal power plant/unit.	The project activity is the new installation of grid connected wind power plant (Greenfield plant).
3	In the case of capacity additions, retrofits or replacements: the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	This condition is not relevant for the project activity under consideration, as the project activity does not involve capacity addition, retrofits or replacements.
4	In case of hydro power plants: • The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs. • The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 $W/m^{2.}$ • The project activity results in new	This condition is not relevant, as the project activity under consideration is not the installation of a hydro power plant.

	single or multiple reservoirs and the power density of each reservoir, as per definitions given in the project emissions section, is greater than 4 W/m^2. In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 all the following conditions must apply: • The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2; • Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project1 that collectively constitute the generation capacity of the combined power plant; • Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m^2, is lower than 15MW; • Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	
5	The methodology is not applicable to the following: • Project activities that involve switching from fossil-fuels to renewable energy sources at the site of the project activity, since in this case	The project activity does not involve any of the given criteria hence methodology is applicable for the project activity under consideration.

	the baseline may be the continued use of fossil-fuels at the site; • Biomass fired power plants; • A hydro power plant that result in new single reservoir or in the increase in existing single reservoir where the power density of the power plant is less than 4 W/m^2.	
6	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 and does not involve retrofits, replacements, or capacity additions. Hence, this criterion is also not relevant to the project activity under consideration.

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

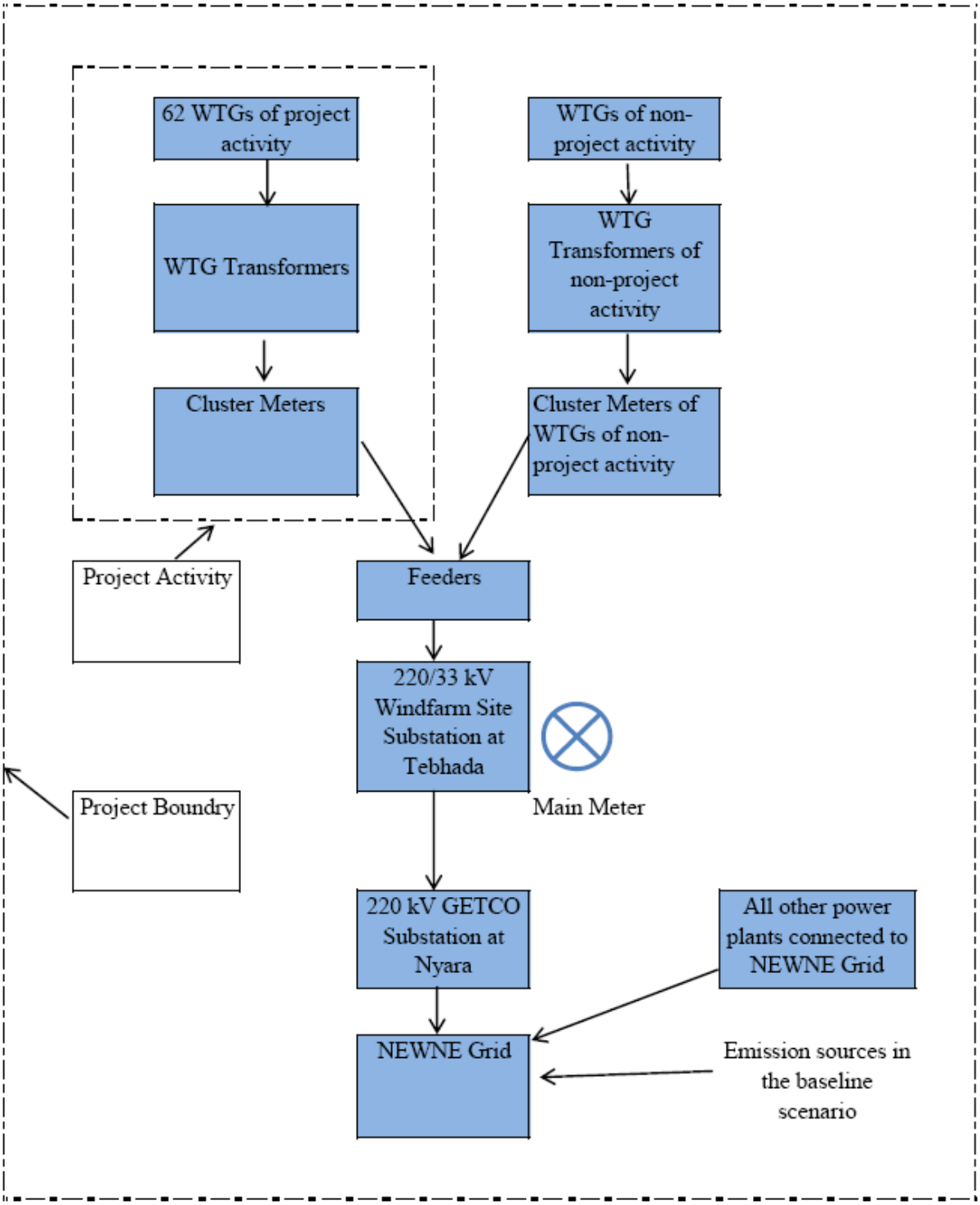
B.3. Description of the sources and gases included in the project boundary:

According to ACM0002, Version 12.3.0, the spatial extent of the project boundary includes the power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

The Indian electricity system is divided into two regional grids, the synchronous Northern, Eastern, Western, and North Eastern (NEWNE) grid and the Southern Region (SR) grid. Each grid covers several states[2]. The project activity is connected to NEWNE grid and this has been considered as the project boundary.

[2] Page 4, User Guide Version 7 of CO_2 Baseline Database for the Indian Power Sector, http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Project Boundary diagram:



The baseline study of NEWNE grid shows that the main source of GHG emissions in the baseline is CO_2 emissions from the conventional power generating systems. The other GHG emissions are that of CH_4 and N_2O, however, the emissions of these GHGs are excluded as the same is also not required to be estimated for wind energy projects as per ACM0002. The project activity is the emission free electricity generation from renewable sources and hence, emits no gases in the atmosphere.

Following table indicates the sources and gases included in the project boundary.

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil-fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source. In the baseline scenario the electricity would have been sourced from the NEWNE grid which is dominated by fossil-fuel fired power plants which in turn emit CO_2.
		CH_4	No	This source is excluded from the project boundary under ACM0002.
		N_2O	No	This source is excluded from the project boundary under ACM0002.
Project Activity	Greenfield wind energy conversion to electricity system	CO_2	No	The project activity does not lead to any such emissions.
		CH_4	No	
		N_2O	No	

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

According to the applied methodology 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 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 of an electricity system".

As the project activity is a Greenfield wind power plant, the baseline scenario is the generation of equivalent amount of electricity delivered to the NEWNE grid by the operation of grid-connected power plants (mainly fossil-fuel based) and by the addition of new generation sources in the grid. This is estimated by multiplying the Combined Margin calculated as per the latest version of "Tool to calculate the emission factor for an electricity system" – Version 02.2.1 with the electricity delivered to the grid.

The details of geographical scope of Indian electricity grid system are described in the table below[3]:

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

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

Sector- wise installed capacity (MW) as on 28/02/2011[4]

Sl. No	Region	Thermal				Nuclear	Hydro	R.E.S. (MNRE)	Total
		Coal	Gas	Diesel	Total		(Renewable)		
1	Northern	23,745	4,135	13	27,893	1,620	13,623	3,166	46,301
2	Western	30,996	7,904	17	38,917	1,840	7,448	5,358	53,562
3	Eastern	18,235	190	17	18,443	-	3,882	360	22,684
4	N. Eastern	60	787	143	990	-	1,116	224	2,329
	NEWNE Grid	**73,036**	**13,016**	**190**	**86,242**	**3,460**	**26,068**	**9,107**	**124,877**
5	Islands	-	-	70	70	-	-	6	76
6	Southern	19,382	4,691	939	25,013	1,320	11,299	9,342	46,973
	All India	**92,418**	**17,707**	**1,199**	**111,325**	**4,780**	**37,367**	**18,455**	**171,926**

[3] Table 2, Page 4, User Guide Version 7 of CO2 Baseline Database for the Indian Power Sector, http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

[4] Sr No 6, Page 8, All India generating installed capacity- region wise, monthly report, February 2011, CEA Reports, Central Electricity Authority, http://www.cea.nic.in/reports/monthly/executive_rep/feb11/8.pdf

It is evident from the above table that the installed capacity in India predominantly comprises of thermal power plants using fossil-fuels; thermal power generation is GHG intensive and is a major source of CO_2 emissions. In the absence of the project activity equivalent amount of electricity would have been generated from the existing grid connected power plants and planned capacity additions in the NEWNE Grid. Thus the project activity displaces the electricity that would have been 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.

Combined Margin (CM) emission factor is calculated according to the procedures prescribed in the approved methodology ACM0002 Version 12.3.0. The approved methodology ACM0002 refers to the latest version of the "Tool to calculate emission factor for an electricity system"-Version 02.2.1.

The baseline emissions and the emission reductions from the project activity are estimated based on the quantum of net electricity generated at wind farm and the combined margin emission factor of the NEWNE grid. Combined margin (CM) is calculated based on operating margin (OM) and build margin (BM) emission factors. As per "Tool to calculate emission factor for an electricity system" - Version 02.2.1 for wind and solar projects, the default weights are: $w_{OM} = 0.75$ and $w_{BM} = 0.25$.

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 participant
Parameter	**Data Source**
$EF_{OM, y}$ = Operating Margin Emission Factor (tCO_2/MWh)	CEA Database for CO2 emission factor, Version 7.0
EF_{BM}, y = Build Margin Emission Factor (tCO2/MWh)	CEA Database for CO2 emission factor, Version 7.0
EF_y = Grid Emission Factor	Calculated as the weighted average of the operating margin and build margin with the default weights as per "Tool to calculate emission factor for an electricity system" - Version 02.2.1

Details of calculation of emission factor have been provided in Annex 3: Baseline Information.

