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: Green Energy Project at Kutch by Powerica Limited
Version: 06
Date of Completion: 02/09/2012

A.2 Description of the project activity:

>>
Powerica Limited is the largest genset manufacturer in India. Founded in 1980, it is the project proponent of the wind power project under the Clean Development Mechanism of Kyoto Protocol. Effective utilization of resources has been a guiding factor for Powerica towards conceptualization of a 21.6 MW wind power project in Gujarat. This project aims at providing electricity to the state of Gujarat through effective utilization of renewable resource which, in the case of the project activity, is wind power.

The project activity is the installation and generation of 21.6 MW (12 units of Vestas make 1.8 MW V100 WTGs) through utilization of wind energy at Kutch district of Gujarat. The specifications of these machines have been provided in Section A.4.3 of this PDD.

The project will be utilizing wind energy for exporting electricity which otherwise would have been generated through alternate fuels (most likely - fossil fuel) based power plants, contributing to reduction in specific emissions (emissions of pollutant) including GHG emissions. Hence, the electricity grid has been taken as the baseline to the project activity as further demonstrated in Section B.4 of this document while information of gases & emission sources in baseline & project activity have discussed in Section B.3 of this document. Details of monitoring of emission reductions have been provided in section B.7.1 and B.7.2 and their calculation have been provided in Section B.6.3 of this document. Being a renewable resource, using wind energy to generate electricity contributes to resource conservation. Powerica will be developing this project keeping in consideration of the funding available under the Clean Development Mechanism (CDM) of the United Nations Framework Convention on Climate Change. This is because the project activity qualifies as a CDM project as it would be feeding clean power to the electricity grid thereby helping in significant reduction of GHG emissions. The project activity is also responsible for sustainable economic growth and conservation of environment through use of wind as a renewable source. The generated electricity will displace equivalent electricity (generated from fossil fuel sources) that would have otherwise been supplied by the state electricity board.

Views of the project participant on contribution of the project activity to sustainable development:
The Designated National Authority (DNA) for the Government of India (GoI) on the Ministry of Environment and Forestry (MoEF), called the National CDM Authority (NCDMA), has stipulated four indicators on sustainable development for Clean Development Mechanism (CDM) projects structured in India. The project participants' view on the contribution of this project activity towards sustainable development follows these four indicators as explained below:

Environment well being:

- **Reduction in the consumption of fossil fuels:** The installation of power plant generating electricity through utilization of renewable resource such as wind power, would lead to reduction in usage of fossil fuels such as coal.

- **Reduction in emission of GHG:** The reduction in usage of fossil fuels for electricity generation will result in reduction of the release of associated GHG emissions (CO_2 and CH_4 emissions).
- **Improvement of Air Quality:** The use of renewable energy for power generation will avoid the emission of air pollutants such as Suspended Particulate Matter (SPM), Sulphur Dioxide (SO_2) and Nitrogen Oxides (NO_x) thereby improvising the surrounding air quality
- **Conservation of Natural Resources:** Installation of wind power plant will result in conserving fast depleting natural resources such as coal, oil etc.

Economic well being:

- **Rural Development:** The installation of wind power project will result in rural and infrastructural development in the surrounding rural areas
- **Economic Development:** The generation of wind power will result in improvising the reliability of the NEWNE Grid and thereby enhance economic development in the region.

Social well being:

- **Generating Local Employment:** The installation of wind power project in rural areas will result in generating local employment opportunities and capacity building of the local employees.
- **Encouragement to entrepreneurs:** The project will provide encouragement to other entrepreneurs to invest into renewable energy sources.

Technological well being:

- The project activity involves the successful installation and operation of state-of-art wind turbine generators (WTGs) of Vestas make. The implementation of these new technologies will help in increasing reliability of renewable energy generation and encourage development of even better technology in the future.

Community Development:

Powerica would use, at a minimum, 2% of the revenues accrued from the sale of Certified Emission Reductions (CERs) on an annual basis for community related activities. These may include providing assistance for development of public amenities in the surrounding areas such as water distribution/sanitation facilities/building of School and Hospital/ free distribution of educational books and school uniforms/annual eye camps/health check up centres for villagers etc.

If the activity undertaken involves capital expenditure exceeding the minimum requirement of 2%, the additional expenditure made would be setoff against the requirements for the subsequent years. Such expenditure would be made within one year after the realization of revenues from the sale of the CERs. Monitoring plan proposed for the expenditure is included in Annex 4 of the PDD.

A.3. Project participants:

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

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

>>
Kutch district, Gujarat, India

A.4.1.1. Host Party(ies):