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):

Demonstration of Additionality for the project activity:

"Tool for the demonstration and assessment of additionality" Version 06.0.0 approved by CDM Executive Board is used to demonstrate project additionality. The tool describes the following steps to determine the additionality:

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

Define realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps:

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

(a) Proposed project activity undertaken without being registered as a CDM project activity:

This alternative involves the implementation of the project activity without CDM benefits. This is in compliance with all applicable legal and regulatory requirements and can be a part of the baseline. However, the project activity is not viable enough without CDM revenues. This argument has been discussed in step 2 of the Additionality section.

(b) Continuation of the current situation:

Under this alternative, there would have been "no project activity". Hence, the equivalent amount of electricity delivered to the NEWNE grid would have been generated by the operation of grid-connected power plants (mainly fossil-fuel based) and by the addition of new generation sources in the grid. Hence, continuation of the current situation is the most plausible baseline alternative for the project.

The baseline alternative for the project activity is also pre-defined in ACM0002 as generation of equivalent amount of electricity by operation of existing grid- connected power plants and by addition of new generation sources.

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

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

The above mentioned two alternatives are in compliance with all mandatory applicable legal and regulatory requirements as shown below:

1. The Indian Electricity Act, 2003 does not restrict or empower any authority to restrict the fuel choice for power generation.
2. The applicable environmental regulations do not restrict the use of wind energy for power generation.
3. There is no legal requirement on the choice of a particular technology for power generation.

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

Proceed to Step 2 (Investment analysis) or Step 3 (Barrier analysis).

Step 2: Investment Analysis

Sub-step 2a: Determine appropriate analysis method

As per "Tool for the demonstration and assessment of additionality" Version 06.0.0, 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).

Simple cost analysis (Option I) is not applicable as the project activity obtains economic benefit by selling the production to off-takers.

The alternative to the project activity is continuation of current situation i.e. no project activity wherein the equivalent amount of electricity delivered to the NEWNE grid would have been generated by the operation of grid-connected power plants (mainly fossil-fuel based) and by the addition of new generation sources in the grid. As per Guidelines on the Assessment of 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". Hence, investment comparison analysis (option II) cannot be applied.

Project proponent chooses to exercise option-III i.e. Benchmark analysis to demonstrate the additionality for the project activity

Sub-step 2b: Option III. Apply benchmark analysis

The post tax equity IRR has been identified as the suitable financial indicator and has been compared with the appropriate benchmark selected as follows:

As per the guidance provided under Paragraph-12 of 'Selection and Validation of Appropriate Benchmarks' in the Guidelines on the Assessment of Investment Analysis (Version 05), "In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity (RoE) are appropriate benchmarks for equity IRR. Benchmarks supplied by relevant national authorities are also appropriate if the DOE can validate that they are applicable to the project activity and the type of IRR calculation presented".

Hence, RoE has been selected by the project proponent as appropriate benchmark for equity IRR. The benchmark RoE for the project is calculated as 16.51%. The detailed working has been attached as Appendix 2.

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

As explain in the sub-step 2b above, post tax equity IRR has been identified as the suitable financial indicator for the project activity. The key assumptions used for calculating post tax equity IRR are set out below:

Assumptions for post tax equity IRR			
Parameter	**Unit**	**Value**	**Supportive**
Size of the project	MW	49.6	Enercon's proposal dated 22.08.2009
Project Cost			
Development, Supply, Erection, Commissioning, Instrumentation & Control and Other Project Costs	Rs. in million	2,916.40	Calculated on the basis of Enercon's proposal dated 22.08.2009
Finance for project			
Equity	%	30%	CERC and GERC norms, http://www.cercind.gov.in/Regulations/CERC_RE-Tariff-Regualtions_17_sept_09.pdf , http://gercin.org/discussionpdf/en_1301043186.pdf
Debt	%	70%	
Equity	Rs. in million	874.93	Calculated

Assumptions for post tax equity IRR			
Parameter	**Unit**	**Value**	**Supportive**
Debt	Rs. in million	2,041.48	Calculated
Interest Rate of Term Loan	%	11.25%	The interest rate is SBI Benchmark Prime Lending Rate, http://in.reuters.com/article/2011/02/28/india-plr-idINSGE71R06L20110228 The same is considered on minus 100 basis points as standard practice
Moratorium	Months	12	Clause 5.5 page 12 GERC order No 2 2009 dated 17.06.2009, http://gercin.org/discussionpdf/en_1301043186.pdf
Repayment (No. of quarterly instalments)	No.s	40	
Expenses			
O&M Cost (per WTG per annum)	Rs. in million	0.607	Enercon's proposal dated 22.08.2009
Yearly escalation of O&M cost	%	5%	Enercon's proposal dated 22.08.2009
Free O&M period	Year	1	Enercon's proposal dated 22.08.2009
Statutory expenses (per WTG per annum)	Rs. in million	0.04	Relevant guidelines issued by statutory authorities, the estimate is provided by Enercon's in its proposal dated 22.08.2009
Insurance (per annum)	%	0.22%	Estimated based on insurance on other assets, (Insurance exp in FY 2008-09/ average of net assets), Annual Report FY 2008-09, http://www.torrentpower.com/investors/pdfs/annual_report_08_09.pdf
Working Capital Norms			
O&M Expenses	Months	1	Clause 17 (1), Page 15, CERC (Terms and Conditions for Tariff determination from

Assumptions for post tax equity IRR			
Parameter	**Unit**	**Value**	**Supportive**
			Renewable Energy Sources) Regulations, 2009, http://www.cercind.gov.in/Regulations/CERC_RE-Tariff-Regualtions_17_sept_09.pdf
Receivables	Months	1	Billing cycle
Interest on Working Capital	%	11.75%	SBI Benchmark Prime Lending Rate, http://in.reuters.com/article/2011/02/28/india-plr-idINSGE71R06L20110228 minus 50 basis points
Depreciation			
Rate for Tax Depreciation	%	7.69%	Rule 5 (1A), Income Tax Rules read with Section 32 (i) of Income Tax Act, 1961, http://law.incometaxindia.gov.in/DIT/File_opener.aspx?page=ITRU&schT=rul&csId=2f13c0bd-dec4-4df6-a273-431e3b91a01b&rNo=&sch=&title=Taxmann%20-%20Direct%20Tax%20Laws
Depreciation Method taken for Tax Depreciation		SLM	
Rate for Book Depreciation	%	5.28%	Section 350 read with Item II b of Schedule XIV, Companies Act, 1956, http://www.aadisol.in/aca/images/bullentins/bt_23.pdf
Depreciation Method taken for Book Depreciation		SLM	
Residual Value	% of Capital Cost	10%	as per GERC Order No 2 2009 dated 17/06/2009, http://gercin.org/discussionpdf/en_1301043186.pdf
Tax			
Tax Rates			Income Tax Act, 1961 read with Finance Act 2009, Para E of First Schedule & Section(45)(a)(ii), page 17 & page 32, http://www.saraltaxoffice.com/
Corporate Tax Rate	%	33.99%	
MAT for Company	%	16.995%	

Assumptions for post tax equity IRR			
Parameter	**Unit**	**Value**	**Supportive**
			resources/finance-act-2-2009.pdf
Service Tax	%	10.30%	Notification no. 8 2009 dated 24.02.2009, http://www.servicetax.gov.in/st-notfns-home.htm and http://www.saraltaxoffice.com/resources/st-rates.php
Revenue			
Generation			
PLF	%	21.22%	Average of actual PLF observed in nearby site (Sadodar Substation) during Jan 2008 to Dec. 2009
Tariff			
Tariff	Rs. per kWh	3.55	GERC Order No 2 2009 dated 17.06.2009, http://gercin.org/discussionpdf/en_1301043186.pdf
Generation Based Incentive			
GBI Rate	Rs. per kWh	0.5	MNRE Guidelines dated 17.12.2009, http://www.mnre.gov.in/file-manager/grid-wind/gbi-scheme.pdf
Max. GBI per MW	Rs. in million	6.2	
Total GBI eligibility	Rs. in million	307.52	
Maximum availability period	Years	10	

The post tax equity IRR for the project without CDM revenues is 4.71% i.e. less than the benchmark of 16.51% and hence the project activity is not financially attractive.

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

Include a sensitivity analysis that shows whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favor of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be the most financially/economically attractive (as per Step 2c para 11a) or is unlikely to be financially/economically attractive (as per Step 2c para 11b).

Sensitivity Analysis

As per para 20 of guidelines on the assessment of investment analysis, only those parameters should be selected for the sensitivity analysis that constitute more than 20% of either total project costs or total project revenues. Capital cost, O&M cost, PLF and tariff are such parameters and hence these are selected for sensitivity analysis.

Capital Cost

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

	10% decrease in capital cost	Base capital cost	10% increase in capital cost
Equity IRR	7.07%	4.71%	3.20%

The sensitivity analysis shows even with 10% lower capital cost, the equity IRR does not cross the benchmark.

O&M Cost

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

	10% decrease in O&M Cost	Base O&M Cost	10% increase in O&M Cost
Equity IRR	5.09%	4.71%	4.38%

The sensitivity analysis clearly shows even with a lower O&M Cost, the equity IRR does not cross the benchmark.

Plant Load Factor

Plant Load Factor is the key variable encompassing variation in wind profile, variation in off-take (including grid availability) including machine downtime. The PLF estimated by Third party is 20.60%. We have conducted sensitivity at a variation of 10% over the base case.

	10% decrease in PLF	Base PLF	10% increase in PLF
Equity IRR	2.81%	4.71%	7.08%

The estimated electricity generation from the project is determined by third party assessment in Energy Yield and Wind Regime Report. However, even with 10% increase in PLF, it is observed that the IRR is less than the benchmark.

Tariff

The sensitivity in tariff is conducted after taking to consideration +/-10% decrease in tariff.

	10% decrease in tariff	Base tariff	10% increase in tariff
Equity IRR	2.82%	4.71%	7.06%

At the time of investment decision project participant has considered tariff of Rs 3.55/-. However, subsequent to the investment decision the project proponent has gone ahead with REC based tariff structure. The sensitivity analysis shows that even with 10% increase in tariff the IRR is not crossing the benchmark.

The results of the sensitivity analysis conducted confirm that the returns from the project do not exceed the required benchmark even with variations in project parameters. Hence, it can be concluded that the project activity is unlikely to be financially attractive.

Step 4: Common practice analysis

As per para 6 of "Tool for the demonstration and assessment of additionality" (version 06.0.0);

Measure *(for emission reduction activities) is a broad class of greenhouse gas emission reduction activities possessing common features. Four types of measures are currently covered in the framework:*

(a) Fuel and feedstock switch;
(b) Switch of technology with or without change of energy source (including energy efficiency improvement ***as well as use of renewable energies****);*
(c) Methane destruction;
(d) Methane formation avoidance

As per para 2 of Guidelines on common practice (Version 2.0., EB 69, Annex 8);

Measure *(for emission reduction activities) is a broad class of greenhouse gas emission reduction activities possessing common features. Four types of measures are currently covered in the framework:*

(a) Fuel and feedstock switch (example: switch from naphtha to natural gas for energy generation, or switch from limestone to gypsum in cement clinker production);

*(b) Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies (example: energy efficiency improvements, **power generation based on renewable energy**);*
(c) Methane destruction (example: landfill gas flaring);
(d) Methane formation avoidance (example: use of biomass that would have been left to decay in a solid waste disposal site resulting in the formation and emission of methane, for energy generation).

The project activity will utilize wind energy for electricity generation which belongs to the Measure (b) (use of renewable energies).

As per para 47 of the "Tool for the demonstration and assessment of additionality" (version 06.0.0), for measures that are listed in paragraph 6, identify and discuss the existing common practice through the following steps:

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

As per para 7 of "Tool for the demonstration and assessment of additionality" (Version 06.0.0), ***Output*** *is goods or services with comparable quality, properties, and application areas (e.g. clinker, lighting, residential cooking);*

As per above definition "grid connected power generation" may be considered to be the output in the context of the project activity.

The design capacity of the project activity is 49.6 MW. Therefore, the applicable output range is from 24.8 MW to 74.4 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.

As per para 5 of "Tool for the demonstration and assessment of additionality" (Version 06.0.0), ***Applicable geographical area*** *covers the entire host country as a default; if the technology applied in the project is not country specific, then the applicable geographical area should be extended to other countries. Project participants may provide justification that the applicable geographical area is smaller than the host country for technologies that vary considerably from location to location depending on local conditions.*

As per above definition, the host country, i.e. India has been considered as the applicable geographical area for this project.

Therefore, all plants delivering the same output or capacity, within the applicable output range calculated in Step 1 and have started commercial operation before 30/03/2011 have been identified.

$N_{all}= N_{wind}+ N_{solar} +N_{biomass}+N_{hydro}+N_{thermal}+N_{nuclear}$

Where N_{all} = Number of all plants not registered/under validation as CDM project delivering the same capacity within the range of 24.8 MW-74.4 MW as the proposed project with commercial operation start date before 30th March, 2011 in India.

Province N_{wind} = Number of all wind plants not registered/under validation as CDM project delivering the same capacity within the range of 24.8 MW-74.4 MW as the proposed project with commercial operation start date before 30th March, 2011 in India.

N_{solar} = Number of all solar plants not registered/under validation as CDM project delivering the same capacity within the range of 24.8 MW-74.4 MW as the proposed project with commercial operation start date before 30th March, 2011 in India.

$N_{biomass}$ = Number of all biomass plants not registered/under validation as CDM project delivering the same capacity within the range of 24.8 MW-74.4 MW as the proposed project with commercial operation start date before 30th March, 2011 in India.

N_{hydro} = Number of all hydro plants not registered/under validation as CDM project delivering the same capacity within the range of 24.8 MW-74.4 MW as the proposed project with commercial operation start date before 30th March, 2011 in India.

$N_{thermal}$ = Number of all thermal plants not registered/under validation as CDM project delivering the same capacity within the range of 24.8 MW-74.4 MW as the proposed project with commercial operation start date before 30th March, 2011 in India.

$N_{nuclear}$ = Number of all nuclear plants not registered/under validation as CDM project delivering the same capacity within the range of 24.8 MW-74.4 MW as the proposed project with commercial operation start date before 30th March, 2011 in India.

Identification of Projects in N_{all}

Particulars	No of projects[5]
N_{wind}	2
N_{solar}	0
$N_{biomass}$	8

[5] Excel sheet showing details of projects included in N_{all} and N_{diff} is being submitted along with list of CDM projects also which are excluded from analysis.

N_{hydro}	49
$N_{thermal}$	10
$N_{nuclear}$	0
N_{all}	**69**

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}

As per para 9 of "Tool for demonstration and assessment of additionality" (version 06.0.0), ***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):
  (i) Micro (as defined in paragraph 24 of Decision 2/CMP.5 and paragraph 39 of Decision 3/CMP.6);
  (ii) Small (as defined in paragraph 28 of Decision 1/CMP.2);
  (iii) Large;

(d) Investment climate in the date of the investment decision, inter alia:
  (i) Access to technology;
  (ii) Subsidies or other financial flows;
  (iii) Promotional policies;
  (iv) Legal regulations;

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

Apart from N_{wind}, all other power plants included in the N_{all} apply different technology based on (a) energy source/fuel and hence are identified as N_{diff}.

Hence,
$N_{diff}= N_{solar}+N_{biomass}+N_{hydro}+N_{thermal}+N_{nuclear}$
$N_{diff}= 0+8+49+10+0$
$N_{diff}= 67$

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= 1-67/69
Hence, F=0.0289

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.

According to the analysis of step 2 and step 3, it is concluded that:
N_{all} = 69
N_{diff} = 67

Thereby; $N_{all}-N_{diff}$ = 2

For the project activity, F=0.03 and $N_{all}-N_{diff}$=2.

Therefore since both the conditions are not fulfilled, the project **is not common practice within the region.**

Thus, it can be concluded that the project activity is additional.

Prior consideration – CDM

In accordance with EB 49, Annex 22, paragraph 2 (i.e. 'Guidelines on the demonstration and assessment of prior consideration of the CDM') "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"

The start date for the project activity under consideration is 30/03/2011 (Date of placing the purchase orders for the WTGs). The project proponent had already informed both the Host Party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status using the standardized form F-CDM- Prior Consideration. The above mentioned notification was made by the project proponent dated 17/09/2011 which is within six months from the Project activity start date *i.e.* the date on which the purchase orders for the WTGs were placed. (*Wind power project in Jamnagar District, Gujarat, India*; Prior Consideration; CDM; UNFCCC, http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html)

Chronology of events in the implementation of the project activity by project proponent indicating how continuing real actions were taken to achieve CDM status is indicated below:

Sr No	Event	Date	Evidence
1	Receipt of proposal from Enercon	22/08/2009	Enercon proposal
2	Approval for setting up of wind power project	28/01/2010	Extract of Board Resolution
3	Appointment of CDM Consultant	09/08/2010	Engagement Letter
4	Purchase orders and work orders issued to contractors for 55 WTGs	30/03/2011	Purchase orders and work orders
5	Purchase orders and work orders issued to contractors for 7 WTGs[6]	30/08/2011	Purchase orders and work orders
6	Prior Consideration Form submitted to UNFCCC and NCDMA	17/09/2011	E-Mail
7	Appointment of Validator	25/01/2012	Validation service agreement
8	Commissioning of Project	February and March 2012	Commissioning certificates

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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

$$ER_y = BE_y - PE_y$$

Where:
BE_y = Baseline Emissions in year *y* (tCO_2 e/yr)
PE_y = Project Emissions in year *y* (tCO_2 e/yr)

Estimation of Baseline Emissions:
Baseline emissions include only CO_2 emissions from electricity generation by fossil-fuel fired power plants that would be 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 by the addition of new generation sources. The baseline emissions are to be calculated as follows:

[6] Purchase orders for 55 WTGs have been issued on 30/03/2011. Since the land for 7 locations were still to be acquired, project proponent had right to purchase such WTGs on subsequent date. On clearance of land for these locations purchase orders for 7 WTGs have been issued on 30/08/2011

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

Where:
BE_y = Baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,\ CM,\ y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" version 02.2.1 (tCO_2/MWh)

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

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

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

The proposed project activity is in the state of Gujarat which falls under NEWNE grid. The 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 "Tool for calculating the emission factor for an electricity system" - Version 02.2.1. The steps of calculation are as follows:

STEP 1: Identifying the relevant electricity systems:

The Indian electricity system is divided into two grids, the Integrated Northern, Eastern, Western, and North-Eastern regional grids (NEWNE) and the Southern grid[7].

According to the geographical scope of the two electricity grids, the state of Gujarat falls in the NEWNE Grid. As the project activity is connected to the NEWNE electricity grid, the NEWNE grid is the "project electricity system".

Power can be dispatched without significant constraints within the NEWNE Grid and also between the states in the regional grids and thus, represents the "project electricity system".

[7] Para 2, page 4, User Guide Version 7.0, CO_2 Baseline Database for the Indian Power Sector
http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

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

The "Tool for calculating the emission factor for an electricity system" version 02.2.1 has provided the choice to the project participants to follow either of the below mentioned two options to calculate the operating margin and the build margin emission factor.

Option I: Only grid power plants are included in the calculation

Option II: Both grid and off grid power plants are included in the calculation

As off grid power plants are not included in the project electricity system, Option I is chosen by the project participant.