>>
India

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

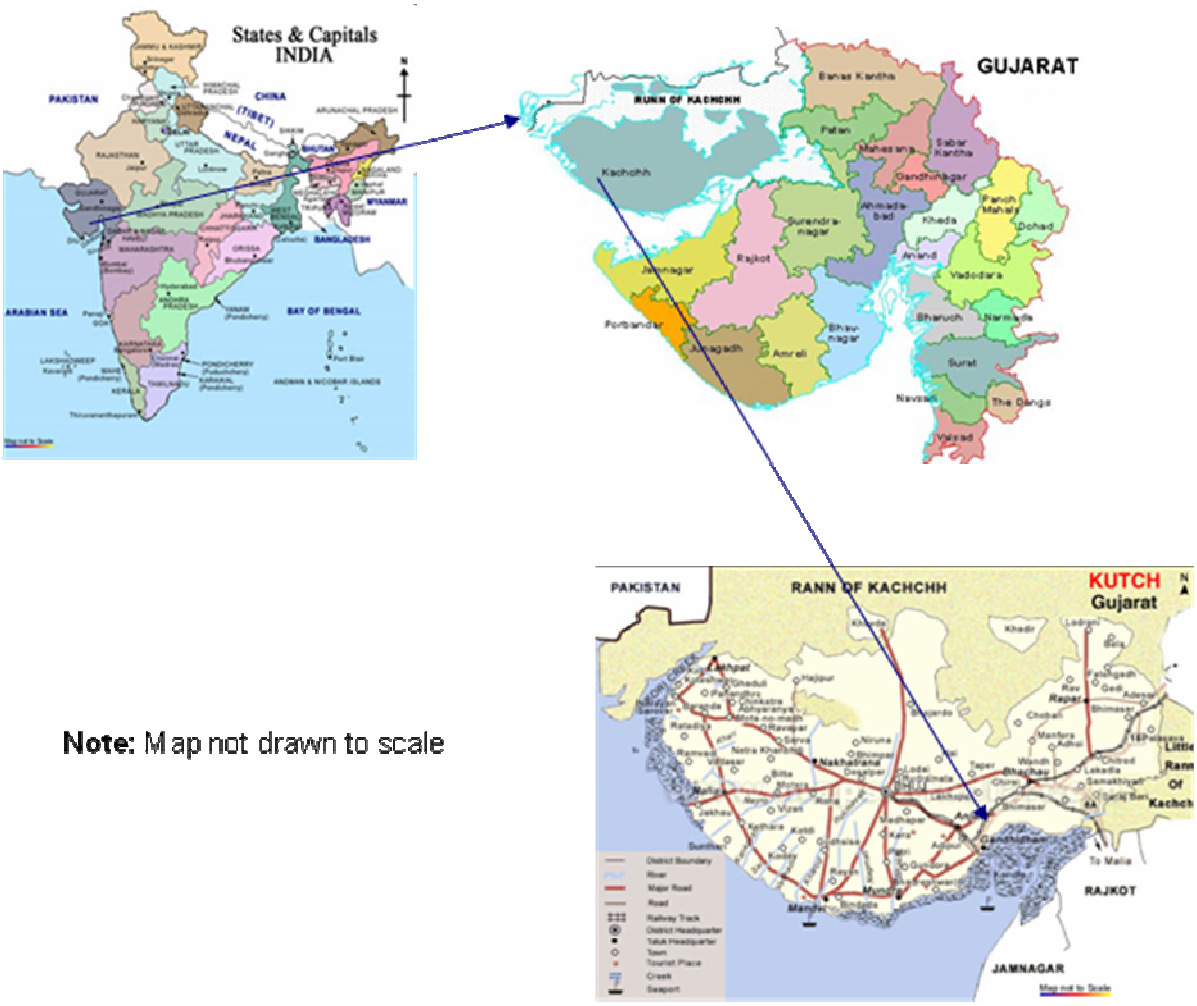
>>
Western Region / State: Gujarat

A.4.1.3. City/Town/Community etc:

>>
District: Kutch

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

>>
The project activity is located in Kutch district of Gujarat state. The project location and the wind map are attached in the figure below



Note: Map not drawn to scale

The unique location identification of project activity is given as below:

Sr.No	WTG No.	Latitude (N)	Longitude (E)	Village
1	JW10	23° 11' 56"	70° 32' 48"	Jangi
2	JW12	23° 12' 29"	70° 32' 13"	Jangi
3	JW13	23° 12' 12"	70° 32' 16"	Jangi
4	JW27	23° 12' 49"	70° 33' 35"	Jangi
5	JW30New	23° 11' 59"	70° 31' 55"	Jangi
6	JW9	23° 12' 3"	70° 33' 2"	Jangi
7	NM82-3	23° 11' 53"	70° 35' 26"	Vandhiya
8	NM82-4	23° 12' 5"	70° 35' 19"	Vandhiya
9	NM82-6	23° 11' 59"	70° 35' 47"	Vandhiya
10	NM82-7	23° 11' 53"	70° 35' 58"	Vandhiya
11	VW21	23° 12' 20"	70° 37' 30"	Vandhiya
12	VW32	23° 12' 12"	70° 37' 12"	Vandhiya

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

>>
Sectoral Scope 01: Energy Industries (renewable/non-renewable sources.).

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

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It is to be noted that the project activity is a greenfield project for generation of electrical energy using wind which is a renewable source of energy. Thus, this project actually displaces the electricity grid which is predominantly fossil-fuel based.

In wind energy generation, kinetic energy of the wind is converted into mechanical energy and subsequently into electrical energy. Wind turbines capture the wind's energy with three propeller-like blades, which are mounted on a rotor, to generate electricity. The turbines sit high atop towers, taking advantage of the stronger and less turbulent wind. As the wind blows through the blades of the windmill, a pocket of low-pressure air forms on the downwind side of the blade. The low-pressure air pocket then pulls the blade towards it, causing the rotor to spin. The rotor turns the shaft that further spins the connected generator. The spinning of this generator produces the required electricity. Since power is generated from wind energy, no emissions are attributed to the project emissions and emissions due to fossil-fuel based grid has been displaced due to the project activity. Detailed information of gases & emission sources in baseline & project activity have discussed in Section B.3 of this document.

Emission reductions will be claimed on the net electrical energy that is supplied to grid. Details of monitoring of emission reductions have been provided in section B.7.1 and B.7.2 and their calculation have been provided in Section B.6.3 of this document. The salient features of the technology utilized are:

Make	Vestas
Model	V100-1.8 MW
Lifetime	20 years
Rated Power	1,800 kW
Rotor diameter	100 m
Swept area	7,850 m^2
No. of blades	3
Cut in wind speed	4 m/s
Cut out wind Speed	20 m/s
Generator Type	Asynchronous with wound rotor, slip rings
Operating Temperature Range	-20^0C to 40^0C
Hub Height	80m

Source: Supply agreement Schedule 12APage 99

Generation of power through wind turbine has no sources of emission as discussed in detail in Section B.3 of this document. The electricity generated is monitored using electrical meters which provide a measure of the actual electrical energy that would have been sourced from a fossil-fuel based grid had it not been generated using wind energy. Hence, the fossil-fuel power based grid shall form the baseline to the project activity which has been developed in Section B.4 of this document. Further to this, a detailed monitoring procedure is provided in Section B.7 of this document. Typical generation figures of the WTGs have been provided in Section B.5 of this document.