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

According to the "Tool for calculating the emission factor for an electricity system" version 02.2.1, 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 (option (b)) and dispatch data analysis OM (option (c)) cannot be currently applied in India due to lack of necessary data[8]

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 NEWNE grid in India in the last five years is as follows[9]:

[8] Footnote 3, page 6, User Guide Version 7.0, CO_2 Baseline Database for the Indian Power Sector http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

[9] Version 7.0, CO_2 Baseline Database for the Indian Power Sector http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Share of Must-Run (% of Net Generation)						
Grid	2006-07	2007-08	2008-09	2009-10	2010-11	Average
NEWNE	18.5%	19.0%	17.4%	15.9%	17.6%	17.7%

The above data clearly shows that the percentage of total grid generation by low cost/must run plants (on the basis of average of five most recent years) for the NEWNE grid is less than 50 % of the total generation. Hence, the Simple OM method can be used to calculate the Operating Margin Emission factor.

The 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[10].

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.

The simple OM may be calculated by one of the following two options:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or

Option B: 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 can only be used if:
(a) The necessary data for Option A is not available; and
(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
(c) Off-grid power plants are not included in the calculation (i.e. if Option I has been chosen in Step 2).

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[11]. The operating margin emission factor in the CEA database is calculated using the guidelines provided by the UNFCCC in the "Tool to calculate the emission factor for an electricity system" version 02.2.1. The CEA database uses option A mentioned above.

[10] Tool for calculating the emission factor for an electricity system version 02.2.1

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

Project participant has, therefore, used the data published in the CEA database, for calculating the Baseline Emission Factor (Refer Annex 3).

STEP 5: Calculate the build margin emission factor:

Out of the two options provided in the "Tool for calculating the emission factor for an electricity system" version 02.2.1 the project proponent has chosen **Option 1 i.e.** 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.

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:

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

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

The build margin emission factor in the CEA database is calculated using the guidelines provided by the UNFCCC in the "Tool to calculate the emission factor for an electricity system" version 02.2.1. The details of same can be found CEA Database Version 7.0 http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm. We have, therefore, used the data published in the CEA database, for calculating the Baseline Emission Factor (Refer Annex 3).

STEP 6: Calculate the combined margin emissions factor[12]:
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

[12] Tool for calculating the emission factor for an electricity system version 02.2.1

(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option. Therefore, the combined margin emissions factor is calculated as follows:

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

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
w_{OM} = Weighting of operating margin emissions factor (%)
w_{BM} = Weighting of build margin emissions factor (%)
(Where $w_{OM} + w_{BM} = 1$).

The following default values should be used for w_{OM} and w_{BM} as provided in the Tool for calculating the emission factor for an electricity system version 02.2.1 :

- Wind and solar power generation project activities: $w_{OM} = 0.75$ and $w_{BM} = 0.25$ (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.
- All other projects: $w_{OM} = 0.5$ and $w_{BM} = 0.5$ for the first crediting period, and $w_{OM} = 0.25$ and $w_{BM} = 0.75$ for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

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 0.9528 tCO_2/MWh (Refer Annex 3 for calculation).

Details of Baseline data:

Data of operating margin for the three financial years from 2008-09, 2009-10 and 2010-11 and Build Margin for 2010-11 has been obtained from - Baseline Carbon Dioxide Emission Database Version 7.0, Ministry of Power: Central Electricity Authority (CEA), the detailed excel sheet is available at: http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm.

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 (PE_y = 0).

Estimation of Leakage Emissions

As per ACM0002 Version 12.3.0, no leakage has been considered (LE_y = 0). The details on OM, BM and CM estimates as provided by the CEA are shown in Annex 3.

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

Data / Parameter:	**$EF_{grid, OM,y}$**
Data unit:	tCO_2/ MWh
Description:	Operating Margin CO_2 emission factor of the grid (NEWNE Grid)
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" Version 7.0 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/cdm_co2.htm
Value applied:	0.9842
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 in accordance with CDM methodologies: ACM0002, and "Tool to Calculate the emission Factor for an Electricity System" Version 02.2.1. Please refer to Annex 3: of the PDD for further details.
Any comment:	The value is calculated on *ex-ante* basis and it will remain same during first crediting period.

Data / Parameter:	**$EF_{grid, BM,y}$**
Data unit:	tCO_2/ MWh
Description:	Build Margin CO_2 emission factor of the grid (NEWNE Grid)
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" Version 7.0 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value applied:	0.8588
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 CDM methodologies: ACM0002, and "Tool to Calculate the emission Factor for an Electricity System" Version 02.2.1. Please refer to Annex 3: of the PDD for further details.
Any comment:	The value is calculated on *ex-ante* basis and it will remain same during the first crediting period. For the second crediting period, the build margin emission factor will 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 will be used.

Data / Parameter:	**EF_y** or **$EF_{grid, CM, ,y}$**
Data unit:	tCO_2/ MWh
Description:	Combined Margin CO_2 emission factor of the grid (NEWNE Grid)
Source of data used:	Estimated using following formula as per "Tool to Calculate the emission Factor for an Electricity System" Version 02.2.1 **$EF_{grid, CM, ,y}$** = $EF_{grid, OM,y} \times w_{OM} + EF_{grid, BM,y} \times w_{BM}$
Value applied:	In case of wind power projects default weights of 0.75 for EF_{OM} and 0.25 for EF_{BM} are applicable as per "Tool to Calculate the emission Factor for an Electricity System" Version 02.2.1. Combined Margin Emission Factor **(EF_y** or **$EF_{grid, CM, ,y}$)** : **0.9528** tCO_2/ MWh 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 in accordance with CDM methodologies: ACM0002, Version 12.3.0, and "Tool to Calculate the emission Factor for an Electricity System" - Version 02.2.1. Please refer to Annex 3: of the PDD for further details.
Any comment:	The value is calculated on *ex-ante* basis.

B.6.3. Ex-ante calculation of emission reductions:

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

The calculation for the emission reductions is as under[13]:

Baseline emission factor (Combined Margin) (**EF_y** or **$EF_{grid, CM, ,y}$**) = 0.9528 tCO_2/MWh

Annual net electricity generation supplied to the grid by the project activity (**$EG_{PJ, y}$**)
= 49.6 MW (Capacity) X 20.60% (PLF) X 8,760 (hours) MWh

[13] Refer Annex 3 for sources and calculations

= 89,506 MWh

Annual Baseline Emissions: $\mathbf{BE_y = EF_y * EG_y}$
= 0.9528 tCO_2/MWh X 89,506 MWh
= 85,281 tCO_2
Project emissions = 0
Leakage = 0
Hence $BE_y = ER_y$

The emission reductions per year are estimated to be 85,281 tCO_2.

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

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of overall emission reductions (tonnes of CO_2 e)
Year 1	0	85,281	0	85,281
Year 2	0	85,281	0	85,281
Year 3	0	85,281	0	85,281
Year 4	0	85,281	0	85,281
Year 5	0	85,281	0	85,281
Year 6	0	85,281	0	85,281
Year 7	0	85,281	0	85,281
Total (tonnes of CO_2e)	**0**	**596,967**	**0**	**596,967**

***** 1st Year begins from 05/11/2012 or the date of registration of project activity whichever is later

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{PJ,y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data to be used:	Share Certificate issued by State Load Dispatch Centre (SLDC), Gujarat
Value of data applied for the purpose of calculating expected	Annual net electricity generation supplied to the grid by the project activity = 49.6 MW (Capacity) X 20.6% (PLF) X 8,760 (hours) MWh = 89,506 MWh (*ex-ante*)

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	This is a calculated parameter based on the export and the import of the WTGs of project activity. However following metering and recording procedures is followed for the calculation of net electricity generation supplied to the grid by project activity. **Metering:** The WTGs of the project are divided into clusters and each cluster has dedicated metering system (Cluster Meter - 0.2s). Different clusters ultimately lead to the shared GETCO main meter at the Tebhada substation (Main Meter) of accuracy class 0.2s. Data monitoring takes place at the Cluster Meters and Main Meter. **Measurement and recording:** The following parameters will be measured continuously at substation Main Meter and recorded on monthly basis: (i) **Electricity Export ($EG_{PJ,export,y}$):** The quantity of electricity supplied by the project plant/unit to the grid in year *y*; and (ii) **Electricity Import ($EG_{PJ,Import,y}$):** The quantity of electricity delivered to the project plant/unit from the grid in year *y* The net electricity generation supplied to the grid in year *y* is a calculated value and would be determined as the difference between the electricity exported to the grid and the electricity imported from the grid by the project activity. $EG_{PJ,y} = EG_{PJ,export,y} - EG_{PJ,Import,y}$ The project activity will have various clusters and each cluster has exclusive metering arrangement and the meter readings taken at these metering points i.e. Cluster Meters will be provided by the representatives of O&M Contractor to Gujarat Electricity Development Authority (GEDA)/SLDC. The WTGs of the project activity and WTGs of other project owners are connected to the substation Main Meter. GEDA/SLDC apportions the net electricity generation supplied to the grid recorded at Main Meter to all the project owners after adjusting transmission loss to the meter readings taken at dedicated Cluster Meters of different project owners. The procedure of apportionment is explained in detail in section B.7.2. The meter reading is taken jointly by the representatives of O&M Contractor and GEDA/SLDC. The electricity from Tebhada substation is finally supplied to the GETCO

	substation at Nyara. As per the current arrangement in the state of Gujarat, the net electricity generation supplied to the grid by the project owners is provided by SLDC in the share certificate of electricity generated. This certificate contains only the final value of the net electricity supplied and does not mention the values for $EG_{PJ,export,y}$ and $EG_{PJ,Import,y.}$ The values for $EG_{PJ,export,y}$ and $EG_{PJ,Import,y}$ are monthly recorded by GEDA/O&M representative/SLDC in form of Joint Meter Reading (JMR) and the same is not being provided to the project owners as per current procedures. Thus, the values of the net electricity generation supplied to the grid by the project activity will be taken directly by the project proponent from the share certificate provided by SLDC for calculation of emission reductions as the $EG_{PJ,export,y}$ and $EG_{PJ,Import,y}$ values are not available to the project participant and thus not being monitored in the monitoring plan.
QA/QC procedures to be applied:	• The Main Meter located at the Tebhada substation and Cluster Meters shall be calibrated atleast once in three years. Apart from calibration, GETCO will carry out the periodical testing, sealing and maintenance of the Main Meter. • The Tebhada substation is further connected to the GETCO substation at Nyara. The energy meters connected to GETCO substation are considered as the backup meters. If during meter testing the Main Meter at the wind farm site substation is found beyond the permissible limit of error, the meter reading will be taken from the backup meters located at the GETCO substation at Nyara after addition of average historical transmission losses. • If during meter testing, the Cluster Meter is found beyond the permissible limit of error, the sum of reading at Local Control System (LCS) meter located at each wind turbine of the project activity will be provided to GEDA/SLDC for purpose of apportioning net electricity generation 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 WTGs. 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. • Thus the QA/QC procedures will be jointly implemented by GETCO and the project participant.

	• The net electricity generation supplied by the project to the grid can be cross verified with records for sale of electricity and other records maintained by project participant relating to electricity generation by project such as LCS data.
Any comment:	The data will archived electronically/paper as available for the entire crediting period and 2 years post crediting period.

Data / Parameter:	$EG_{LCS,y}$
Data unit:	MWh/yr
Description:	Summarised quantity electricity generation recorded at LCS of WTG
Source of data to be used:	Generation at controller as recorded through SCADA system/ Centralised Monitoring System of O&M contractor
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Not used
Description of measurement methods and procedures to be applied:	This parameter is not used for CER calculation as only net electricity generation supplied to the grid is used in calculation of emission reductions. However, the project participant will be monitoring the generation recorded at LCS of each WTG as it can be used to cross check the net electricity generation supplied to the grid. The controller of each WTG is connected through SCADA system and generation of the same is continuously monitored and daily recorded through SCADA system/ Centralised Monitoring System of O&M contractor. The summarized generation of 62 WTGs will be reported by the project participant on monthly basis and this will be used to cross check the reported net electricity generation. However, this parameter will not exactly match with the net electricity generation supplied to the grid because of transmission losses but it can provide the approximate reference to the values reported.
QA/QC procedures to be applied:	The data will be recorded by trained personnel of O&M contractor through computerized system. 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 WTGs. 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.

Any comment:	The data will be archived electronically/paper as available for the entire crediting period and 2 years post crediting period.

B.7.2. Description of the monitoring plan:

To ensure efficient operation and maintenance of all the wind turbines, project proponent has entered into a comprehensive O&M agreement with Enercon India Limited. The O&M personnel will be qualified engineers and will be trained at the WTG manufacturing facility of Enercon India Limited at Daman for operating and ensuring optimum performance of the WTGs.

Enercon is an ISO 9001:2000 certified Quality Management system from Germanischer Lloyd. Enercon follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, finance, construction, commissioning and operation of the wind power project. Furthermore, project participant shall oversee the performance of the WTGs through SCADA system.

The monitoring plan for this project activity includes details of the operational and management structure that project proponent is developing to monitor emission reductions during the crediting period. It also identifies the team and responsibilities for monitoring the relevant parameters, data archiving and calibration of equipment and procedures.

The monitoring plan is organized as per information provided below, and the detailed background information is included under Annex 4.

- Introduction about the monitoring plan
- Description of data required to be monitored
- Organizational structures & procedures for collection, processing, review, storage and reporting of data

Data Recording

- The meter reading at the Main Meter at Tebhada substation and the Cluster Meters of the project activity will be done each month.
- The LCS meter reading is recorded continuously by the online monitoring system.

Procedure for apportion of electricity generation recorded at Main Meter:

- **Net electricity exported to the grid by the project activity**
  $EG_{PJ,y} = EG_{PJ,export,y} - EG_{PJ,Import,y}$

  Where,
  $EG_{PJ,y}$ = Net Electricity exported by the project activity to the grid

$EG_{PJ,export,y}$ = Electricity exported by the project activity to the grid, calculated
$EG_{PJ,import,y}$ = Electricity imported from the project activity to the grid, calculated

- **Electricity exported by the project activity to the grid**
  $EG_{PJ,export,y} = EG_{GETCO,\ Export}$ X $EG_{Cluster,\ Export}$/ $EG_{Cluster,\ WF,\ Export}$

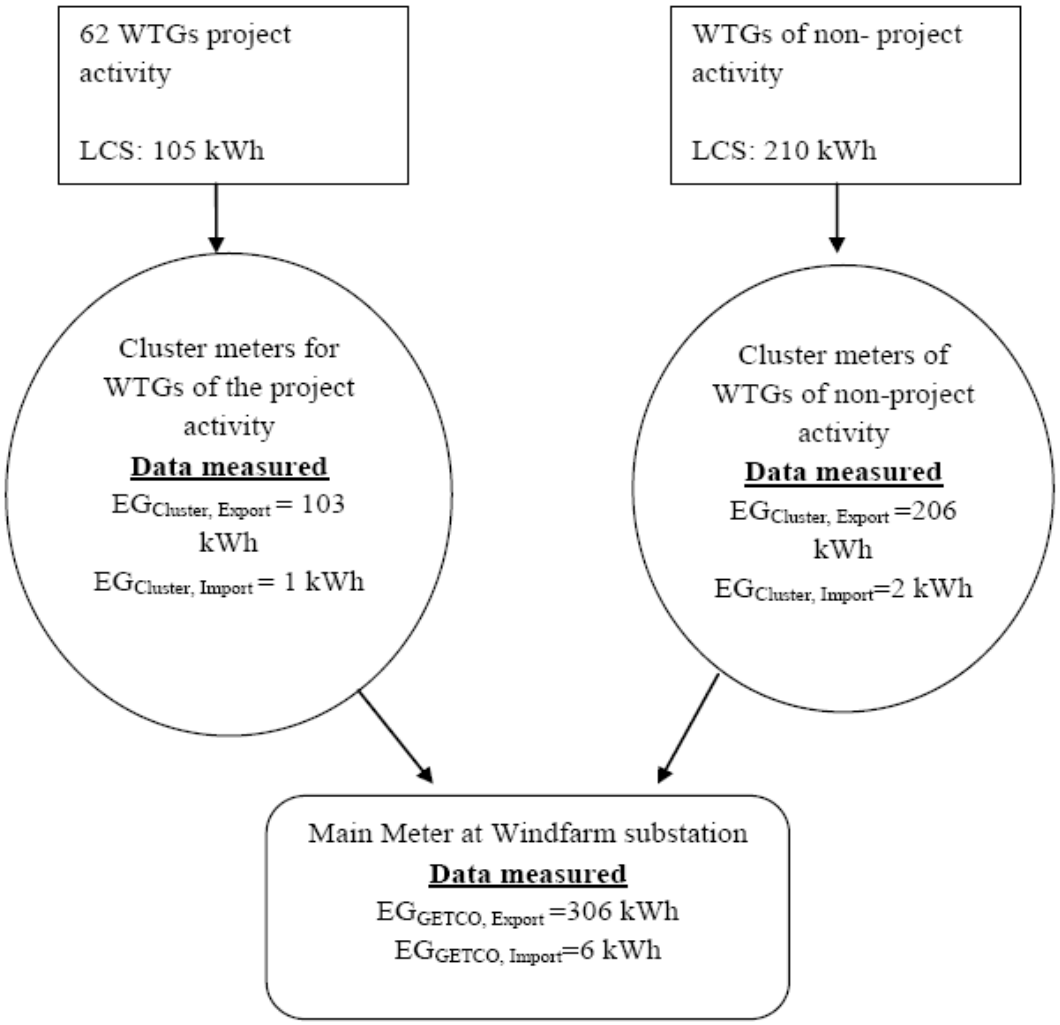
  Where,
  $EG_{GETCO,\ Export}$ = Electricity exported, as recorded at the Main Meter at Tebhada substation
  $EG_{Cluster,\ Export}$ = Electricity exported by the project activity, as measured at Cluster Meter
  $EG_{Cluster,\ WF,\ Export}$ = Electricity exported by all the wind farms (WTGs of project activity and WTGs of non-project activity) connected to Tebhada substation, as measured at Cluster Meter

- **Electricity imported from the Grid by the project activity**
  $EG_{PJ,Import,y} = EG_{GETCO,\ Import}$ X $EG_{Cluster,\ Import}$ / $EG_{Cluster,\ WF,\ Import}$

  Where,
  $EG_{GETCO,\ Import}$ = Electricity imported, as recorded at the Main Meter at Tebhada substation
  $EG_{Cluster,\ Import}$ = Electricity imported by the project activity, as measured at Cluster Meter
  $EG_{Cluster,\ WF,\ Import}$ = Electricity imported by all the wind farms (WTGs of project activity and WTGs of non-project activity) connected to Tebhada substation, as measured at Cluster Meter

The meter reading is taken jointly by representative of GEDA/SLDC and representatives of O&M contractor and recorded in form of JMR. The parameter such as $EG_{GETCO,Export}$, $EG_{GETCO,\ Import}$, $EG_{Cluster,WF,Export}$, $EG_{Cluster,WF,Import}$ used in calculation of $EG_{PJ,y}$ are not available with project participant as per the current procedure followed in the state of Gujarat. Hence, these parameters are not included in section B.7.1. Further, only data available with PP is $EG_{PJ,y}$ (Net electricity exported by the project activity to the grid) which is sourced from share certificate issued by State Load Dispatch Centre (SLDC), Gujarat and LCS reading recorded through SCADA system/Centralised Monitoring System of O&M contractor. These both are included as the monitoring parameters.

The above apportioning procedure is explained in below example:



$EG_{PJ,export,y} = EG_{GETCO,\ Export} \times EG_{Cluster,\ Export} / EG_{Cluster,\ WF,\ Export}$
= 306*103/(206+103)
= 102

$EG_{PJ,Import,y} = EG_{GETCO,\ Import} \times EG_{Cluster,\ Import} / EG_{Cluster,\ WF,\ Import}$
= 6*1/3
= 2

$EG_{PJ,y} = EG_{PJ,export,y} - EG_{PJ,Import,y}$
= 102-2
= 100 (this data is taken directly from the share certificate issued by SLDC on monthly basis and will be used in calculation of emission reduction).