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

>>

Years	Annual estimation of emission reductions in tonnes of CO_2e
Year 1	53,122
Year 2	53,122
Year 3	53,122
Year 4	53,122
Year 5	53,122
Year 6	53,122
Year 7	53,122
Total estimated reductions (tonnes of CO_2e)	**371,851**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	53,122

A.4.5. Public funding of the project activity:

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No public funding has been used in this 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: ACM0002, Version 12.3.0, EB 66
The methodology also refers to the latest approved versions of:

- "Tool to calculate the emission factor for an electricity system", Version 02.2.1, EB 63
- "Tool for the demonstration and assessment of additionality", Version 06.0.0, EB 66
- "Guidelines for the reporting and validation of plant load factors", Version 01, EB 48

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

>>
The adopted baseline methodology has been chosen for the project activity based on the fulfilment of the applicability conditions as described below:

Sr. No.	Applicability Conditions as per ACM0002	Applicability to this Project Activity
1.	The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit	The project activity is the installation of 21.6 MW wind energy based power plant in Gujarat.
2.	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	The project activity is a greenfield setup and does not involve capacity additions, retrofits or replacements.
3.	In case of hydro power plants, one of the following conditions must apply: • The project activity is implemented in an existing single or multiple reservoir, with no change in the volume of reservoir; • The project activity is implemented in an existing single or multiple reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; • The project activity results in new single or multiple reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	This is not a hydro power project. Hence, this applicability criterion is irrelevant.

Sr. No.	Applicability Conditions as per ACM0002	Applicability to this Project Activity
4	In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m2 all the following conditions must apply: • The power density calculated for the entire project activity using equation 5 is greater than 4 W/m2; • 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/m2, 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/m2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	This is not a hydro power project. Hence, this applicability criterion is irrelevant.
5.	This methodology is not applicable for project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be continued use of fossil fuels at the site	The wind-mills are being newly installed at the project sites Hence there is no fuel-switch from fossil fuel to renewable energy source in the proposed project activity.
6.	This methodology is not applicable for Biomass fired power plants	Not relevant to the proposed wind project activity
7.	This methodology is not applicable for Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2	Not relevant to the proposed wind project activity

This baseline methodology is used in conjunction with the approved monitoring methodology ACM0002, Version 12.3.0 ("Consolidated baseline methodology for grid-connected electricity generation from renewable sources").

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

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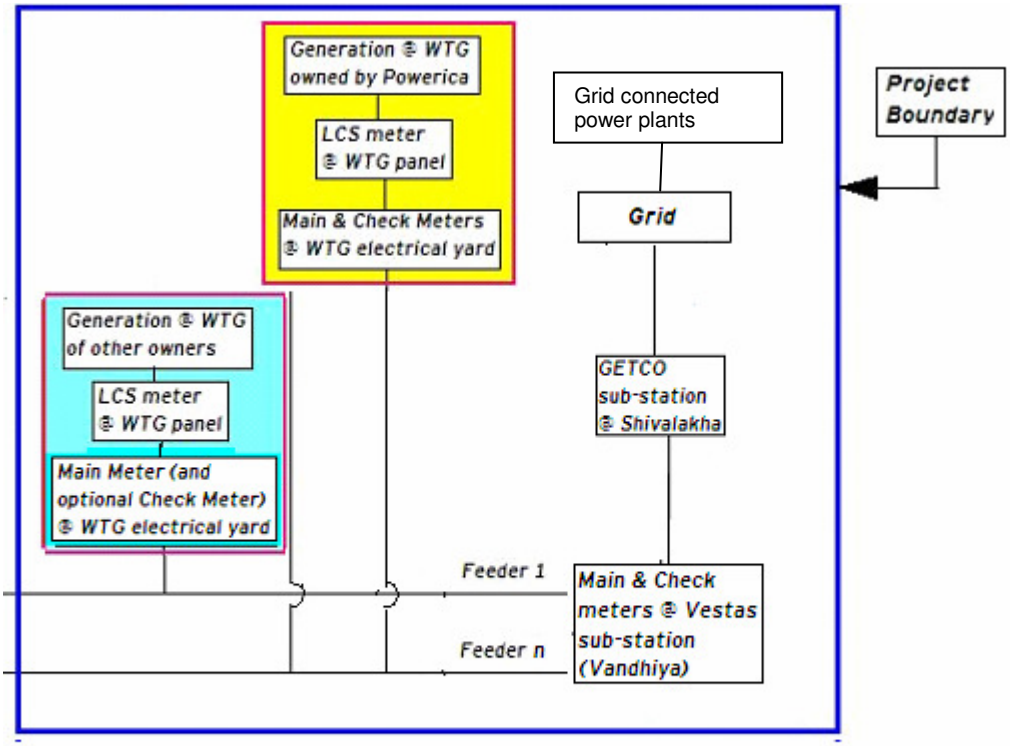
As per the **Approved consolidated baseline and monitoring methodology ACM0002**, the project boundary is "*The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to*."
As per the approved methodology, ACM0002, Version 12.3.0, following gases and emission sources has been included in the project boundary.



	Source	Gas	Included	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam.	CO_2	No	The present project activity is a greenfield wind power project. Hence, not relevant
		CH_4	No	
		N_2O	No	
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	The present project activity is a greenfield wind power project. Hence, not relevant
		CH_4	No	
		N_2O	No	

	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	The present project activity is a greenfield wind power project. Hence, not relevant
		CH_4	No	
		N_2O	No	

For most renewable energy project activities, $PE_y = 0$. However, for hydro, geo-thermal and similar categories of project activities, project emissions have to be considered.

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

>>

Identification of the baseline scenario

The project activity is the installation of a new wind power plant. This project is not a modification/ retrofit of any existing electricity generation facility. Hence, in accordance to the approved methodology ACM0002, Version 12.3.0, the baseline scenario for new installation facility is described as:

"*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 for an electricity system."*

Determination of emission factor figures have been calculated and provided in section B.6.1 of this PDD.

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

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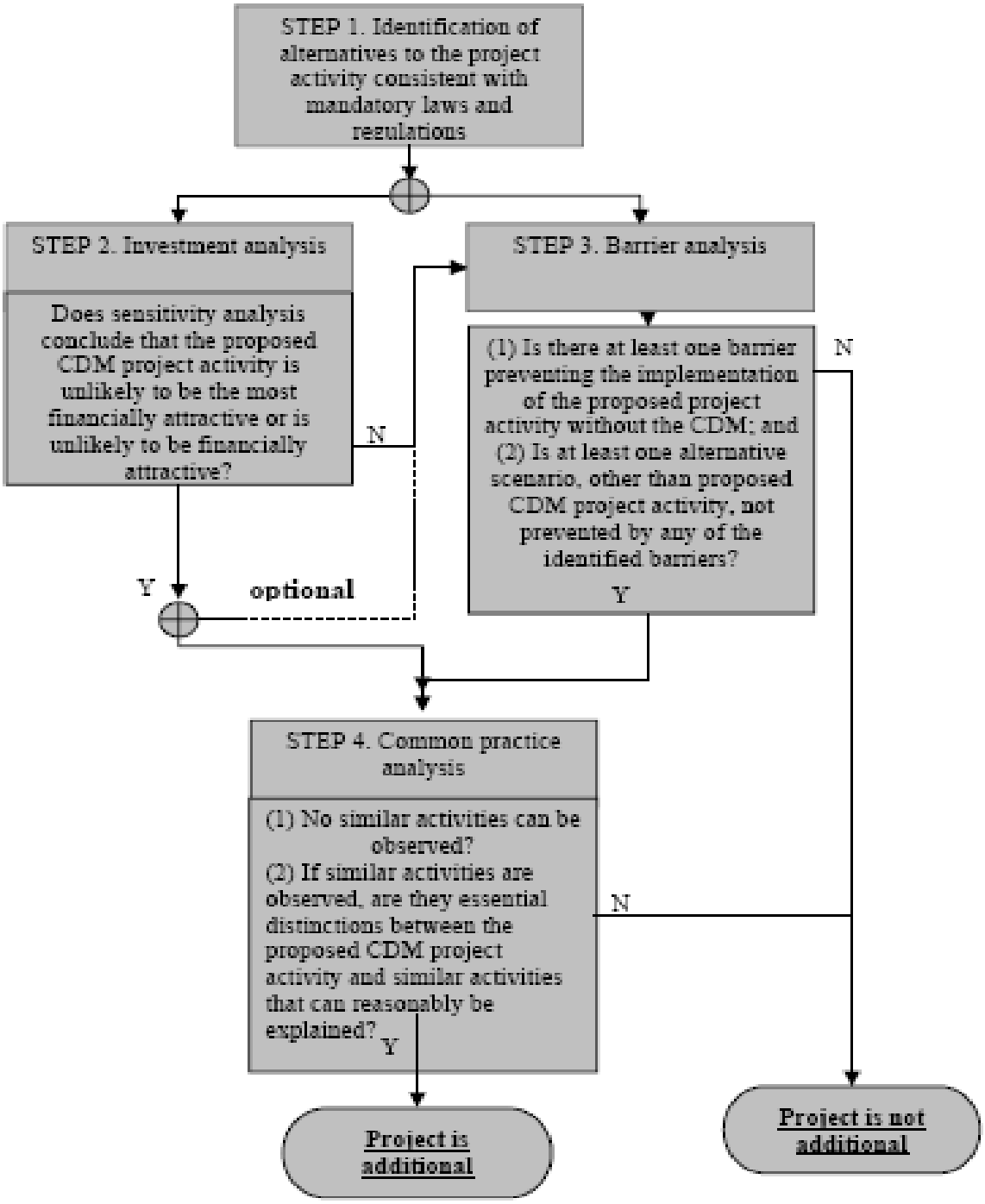
The project activity has been conceived as a CDM project since its inception. Powerica has taken CDM revenue right from the onset of this wind project. The evidence of the same can be verified by the Designated Operational Entities (DOE) at the time of project validation.

The additionality of the proposed project activity has been demonstrated below in accordance with the "Tool for the demonstration and assessment of additionality, Version 06.0.0 and as described in the following flow chart. This is followed by the descriptions of baseline and project scenarios and how emission reductions would occur in the project activity. The steps as per the additional tool are provided in the figure below:


STEP 1. Identification of alternatives to the project activity consistent with mandatory laws and regulations
STEP 2. Investment analysis
Does sensitivity analysis conclude that the proposed CDM project activity is unlikely to be the most financially attractive or is unlikely to be financially attractive?
N
Y
optional
STEP 3. Barrier analysis
(1) Is there at least one barrier preventing the implementation of the proposed project activity without the CDM; and (2) Is at least one alternative scenario, other than proposed CDM project activity, not prevented by any of the identified barriers?
Y
N
STEP 4. Common practice analysis
(1) No similar activities can be observed?
(2) If similar activities are observed, are they essential distinctions between the proposed CDM project activity and similar activities that can reasonably be explained?
Y
N
Project is additional
Project is not additional

Steps	Additionality Requirements	Status of Additionality Check
1.Identification of alternative to the project activity consistent with mandatory laws and regulations		
Sub-step 1(a): Define alternatives to the project activity Sub-step 1(b): Consistency with mandatory laws and regulations	Powerica has set up a 21.6 MW wind power project in order to generate electricity and supply the same to the state electricity grid. As per approved methodology ACM 0002 Version 12.3.0: *"If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:* *Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system"."* Thus as per the approved methodology, no other alternative scenarios are required to be identified or assessed. Further, the project activity conforms to all the applicable laws and regulations in India: • Power generation using wind energy is not a legal requirement or a mandatory option. There are state and sectoral policies, framed primarily to encourage wind power projects. These policies have also been drafted realizing the extent of risks involved in the projects and to attract private investments. • The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation. • There is no legal requirement on the choice of a particular technology for power generation.	The additionality check has crossed Step 1 and may proceed to Step 2 (Investment Analysis) followed by Step 4 (Common Practice Analysis). In the project case, Step 2 has been used for additionality check, followed by Step 3 and 4.
Step 2: Investment Analysis		
Step 2 (a): Determine appropriate analysis method	The project proponent proposes to generate the revenue by selling electricity to state electricity board. Hence a simple cost analysis is not applicable in the present situation. Further, as per guidance 19 of Annex 5, EB 62, "If the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used" Since the baseline situation for the project activity does not require the project proponent to make an investment, amongst the other two options, Investment Comparison Option and Benchmark analysis, the benchmark analysis has been adopted. Here, the Net Present Value of the equity for the project activity serves as a financial indicator to assess the attractiveness of the project activity. NPV is the sum of the present values of the	The additionality check has crossed Step 2(a). and can proceed to Step 2(b)

<table>
<tr><th>Steps</th><th>Additionality Requirements</th><th>Status of Additionality Check</th></tr>
<tr><td></td><td>individual cash flows. NPV is an indicator of how much value an investment or project adds to the firm. Moreover, calculating the NPV of the equity provides additional information regarding the extent of profit/loss the equity is expected to achieve in absolute terms (INR). It is because of this added information that the PP has chosen NPV as the financial indicator.</td><td></td></tr>
<tr><td>Step 2(b): Option III: Apply benchmark analysis</td><td>An investment analysis of the project activity was conducted by estimating the Net present Value (NPV) of investment involved in the project. The discounting rate for the project has been chosen as 18.44%. This discounting rate is the benchmark applicable to independent power producers in the country implementing similar projects and has been arrived at following the Capital Asset Pricing Model.