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

Date of completion of the application of the baseline and monitoring methodology: 21/04/2012

Responsible person(s) / entity (ies): Torrent Power Limited. Please refer Annex 1 for detail information of the contact person.

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:

30/03/2011 (The date of placement of purchase orders for the WTGs)

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

20 years, 0 months from the date of commissioning

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

Renewable crediting period

C.2.1. Renewable crediting period:

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

05/11/2012 or the date of registration of the project activity with UNFCCC, whichever is later.

C.2.1.2. Length of the first crediting period:

07 years 00 months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not Applicable

C.2.2.2. Length:

Not Applicable

SECTION D. Environmental impacts

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

The project activity is based on renewable energy and is emission free and does not require any natural resources. Further, a list of projects or activities requiring prior environmental clearance[14] has been provided in the Schedule of EIA Notification (S.O 1533) dated 14/09/2006 of Ministry of Environment and Forests (Government of India). Wind power projects are not included in this notification and thus, an Environment Impact Assessment (EIA) is not required for the project activity.

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:

Not applicable as the environmental impacts for such project are not considered as significant by the host Party or project proponent.

[14]Notification, MoEF, http://envfor.nic.in/legis/eia/so1533.pdf

SECTION E. Stakeholders' comments

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

Project proponent identified local communities, employees, contractors and consultants as the stakeholders with an interest in the project activity. Accordingly, project proponent sent out a notice on 14/10/2011 to representatives of various stakeholder groups (viz 2 NGOs, representatives of 4 surrounding villages, employees of contractors, employees of project proponent and employees of consultant) informing them of the proposed meeting on 21/10/2011 at Jamnagar and requesting each stakeholder group to send representatives to the said meeting. Also the aforesaid notice was placed at 4 village sarpanchs' offices of Lalpur Taluka, and 3 places at project site. This notice also gave time for the various stakeholders to file their observations by 25/10/2011 in writing.

There were 58 participants representing various parties including from local communities, NGOs, employees of contractors and employees of project proponent who attended the meeting on 21/10/2011. Villagers from the vicinity also showed interest in the project and related social and environmental development activities.

The meeting agenda was as follows:

1. Welcome address by Shri Ravikant Vyas
2. Election of a Chairperson for the meeting
3. Introduction on CDM by Shri Rikesh Tankariya
4. Introduction of the project activity by Shri Ravikant Vyas
5. Open house discussion on the merits of the project with permission of the Chair.
6. Circulation of questionnaire and compilation of the response received.
7. Preparation and circulation of draft Minutes of Meeting and signing of the MoM.

E.2. Summary of the comments received:

After a brief discussion regarding the pros and cons of this project the chair person interacted with the participants to clarify their doubts and concerns regarding the likely impacts of the project. The stakeholders viewed Torrent Group as a reputed group of companies contributing to the local economy. Overall there was agreement that the proposed project had negligible adverse effect on people or their livelihood and that the project activity is a beneficial project towards sustainable development. Detailed comments and responses are shown in the table in section E.3.

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

Project proponent clarified all the stakeholder's concerns by providing answers to all questions to the satisfaction of the participants. Detailed MoM delineating the above concerns and project proponent's responses has been recorded and appended hereunder.

The Chairman called upon the participants to seek clarifications and express their concerns on the likely impacts of the project, and it being structured as clean development mechanisms project under Kyoto Protocol. The participants sought clarifications on Kyoto Protocol and Clean Development Mechanisms process. Overall there was agreement that the proposed project was a beneficial project from sustainability viewpoint. Specific concerns and questions and the answers are delineated in the table below:

Sr No	Answer / outcome	Answer / outcome
	Public	
1	What socio-economic development can be availed from the wind project?	The project activity will lead to the development of supporting infrastructure such as roads, evacuation network etc. and provide direct and indirect employment opportunities.
2	Does the project increase employment opportunities in the area?	At the local level, the project activity will lead to the creation of skilled and unskilled jobs throughout the construction and ongoing operation and maintenance of the project. At a national level, employment in turbine and balance of plant component manufacturing will be promoted.
3	What is the role of project proponent in CDM and Kyoto Protocol?	Torrent as a responsible corporate citizen volunteers to support the cause behind Kyoto Protocol. The group believes that all developmental projects should be evaluated against their potential for emission/discharge/disturbance reduction and environment restoration opportunities.
4	Will the installation of wind farm affect the rainfall in the region?	Wind turbines only extract energy from the wind and do not affect the rain fall.
5	Does the project affect grazing of cattle?	It does not affect grazing of cattles as windfarm is located far away from villages.
6	How do CO_2 emissions contribute to global warming?	CO_2 emissions when present in the atmosphere prevent escape of solar heat energy from the earth's surface, resulting in heat build-up and global warming.
7	What is the impact of noise of WTGs on human life?	The intensity of sound generated by the wind turbines is maximum at the hub height but it is not discomforting to humans or other living beings, as the noise generated is within permissible limits.
8	Does the installation of wind farm affect the ground water level in the nearby villages?	No, the wind farm installed in the region does not affect either ground water level or drinking water quality of area nearby to the project site.

Sr No	Answer / outcome	Answer / outcome
	NGOs	
1	What are the safety practices to be adopted for this project?	Safety at windfarm site is of paramount importance for project proponent and contractor at all stages of development, construction, installation & commissioning and lifetime operation and maintenance. Employees will be given health and safety training to perform work at all the stages. Safety Health and Environment (SHE) Manual will be followed for each type of activities to be performed.
	Employee's Concerns	
1	How many CDM projects have happened in India so far?	Atleast 100 wind power projects are at various stages of registration (validation/registered) with UNFCCC under CDM Mechanism.
2	Does this project require new skills and how are you going to provide them?	The engineers and technicians to be employed for the project will undergo enhancement of skill through appropriate training as required for the type of activity to be performed. Safety training is provided by Enercon at Site as well as Enercon training academy at Daman.
3	Does this project lead to cost savings in energy production as compared to conventional fossil-fuel projects?	Wind projects cost is generally higher compared to conventional power plants. CDM benefits are expected to offset partially this disadvantage.

Project proponent has also circulated questionnaire to the stakeholders for their concerns and opinion. The responses received to the questionnaire are summarised in table below:

No	Questions	Option	Numbers	Ratio (%)
1	How much do you know about wind power projects?	A lot	14	31
		A little	30	67
		Nothing	1	2
2	What do you think are the positive impacts the proposed project will have on your life?	More stable power supply	36	80
		More employment opportunities	36	80
		Improvement of living standards	27	60
		Improvement	36	80

No	Questions	Option	Numbers		Ratio (%)
		in local area			
3	What do you think are the negative impacts the proposed project will have on your life?	Livelihood	Significant	2	4
			Minor	2	4
			No Impact	41	91
		Use of land	Significant	1	2
			Minor	40	89
			No Impact	4	9
4	The negative impacts of the project construction on the environment.	Significant	0		0
		Minor	3		7
		No Impact	42		93
5	The positive impacts of the project construction on the local economic development	Significant	16		36
		Minor	2		4
		No Impact	27		60
6	Do you support the project construction?	Yes	45		100
		No	0		0

Subsequent to questions and answers, chairman summarized the concerns articulated and clarifications provided.

The stakeholders were appreciative of the project being undertaken. They were in agreement on the beneficial effects of the said project activity and expressed their views that such type of projects should be promoted.

Further, Shri Ravikant Vyas from TPL thanked the chair and also all the stakeholders who participated in the meeting for their time and effort taken to come to the venue of the meeting and for sharing their opinion about the project.

The MoM was signed by Chairman and Deputy Chairman of the meeting.

Further, no comments were received in writing from the various stakeholders in response to the notice dated 14/10/2011 by 25/10/2011, the date stipulated in the notice.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Represented by:	
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding or Official Development Assistance is involved.

Annex 3

BASELINE INFORMATION

Computation of the Grid Emission Factor:

The Operating Margin data for the most recent three years and the Build Margin data for the NEWNE Electricity Grid as published in the CEA database (Version 7.0) are as follows:

Operating margin CO_2 emission factor ($EF_{grid,OM,y}$)				
Parameter	**2008-09**	**2009-10**	**2010-11**	**Source / Reference**
Simple Operating Margin Emission Factor NEWNE Grid (tCO_2/MWh)	1.0066	0.9777	0.9707	"CO2 Baseline Database for Indian Power Sector" Version 7.0 published by the Central Electricity Authority, Ministry of Power, Government of India available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Net Generation in OM in NEWNE Grid (GWh)	421,803	458,043	476,987	
Net electricity import from SR (GWh)	0	4,284	0	
Net generation including imports in NEWNE Grid (GWh)	421,803	462,327	476,987	
Weighted average Simple Operating Margin Emission Factor (tCO_2/MWh) = (1.0666*421,803+0.9777*462,327+0.9707*476,987)/(421,803+462,327+476,987) = 0.9842				
Note: Three year generation weighted average of Operating margin CO2 emission factor has been calculated following the guidelines provided in "Tool to Calculate the emission Factor for an Electricity System" - Version 02.2.1				

Build margin CO_2 emission factor ($EF_{grid,BM,y}$)		
Parameter	**NEWNE Grid (tCO_2/ MWh)**	**Source / Reference**
Build Margin - 2010-11	**0.8588**	"CO2 Baseline Database for Indian Power Sector" Version 7.0 published by the Central Electricity Authority, Ministry of Power, Government of India available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
$EF_y = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}$		
Combined margin CO_2 emission factor ($EF_{grid,CM,y}$ or EF_y)		

Parameter	Notations	Unit	Value	Source / Reference
Operating margin CO2 emission factor	$\mathbf{EF_{grid,OM,y}}$	tCO_2/ MWh	0.9842	Please refer to the above
Build margin CO2 emission factor	$\mathbf{EF_{grid,BM,y}}$	tCO_2/ MWh	0.8588	Please refer to the above
Weighting of operating margin emissions factor	$\mathbf{w_{OM}}$	%	75%	According to Tool to Calculate the emission Factor for an Electricity System" - Version 02.2.1
Weighting of build margin emissions factor	$\mathbf{w_{BM}}$	%	25%	
Combined margin CO2 emission factor	$\mathbf{EF_{grid,CM,y}}$ **or** $\mathbf{EF_y}$	tCO_2/ MWh	**0.9528**	Calculated as (0.9842*0.75+0.8588*0.25)
Note: Combined margin CO_2 emission factor has been calculated following the guidelines provided in "Tool to Calculate the emission Factor for an Electricity System" - Version 02.2.1				

Computation of Baseline emission:

Baseline Emission			
Parameter	**Unit**	**Value**	**Reference / Supportive / Source**
No of WTGs	N/A	62	No of WTGs - Enercon E-53 make
Capacity of each WTG	KW	800	Rated capacity of each WTG - Enercon E-53 make
Total project capacity	MW	49.6	Calculated based on the no of WTGs and capacity of each WTG (62*0.800)
PLF	%	20.60%	Energy Yield Report of Consultant
Operating hours in a year	Hours	8,760	Calculated based on no of days in a year and no of hours in a day (24*365)
Net electricity supplied by the project activity (EG_y)	MWh	89,506	Calculated based on total project capacity, PLF and operating hours (49.6*21%*8,760)
Combined Margin CO2 emission factor of the grid (NEWNE Grid) / Baseline emission factor ($EF_{grid, CM, y}$)	tCO_2/ MWh	0.9528	Calculated as per the guidelines provided in "Tool to Calculate the emission Factor for an Electricity System"- Version 02.2.1. Data source: "CO2 Baseline Database for Indian Power Sector" Version 07.0 published by the Central Electricity Authority, Ministry of Power, Government of India.
Baseline emission per annum (BE_y)	tCO_2	**85,281**	(89506*0.9528)

Annex 4

MONITORING INFORMATION

1. The Monitoring Plan

This Annex 4 serves as the Monitoring Plan (MP) for the "Wind power project in Jamnagar District, Gujarat, India". The MP presents a plan to meet the requirements for the collection, processing and reporting of data required to fulfil the requirements in decision 3/CMP.1. It describes management systems and procedures to be implemented by project proponent upon project implementation in order to ensure consistent project operation as well as monitoring, processing and reporting of data required for the calculation of emission reductions (ERs) taking into account approved consolidated monitoring methodology ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", Version 12.3.0.

If necessary, the MP can be updated and adjusted to meet operational requirements, provided such modifications are approved by a Designated Operational Entity (DOE) during the process of validation and/or verification.

2. Description of data required to be monitored

Approved monitoring methodology ACM0002 (Version 12.3.0, EB 66) Sectoral Scope: 1, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", by CDM - Meth Panel is proposed to be used to monitor the emission reductions.

The MP foresees recording of the following parameters during project operation in order to enable calculation of emission reductions from the project activity.

Table 1: Parameters to be monitored for calculation of emissions reduction:

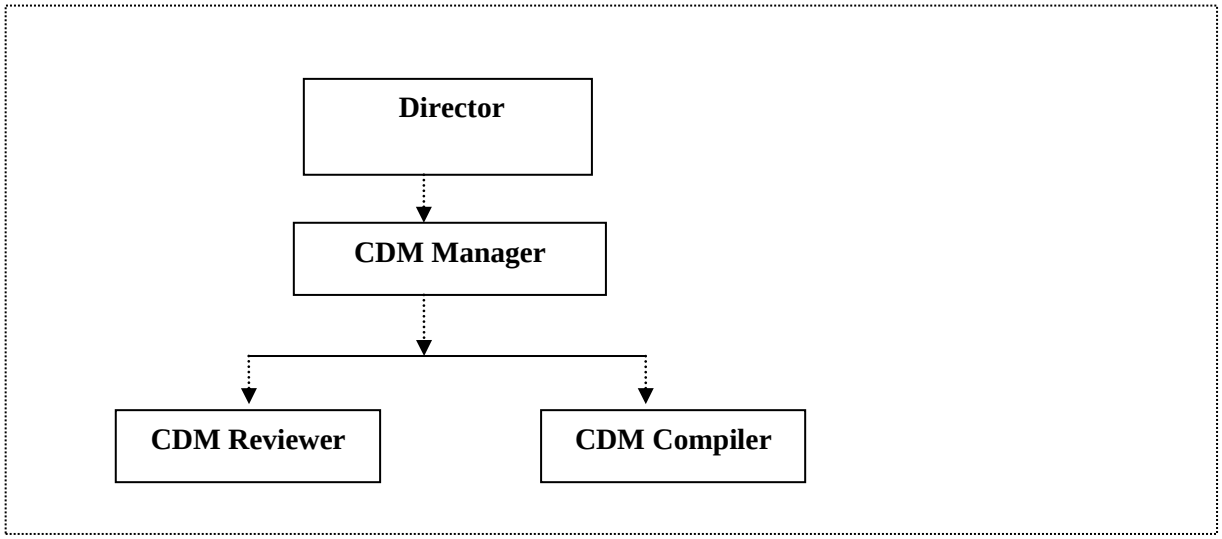
Data / Parameter:	**$EG_{PJ,y}$**
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data to be used:	Share Certificate issued by State Load Dispatch Centre (SLDC), Gujarat
Any comment:	The data will be archived for the entire crediting period and 2 years post crediting period in electronic or paper form.

Data / Parameter:	**$EG_{LCS,y}$**
Data unit:	MWh/yr
Description:	Summarised quantity electricity generation recorded at LCS of WTG

Source of data to be used:	Generation at controller as recorded through SCADA system/ Centralised Monitoring System of O&M contractor
Any comment:	The data will be archived for the entire crediting period and 2 years post crediting period in electronic or paper form.

3. Description of organizational structures & procedures for collection, processing, review, storage and reporting of data

A) CDM Organization Structure:



B) CDM responsibility matrix:

Table 2: CDM responsibility matrix

S/No	Designation	Responsibilities
1	Director	• Implement the organization structure. • Issue office orders, authorizing the CDM Manager to implement the PDD and the Monitoring plan and delegating to him all powers in relation thereto.
2	CDM Manager	• Direct the CDM team (CDM Reviewer and CDM Preparer) in relation to conformance with PDD and monitoring plan. • Storage of aggregated data • Coordinate with DOE during verification process. • Randomly check data wherever necessary to check the

		authenticity of data independently and take corrective actions wherever required. • Resolve all conflicts in relation to CDM project activity. • Implement the PDD and the Monitoring Plan.
3	CDM Reviewer	• Review of Monitoring Report • Report non-conformances with PDD, Monitoring plan and CDM manager's directions. • Ensuring calibration of the monitoring equipments as and when required.
4	CDM Compiler	• Data collection • Data processing • Calculate ER • Preparation of Monitoring Report

Appendix 1

ACTION PLAN TOWARDS CORPORATE SOCIAL RESPONSIBILITY FOR SUSTAINABLE DEVELOPMENT

Background

The National CDM Authority has mandated the project proponent to commit a minimum of 2% earning (net realization value) of proceeds from sale of Carbon Credits towards sustainable development including society/community development[15]. In addition to investment in the Renewable Energy Project, which in itself is a significant contribution to the cause of sustainable development, the project proponent proposes to enhance its contribution further by identifying and contributing towards suitable community initiatives.

Implementation and Monitoring of Contribution

Based on the preliminary understanding of issues faced by societies in general, it is expected that healthcare, sanitation, education could be potential focus areas. The scope of activities could include but not be limited to organizing medical camps, providing amenities to village schools such as furniture, stationary, buildings, toilets, mid-day meal program, sanitation programs in several villages and such other activities. However, as part of the company's assessment of prevailing local requirements, the nature and scope of work would be modified and taken-up suitably going forward.

The project proponent proposes to commit the expenditure over the entire crediting period and not on a year on year basis suggesting that it is possible that in some years the expenditure would be more than 2% and in some years less than 2%. By the end of the crediting period, the project proponent would have incurred 2% of the total net proceeds on community initiatives. This option is proposed as against a year on year approach to take care of issues such as non sale of credits in a given year due to market factors, accrual of substantially large proceeds in a given year owing to a market upswing or sale of aggregated credits stifling the ability to spend a large amount efficiently in one year, etc.

The expenditure incurred by the project participant can be monitored either through invoices/receipts received or such other means.

[15] News, For Large Scale CDM Project, http://www.cdmindia.in/detail_news.php?id=3

Appendix 2 - Benchmark Calculation

"Guidelines on the Assessment of Investment Analysis" - Version 05, paragraph 13, states that "*In the cases of projects which could be developed by an entity other than the project participant, the benchmark should be based on parameters that are standard in the market."* Since, the project activity could have been implemented by an entity other than the project participant, the benchmark RoE has been calculated taking values from publically available and reliable data sources that are frequently used in investment analysis.

Calculation of benchmark RoE[16]:

The bench mark RoE (i.e. cost of equity) for the project has been calculated using the Capital Asset Pricing Model (CAPM). As per CAPM, the cost of equity investment is the return of a risk-free security plus beta times the difference between the market return and the risk-free return.

While considering a new project, CAPM can provide the required rate of return that the project needs to yield, taking into account the volatility (risk) of the stock relative to the market (Beta). This required return on equity represents the cost of equity for the project.

The formula of CAPM is as follows:

$Ke = R_f + \beta \times (R_m - R_f)$

Where:
Ke = Rate of return on equity capital;
R_f = Risk-free rate of return;
B = Beta;
$R_m - R_f$ = Market risk premium;

Risk free rate:
The risk free rate is the rate of return on an asset that is theoretically free of any risks. Generally, the rate of interest on government bonds is considered as risk free rates. The long term government bond rates are suitable indicators of risk free rates when the time horizon for the investment is long term.