$R_i = R_f + \beta * (R_m - R_f)$
where,
<table><tr><td>R_i</td><td>Market based returns on equity</td></tr><tr><td>R_f</td><td>Risk-free Return at the time of decision making</td></tr><tr><td>β</td><td>Average of Beta value among 8 power sector companies for 5 year period from 01/02/2006 - 01/02/2011</td></tr><tr><td>R_m</td><td>Risk Premium</td></tr></table>
For the present project activity, the Reserve Bank of India’s average Government yield to maturity rate has been adopted as the risk-free rate of return which stood at 8.3920 % for an investment term of 20 years, as per the report published by the RBI on January 12, 2010[1].

The Beta value has been taken to be the average of the 5 year beta values of the following companies which are listed on the BSE 500:
1. CESC Ltd.
2. Gujarat Industries Power Co. Ltd
3. KSK Energy Ventures Ltd.
4. Neyveli Lignite Corp.
5. Tata Power Co. Ltd.
6. Torrent Power Ltd.
7. Jaiprakash Power Ventures Limited
8. NTPC

The average Beta value for all these companies is 1.1502 and this has been considered for the benchmark calculation.

The risk premium value has been arrived at by calculating the Compound Annual Growth Rate for the BSE-500 since its base year</td><td></td></tr>
</table>

[1] http://www.rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=11891

<table>
<tr><th>Steps</th><th>Additionality Requirements</th><th>Status of Additionality Check</th></tr>
<tr><td></td><td>(1999) on a base value of 1000. At the time of decision making, the BSE-500 had a low of 6701.52. Hence, the risk premium value is

= R_m = {(6701.52/1000)^(1/12.03) – 1} = 17.13%

wherein, 11.83 years has been the gap between the base year and the date of decision making for the project activity.

Hence, R_i = 8.3920 + 1.1502* (17.13 – 8.3920) = 18.44%</td><td></td></tr>
<tr><td>Step 2 (c): Calculation and comparison of financial indicators</td><td>The following assumptions have been made for conducting the financial analysis:
(Note: 1 Lakh INR= 100,000 INR)

<table>
<tr><td>Capacity of the wind project</td><td>21.6 MW</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>No. and capacity of machines</td><td>12 Nos. X 1.8 MW</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Gross Annual Generation</td><td>62.08 Lakh kWh/WTG</td><td>Quotes provided by WTG provider[2]</td></tr>
<tr><td>Transmission losses</td><td>4%</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Machine Availability</td><td>95%</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Grid Availability</td><td>95%</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Wind Uncertainty</td><td>6%</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Net Annual Generation incl. of above loss factors</td><td>50.57 Lakh kWh/WTG</td><td>Calculated</td></tr>
<tr><td>Annual O&M Costs</td><td>INR 28 Lakh/WTG</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>% Escalation in O&M charges p.a.</td><td>7.5%</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Power Tariff</td><td>INR 3.56/kWh</td><td>GERC Order dated 30-01-2010[3]</td></tr>
<tr><td>Tax holiday u/s 80IA available for</td><td>15 years</td><td>Income Tax Law[4]</td></tr>
<tr><td>Total Project Cost including land cost</td><td>INR 16080 Lakh</td><td>Quotes provided by WTG provider</td></tr>
<tr><td>Fund</td><td>Equity 100 %
Debt 0 %</td><td></td></tr>
<tr><td>Book Depreciation</td><td>5.28%</td><td>Schedule XIV of the Company’s Act 1956</td></tr>
</table>
</td><td></td></tr>
</table>

<table>
<tr><th>Steps</th><th>Additionality Requirements</th><th>Status of Additionality Check</th></tr>
<tr><td></td><td>
<table>
<tr><td>IT Depreciation</td><td>100%</td><td>Income Tax Act 1961
80% depreciation (http://www.gwec.net/fileadmin/images/India/IWEO_2011_lowres.pdf, page 19) + 20% additional depreciation as per (http://www.taxmanagementindia.com/visitor/detail_article.asp?ArticleID=1544)</td></tr>
<tr><td>Corporate tax rate</td><td>33.22%</td><td>As per local tax laws[5]</td></tr>
</table>

The Equity NPV works out to INR -3310.72 Lakhs keeping the above data in consideration without CDM Revenues.</td><td></td></tr>
<tr><td>Step 2 (d): Sensitivity Analysis</td><td>As per paragraph 20 of "Guidelines on the Assessment of Investment Analysis" Version 05, EB 62, Annex 5, "the purpose of the sensitivity analysis is to determine in which scenarios the project activity would pass the benchmark or become more favourable than the alternative". Further, "only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude)".

Thus, for this project activity, the following parameters are considered for the sensitivity analysis:

i) Capital cost
ii) O&M cost
iii) Tariff
iv) Generation

This guideline also states that, "sensitivity analysis should at least cover a range of +10% and -10%, unless this is not deemed appropriate in the context of the specific project circumstances" and "a scenario resulting in the project activity passing the benchmark or becoming a financially attractive alternative needs to be assessed.

Thus, a sensitivity analysis has been performed by applying a variation of ±10% to the above parameters:</td><td></td></tr>
</table>

<table>
<tr><th>Steps</th><th>Additionality Requirements</th><th>Status of Additionality Check</th></tr>
<tr><td></td><td>
Also, based on the above parameters, the project activity becomes a financially attractive or a feasible option when the value of the equity NPV, becomes zero or positive.

The results of sensitivity analysis for the project activity can be summarized as:

<table>
<tr><th rowspan="2">Parameter Varied for NPV (Lakh INR) w/o CDM</th><th colspan="2">Variation</th></tr>
<tr><th>10%</th><th>-10%</th></tr>
<tr><td>Capital Cost</td><td>-4668.32</td><td>-1953.13</td></tr>
<tr><td>O&M</td><td>-3461.92</td><td>-3159.53</td></tr>
<tr><td>Tariff</td><td>-2426.75</td><td>-4213.34</td></tr>
<tr><td>Generation</td><td>-2426.75</td><td>-4213.34</td></tr>
</table>

i) Capital cost:

The capital cost for this project activity has been considered for the sensitivity analysis. A 24.38% reduction in the capital cost causes the NPV of the project to cross zero.
However, it may be noted that the Project cost considered for the investment analysis for this project activity is based on the quotations provided by suppliers and a variation of more than 10% in this value is unlikely. Thus, applying a sensitivity of +/- 10% gives the values of NPV which are far from crossing zero.

ii) O&M:

A 192% reduction in the O&M cost will make the project activity financially viable. For this to happen, the O&M costs would have to be negative, which is not possible. Hence changes in the value of O&M will not make the NPV cross zero.

iii) Tariff:

The tariff considered for the investment analysis for this project activity is as per the Power Purchase Agreement (PPA) signed by the PP with the state electricity board.
A 35.67% increase in the tariff rate causes the NPV of the project activity to cross zero.
However, as per this agreement, the tariff rate is fixed throughout the lifetime of the project. Hence, sensitivity analysis on the tariff is not appropriate.

iv) Generation:
</td><td></td></tr>
</table>

Steps	Additionality Requirements	Status of Additionality Check
	A 35.67% increase in the generation causes the NPV of the project activity to cross zero. A sensitivity of +10% i.e. a generation of 55.62 lakh kWh still gives an NPV of INR -2426.75 lakh. A sensitivity of 10% also covers the generation estimated by the third party wind assessment report. Thus, a variation of more than 10% is unrealistic and unlikely. As can be seen from the above analysis there is significant risk associated with the project activity that impacts the viability of the project activity. Thus, it can be concluded that the project activity is not the most financially attractive option.	
Step 4: Common Practice Analysis		
a) Analyze other activities similar to proposed project activity	**Sub-step 4a: Analyze other activities similar to the proposed project activity:** As per the approved methodological tool, common practice analysis includes: "*Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc. Other CDM project activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis*" In the context of the present project activity, the following parameters are defined in line with paragraphs 5 – 10 of this approved methodological tool: ***Measure***: As per paragraph 6, the project activity falls under the following measure: "*(b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies);*" ***Output:*** As per paragraph 7, "power generation" may be considered to be the output in the context of the project activity. Further as per Step 1 of paragraph 47 of the same tool, the applicable output range will be 10.8 MW to 32.4 MW, i.e. ±50% of installed capacity of the project activity (21.6 MW) ***Different technologies*** *in the context of the project activity*:	

Steps	Additionality Requirements	Status of Additionality Check
	a) Energy source/fuel: In this case, the source of energy is wind power b) Feed Stock: This criterion is irrelevant in the context of the project activity as no feed stock is involved c) Size of installation: Since the installed capacity of the project activity is greater than 15 MW, the installation size shall be considered as "*Large*" d) Investment climate: i. Access to technology: Access to the wind power generation technology is fairly same across the host country ii. Subsidies or other financial cash flows: Though not applicable in the case of wind power, subsidies are regulated by the Ministry of New & Renewable Energy, India for the entire host country iii. Promotional policies: Though not applicable in the case of wind power, subsidies are regulated by the Ministry of New & Renewable Energy, India for the entire host country iv. Legal regulation: As per the Electricity Act 2003, the state electricity regulatory commissions are responsible for formulating legislations for various renewable energy power projects coming up in the respective state. Since such regulations vary from state-to-state, the same renewable energy power project will be subjected to different regulations depending upon its location. In light of this, it may be appropriate to consider the pre-2003 era of the Indian power sector as a different investment climate altogether e) Other features: No additional aspects of variance are observed for similar project activities ***Applicable geographical area***: As per paragraph 5, the host country is to be considered as the default geographical area. Thus, as per paragraph 47 of the methodological tool, *Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity* The applicable output range is 10.8 MW to 32.4 MW (i.e. +/- 50% of 21.6MW). *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*	

<table>
<tr><th>Steps</th><th>Additionality Requirements</th><th>Status of Additionality Check</th></tr>
<tr><td></td><td>
started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities shall not be included in this step

In this step, all the plants in India delivering power in the applicable output range of 10.8 MW to 32.4 MW have been considered. Further, all the CDM registered project activities and project activities undergoing validation have been excluded[6].

<table>
<tr><th>Technologies</th><th>N_{all}</th></tr>
<tr><td>Hydroelectric</td><td>239</td></tr>
<tr><td>Thermal</td><td>78</td></tr>
<tr><td>Nuclear</td><td>0</td></tr>
<tr><td>Wind</td><td>25</td></tr>
<tr><td>Biomass & Bagasse</td><td>131</td></tr>
<tr><td>Total (N_{all})</td><td>473</td></tr>
</table>

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 Ndiff.

In this step, those project activities that apply technologies different from that of the project activity (as defined above "Different technologies") have been identified[7].

<table>
<tr><th>Technologies</th><th>N_{diff}</th></tr>
<tr><td>Hydroelectric</td><td>239</td></tr>
<tr><td>Thermal</td><td>78</td></tr>
<tr><td>Nuclear</td><td>0</td></tr>
<tr><td>Wind</td><td>0</td></tr>
<tr><td>Biomass & Bagasse</td><td>131</td></tr>
<tr><td>Total (Ndiff)</td><td>448</td></tr>
</table>

Step 4: Calculate factor F=1-Ndiff/Nall 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

In this step, the factor F is evaluated as below:

$F = 1 - (N_{diff}/N_{all})$
</td><td></td></tr>
</table>

Steps	Additionality Requirements	Status of Additionality Check
	= 1- (448/473) = 0.053 Thus, the results of the analysis are as follows: F < 0.2 Nall – Ndiff > 3 Since both the conditions of paragraph 47 of the approved methodological tool are not fulfilled, the present project activity is not a "common practice" within a sector in the applicable geographical area.	
Step 4b: Discuss any similar options that are occurring:	As is evident from the above, the project activity is not a common practice project, the project is additional and not the same as baseline scenario and would not have occurred without the CDM. The approval and registration of the proposed project activity as a CDM project would lead to additional revenue thereby improving the returns from the project activity alleviating investment and regulatory policy risk to a certain extent. The successful registration also provides an incentive for other proponents to invest in wind power projects. Thus the CDM revenue acts as a risk mitigation tool in overcoming barriers.	