Accordingly, Yield to Maturity (YTM) of Government Securities as on October, 2009 for 20 years maturity has been selected to represent the Government bond rate. YTM is nothing but the internal rate of return earned by an investor who buys the bond today (either in the auction or in the secondary market) assuming that the bond is held until maturity. (Source: No 26C, Page 1246, RBI Monthly bulletin, Dec 2009, http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/26CT_CSB1209.pdf)

[16] The detailed calculation of RoE is provided in excel sheet

The applicable risk free rate is 8.2187%.

Risk Premium:

The risk premium is the return that an investor expects over and above the risk free return available in the market. The market risk premium has been estimated using historical approach. The most common method of calculating risk premium is the difference between historical return of the stock market index and the return of the risk free rate. It is preferred to use long term premiums, since considering shorter time periods can lead to large standard errors because of volatility in stock prices. It is also preferred to calculate the risk premium based on geometric mean of the stock market returns since arithmetic mean overstates the risk premium.

The market return can be calculated from any of the following available indices on BSE stock exchange:

Sr No	Index	Number of companies representing index
1.	BSE-Sensex	30
2.	BSE 100	100
3.	BSE-200	200
4.	BSE-500	500

The broader market indices represent most of the market and thus are reflective of how the whole market is moving. Though BSE 500 index provides the broader market index in calculation of Benchmark, project participant had selected BSE-200 for the calculation of benchmark as only 11 years data were available for BSE-500 index to calculate market return. Since, equity IRR is calculated using an assessment period of 20 years, the calculation of benchmark using the 19 years publicly available data of BSE-200 Index on BSE website is more appropriate. The risk premium has been calculated as the difference in compounded annual return between the BSE-200 since January, 1991 and risk free rate. The detailed calculations are presented in the excel sheet. (Source: BSE Stock Exchange (www.bseindia.com))

The applicable risk premium is estimated as 7.7210%.

Beta:

Beta (β) indicates the sensitivity of the company to market risk factors.

Beta values of companies with investment in power sector have been considered for calculation of average beta. Empirical tests often assume beta is stable for five or more years[17]. Hence, five years daily closing share prices of the following companies and daily closing value of BSE-200 have been used in calculation of Beta. The detailed calculations are presented in the excel sheet. (Source: BSE Stock Exchange (www.bseindia.com))

Companies	**Period considered for calculation**			
	From	**To**	**Years**	**Beta Value**
Tata Power Co.	1-Jan-05	31-Dec-09	5.00	1.00
Neyveli Lignite	1-Jan-05	31-Dec-09	5.00	1.30
NTPC	1-Jan-05	31-Dec-09	5.00	0.82
JP Power Ven.	18-Apr-05	31-Dec-09	4.71	1.28
CESC Ltd	1-Jan-05	31-Dec-09	5.00	0.97
Average				**1.07**

The applicable risk beta value is estimated as1.07.

Hence, $Ke = R_f + \beta \times (R_m - R_f)$

= 8.2187% +1.07* 7.7210%
= **16.51%**

Therefore, benchmark RoE for the project is 16.51%.

[17] **1)** para 3, page 11, http://web.mit.edu/lewellen/www/Documents/ConditionalCapm.pdf, **2)** "Investment Analysis and Portfolio Management" by Prasanna Chandra, 3rd edition, chapter 8, Capital Asset Pricing Model and Arbitrage Pricing Theory, page 257 **3)** Financial Management, by I.M. Pandey, 9th edison, chapter 6, Beta Estimation and cost of equity, page no 108.

Appendix 3 – Location Details

The details of physical location of project activities are provided as follows:

Sr. No.	Location No.	Village	Taluka	District	Latitude			Longitude		
					Deg	Min	Sec	Deg	Min	Sec
1	74	Govana	Lalpur	Jamnagar	22	8	15.2	69	53	55.3
2	225	Bhangol	Bhanvad	Jamnagar	22	6	24.2	69	49	28.0
3	226	Bhangol	Bhanvad	Jamnagar	22	6	14.6	69	49	56.0
4	227	Bhangol	Bhanvad	Jamnagar	22	6	11.4	69	49	37.7
5	228	Bhangol	Bhanvad	Jamnagar	22	6	3.5	69	49	39.7
6	229	Bhangol	Bhanvad	Jamnagar	22	5	55.3	69	49	42.0
7	230	Bhangol	Bhanvad	Jamnagar	22	5	46.9	69	49	32.0
8	231	Bhangol	Bhanvad	Jamnagar	22	6	33.5	69	50	10.8
9	232	Bhangol	Bhanvad	Jamnagar	22	6	28.9	69	50	25.7
10	233	Bhangol	Bhanvad	Jamnagar	22	6	22.4	69	50	28.9
11	234	Bhangol	Bhanvad	Jamnagar	22	6	6.1	69	50	32.7
12	235	Bhangol	Bhanvad	Jamnagar	22	5	20.5	69	49	25.7
13	265	Jampar	Bhanvad	Jamnagar	22	2	13.9	69	45	53.6
14	266	Morzar	Bhanvad	Jamnagar	22	2	12.7	69	46	26.1
15	267	Morzar	Bhanvad	Jamnagar	22	2	23.4	69	46	29.0
16	269	Chokhanda	Bhanvad	Jamnagar	22	2	54.9	69	46	59.8
17	270	Chokhanda	Bhanvad	Jamnagar	22	3	12.6	69	46	51.4
18	272	Shedhakhai	Bhanvad	Jamnagar	22	2	20.8	69	47	53.7
19	274	Shedhakhai	Bhanvad	Jamnagar	22	2	10.7	69	48	26.6
20	275	Shedhakhai	Bhanvad	Jamnagar	22	2	8.5	69	48	35.7
21	276	Shedhakhai	Bhanvad	Jamnagar	22	2	31.2	69	48	35.0
22	277	Shedhakhai	Bhanvad	Jamnagar	22	2	41.8	69	48	27.1
23	278	Kabarka	Bhanvad	Jamnagar	22	2	23.2	69	49	34.4
24	279	Kabarka	Bhanvad	Jamnagar	22	2	17.6	69	49	50.0
25	280	Kabarka	Bhanvad	Jamnagar	22	2	10.2	69	49	47.8
26	281	Kabarka	Bhanvad	Jamnagar	22	2	9.9	69	50	0.7
27	285	Kabarka	Bhanvad	Jamnagar	22	1	55.2	69	50	26.5
28	287	Kabarka	Bhanvad	Jamnagar	22	1	43.3	69	49	52.9
29	288	Kabarka	Bhanvad	Jamnagar	22	1	30.4	69	49	50.4
30	289	Kabarka	Bhanvad	Jamnagar	22	1	43.4	69	49	33.9
31	290	Morzar	Bhanvad	Jamnagar	22	0	47.6	69	48	44.6

Sr. No.	Location No.	Village	Taluka	District	Latitude			Longitude		
					Deg	Min	Sec	Deg	Min	Sec
32	291	Morzar	Bhanvad	Jamnagar	22	0	39.6	69	48	50.0
33	375	Govana	Lalpur	Jamnagar	22	7	58.0	69	53	35.7
34	376	Govana	Lalpur	Jamnagar	22	8	13.2	69	53	35.8
35	377	Govana	Lalpur	Jamnagar	22	8	7.1	69	53	54.2
36	382	Dharampur	Lalpur	Jamnagar	22	6	45.3	69	54	57.7
37	383	Dharampur	Lalpur	Jamnagar	22	6	44.6	69	54	39.4
38	393	Kathitad	Lalpur	Jamnagar	22	4	48.7	69	55	17.3
39	396	Dharampur	Lalpur	Jamnagar	22	5	23.3	69	55	55.8
40	401	Tebhda	Lalpur	Jamnagar	22	5	54.1	69	56	44.5
41	402	Tebhda	Lalpur	Jamnagar	22	6	1.7	69	56	42.5
42	403	Tebhda	Lalpur	Jamnagar	22	6	5.0	69	56	30.7
43	405	Tebhda	Lalpur	Jamnagar	22	6	30.4	69	56	28.0
44	406	Dharampur	Lalpur	Jamnagar	22	6	57.4	69	56	20.9
45	407	Dharampur	Lalpur	Jamnagar	22	7	25.1	69	56	16.4
46	408	Dharampur	Lalpur	Jamnagar	22	7	32.9	69	56	16.4
47	409	Dharampur	Lalpur	Jamnagar	22	7	49.7	69	55	56.3
48	411	Tebhda	Lalpur	Jamnagar	22	7	33.9	69	57	3.5
49	412	Tebhda	Lalpur	Jamnagar	22	7	29.0	69	57	11.3
50	416	Tebhda	Lalpur	Jamnagar	22	7	0.2	69	57	16.8
51	417	Tebhda	Lalpur	Jamnagar	22	6	52.6	69	57	15.0
52	418	Tebhda	Lalpur	Jamnagar	22	6	49.9	69	57	26.3
53	419	Tebhda	Lalpur	Jamnagar	22	6	43.1	69	57	32.7
54	420	Tebhda	Lalpur	Jamnagar	22	6	38.2	69	57	33.9
55	450	Ghunda	Jamjodhpur	Jamnagar	22	4	2.3	69	58	18.7
56	451	Ghunda	Jamjodhpur	Jamnagar	22	3	52.9	69	58	3.2
57	452	Ghunda	Jamjodhpur	Jamnagar	22	3	59.0	69	57	46.9
58	454	Ghunda	Jamjodhpur	Jamnagar	22	3	17.6	69	57	17.1
59	455	Ghunda	Jamjodhpur	Jamnagar	22	3	13.0	69	57	19.3
60	456	Ghunda	Jamjodhpur	Jamnagar	22	3	7.9	69	57	21.8
61	458	Ghunda	Jamjodhpur	Jamnagar	22	2	54.5	69	57	52.8
62	459	Ghunda	Jamjodhpur	Jamnagar	22	2	50.8	69	58	7.8