A brief chronological sequence of the project activity is as follows:

Sl. No.	Event	Date
1.	Quotation from WTG supplier	25/01/2011
2.	Board Approval for project	10/02/2011
3.	Intimation to DNA	07/03/2011
3.	Intimation to UNFCCC	07/03/2011
4.	Supply Agreement (Financial Closure[8])	31/03/2011
5.	Stakeholders' Consultation	06/05/2011
6.	Appointment of DOE	23/07/2011
7.	GEDA clearance	03/09/2011
8.	Commissioning	03/03/2012
9.	Letter of Approval from DNA (MoEF)	03/04/2012

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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Baseline Emissions:

Baseline Emissions Calculations:

As per equation 6 of ACM0002, Version 12.3, the baseline emissions are to be calculated using the following formula

Baseline Emissions = $EG_{PJ,y}$ x $EF_{Grid,CM,y}$
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)

As per equation 7 of ACM0002, Version 12.3, for Greenfield renewable energy power plants,
$EG_{PJ,y} = EG_{facility,y}$
Where,
$EG_{facility,y}$: Quantity of net electricity generation supplied by the project plant/unit to the grid in year y

Thus, Baseline Emissions = $EF_{Grid,CM,y}$ x $EG_{facility,y}$
Method of calculation of combined margin emission factor: ***"Tool to calculate the emission factor for an electricity system", Version 02.2.1, EB 63 (Annex 19).***

The combined margin calculations estimate the baseline emission factor for grid. It consists of a combination of operation margin (OM) and build margin (BM) factors obtained from publication issued by Central Electricity Authority (CEA) of India- CO_2 Baseline Database for the Indian Power Sector, Version 06, dated 01/03/2011.

Calculation of the Baseline Emission Factor
Step 1: Identifying the relevant electric power system
A "project electricity system" is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints.

A "connected electricity system" is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint. The tool requires the following considerations while determining whether significant transmission constraints exist or not:

- In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5% between the systems during 60% or more of the hours of the year.
- The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.

In the Indian context, as no well established spot markets exist, the first criterion is not applicable. Similarly, a transmission line fulfilling the second criteria is an exception in Indian Context. Hence the use of these criteria does not result in a clear grid boundary. In such a scenario, the use of a regional grid definition in case of large countries with layered dispatch systems (e.g. provincial, regional/national) is recommended. Further, it states that a provincial grid definition may in many cases be too narrow given significant electricity trade among provinces that might be affected, directly or indirectly, by a CDM project activity.

Of the two regional grids of the Indian Electricity system, i.e., the NEWNE grid and the Southern grid, the latter covers four states and two Union Territories while the NEWNE grid covers the rest of India. The project is located in the state of Gujarat which is connected to NEWNE grid.

Each state in a regional grid meets its own demand with its own generation facilities and also with allocation from power plants owned by the central sector. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The volume of the net transfers between the regions in India is relatively small and electricity is largely produced and consumed within the same states. Consequently, it is appropriate to assume that the impacts of the project activity will be confined to the regional grid in which it is located. Hence for the purpose of estimation of the baseline emission factor, the NEWNE grid has been chosen as the relevant electricity system.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)
The project proponent wishes to include only grid power plants in the calculation, while off-grid plants will be excluded.

Step 3: Selection of an Operating Margin method
The project proponent wishes to use the Simple Operating Margin (OM) method for the estimation of the Operating Margin Emission Factor. The use of the Simple OM method is justified as the share of the low cost/ must run resources constitute less than 50% of the total grid generation. The data pertaining to the total grid generation and the low/cost must run resources have been included in Annex 3. The Ex ante option has been chosen where in a three year generation weighted average based on the most recent data has been calculated ex ante and is fixed for the first crediting period. Hence, the parameters for the calculation of OM do not need to be monitored and the OM does not need to be calculated during the chosen first crediting period of seven years.

Step 4: Calculation of the Operating Margin Emission Factor according to the Simple OM 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. This may be calculated by any of the two options:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit
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. This option 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).

Net electricity generation and fuel consumption of each power plant is available through the data provided by the Central Electricity Authority (CEA), an official data source[9]. The same has been detailed in Annex 3. CEA database, Version 6, dated 01/03/2011 is the latest version at the time of commencement of validation and hence, has been used.

Assumptions:
The following assumptions have been made in case of unavailability of data at station level:

- Net generation: In case of stations where only gross generation is available, CEA standard values for auxiliary consumption have been applied to calculate the net generation data.

- GCV: Default GCV values for some thermal power stations have been used for cases where station specific data was unavailable.

The following assumptions have been in case of unavailability of data at unit level:

Net generation: The data is not monitored at a unit level and hence the following assumptions have been made

1. The auxiliary consumption (in % of gross generation) of the unit was assumed to be equal to that of the respective stations in the following cases:
   a) All units of a station fall into the build margin; or
   b) All units of a station have the same installed capacity; or
   c) The units in the station have different capacities but do not differ with respect the applicable standard auxiliary consumption.

2. In all other cases, standard values for auxiliary consumption adopted by CEA were applied.

3. Fuel consumption and GCV: Fuel consumption and GCV are generally not measured at unit level. Instead, the specific CO_2 emissions of the relevant units were directly calculated based on heat rates.

Calculation Approach:
The Simple OM has been calculated using the following formula:

$$EF_{grid,OMsimple,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:
$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m = All power units serving the grid in year y except low-cost / must-run power units
y = The relevant year as per the data vintage chosen in Step 3

Determination of $EF_{EL,m,y}$
The emission factor of each power unit m should be determined as follows:

• Option A1. If for a power unit m data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$$

Where:
$EF_{EL,m,y}$ = CO2 emission factor of power unit m in year y (tCO2/MWh)

$FC_{i,m,y}$ = Amount of fossil fuel type "i" consumed by power plant / unit m in year y (mass or volume unit)
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EFCO_{2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$ = Net electricity generated and delivered to the grid by power plant / unit m in year y (MWh)
m = All power plants / units serving the grid in year y except low-cost / must-run power plants / units
i = All fossil fuel types combusted in power plant / unit m in year y
y = The three most recent years for which data is available at the time of submission of the PDD to the DOE for validation (for ex ante option)

The three most recent years for which data was available at the time of submission to the DOE included 2007-08, 2008-09 and 2009-10 and the same is presented in Annex 3 of the PDD. The generation weighted average value for these three years works out to 0.9941 for the NEWNE grid. Thus,

$EF_{Grid,OM,y}$ = 0.9941 tCO_2/MWh

Step 5: Calculate the build margin emission factor

With regards to data vintage, the project participant wishes to use Option 1 viz., 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.

The sample group of power units *m* used to calculate the build margin has been determined as per the following procedure, consistent with the data vintage selected above:

(a) The set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) was identified and their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh) was determined;
(b) The annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh) was determined. The set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) was identified and their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh) was determined;

(c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ the set of power units that comprises the larger annual electricity generation (SET_{sample} = $SET_{\geq 20\%}$) was selected.

Since none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, this set SET_{sample} has been used to calculate the build margin.

The data pertaining to the units thus identified are detailed in the Version 6 of the Baseline Carbon Dioxide Emissions database of the CEA.
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 and will be calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

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 electricity generation data is available

The Build Margin has been calculated ex ante during the crediting period. For ex ante calculation the most recent data available has been used and the build margin thus calculated is 0.8123 for the NEWNE grid. Therefore,

$EF_{Grid,BM,y}$ = 0.8123 tCO_2/MWh

Step 6: Calculation of the Combined Margin Emission Factor
The combined margin emission factor is calculated as follows:

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

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 (%)

The default values to be used for Wind Power projects are

w_{OM}= 0.75 w_{BM}= 0.25

Hence, the Baseline Emission Factor is calculated as below:

$EF_{Grid,CM,y}$ = w_{OM} * $EF_{Grid,OM,y}$ + w_{BM} * $EF_{Grid,BM,y}$
= 0.75 * 0.9941 + 0.25 * 0.8123
= 0.9486 tCO_2/MWh

The Baseline Factor thus calculated is fixed for the first crediting period.

The net export expected from the project activity is on an annual basis is 56,000 MWh. Hence the baseline emissions are calculated as below:
Baseline Emissions (BE_y) = 0.9486 x 56,000
= 53,122 tCO_2

Project Emission Calculations:
According to equation 1 of ACM0002, Version 12.3,
$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$

Where:
PE_y = Project emissions in year *y* (tCO2e)
$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year *y* (tCO2)
$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO2e)
$PE_{HP,y}$ = Project emissions from reservoirs of hydro power plants in year *y* (tCO2e)

As the project activity is the generation of power using renewable wind energy, there is no fossil fuel consumption in the project activity.
Hence, $PE_{FF,y} = 0$
$PE_{GP,y} = 0$
$PE_{HP,y} = 0$ Thus project Emissions for ex ante calculations have been assumed as zero.
Hence, $PE_y = 0$.

Leakage Emission Calculation:
The project proponents have identified no anthropogenic greenhouse gases by sources outside the project boundary that are significant, measurable and attributable to the project activity. Hence, no leakage is considered from the project activity.
$LE_y = 0$

Emission Reduction Calculation:
ER = $BE_y – PE_y – LE_y$
= 53,122 – 0 – 0
= 53,122 tCO_2e

B.6.2. Data and parameters that are available at validation:	
Data / Parameter:	$EF_{Grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Combined Margin Grid emission factor
Source of data used:	[10]CEA website Version :06 (Valid from 01/03/2011)
Value applied:	0.9486
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value applied is taken from the plant from CEA reviews. The weights used for calculating combined margin emission factor are 0.75 and 0.25 for operating margin and built margin respectively.
Any comment:	Data will be kept for crediting period + 2 Years.

Data / Parameter:	$EF_{Grid,OM,y}$
Data unit:	tCO_2/MWh
Description:	Weighted average of 3 years (2007-08, 2008-09, 2009-10) CO_2 Operating Margin emission factor of the grid
Source of data used:	[11]CEA website Version :06 (Valid from 01/03/2011)
Value applied:	0.9941
Justification of the choice of data or	Obtained from the CEA database on CO_2 Baseline for Indian Power Sector, Version 06 as the weighted average of Operating Margin (incl. imports) for

description of measurement methods and procedures actually applied :	years 2007-08, 2008-09, 2009-10
Any comment:	Data will be kept for crediting period + 2 Years.

Data / Parameter:	$EF_{Grid,BM,y}$
Data unit:	tCO_2/MWh
Description:	CO_2 Built Margin emission factor of the grid
Source of data used:	[12]CEA website Version :06 (Valid from 01/03/2011)
Value applied:	0.8123
Justification of the choice of data or description of measurement methods and procedures actually applied :	Obtained from the CEA database on CO_2 Baseline for Indian Power Sector, Version 06 (not adjusted for imports)
Any comment:	Data will be kept for crediting period + 2 Years.

B.6.3 Ex-ante calculation of emission reductions:

>>
As per equation (11) of the applied methodology ACM0002, Version 12.3,
$ER_y = BE_y – PE_y$ [13]

Where,
Baseline Emissions = $EG_{facility,y}$ x $EF_{Grid,CM,y}$ (Equation 6 of applied methodology ACM0002, Version 12.3)

Net annual Generation Capacity of Project Activity supplied to grid($EG_{facility,y}$) = 56,000 MWh[14]
Combined Emission Factor of CO_2 for NEWNE grid($EF_{Grid,CM,y}$) = 0.9486 tCO_2/MWh (As calculated in section B.6.1)

Thus, Baseline Emissions (BE_y) = 56,000 MWh x 0.9486 tCO_2/MWh = 53,122 tCO_2

Further, as per equation (1) of the applied methodology ACM0002, Version 12.3 and as explained in section B.6.1,

Project Emissions (PE_y) = 0 tCO_2

Thus,
Emission Reductions = Baseline Emissions – Project Emissions
= 53,122 – 0 **= 53,122 tCO_2/year**

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

>>

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
Year 1	0	53,122	0	53,122
Year 2	0	53,122	0	53,122
Year 3	0	53,122	0	53,122
Year 4	0	53,122	0	53,122
Year 5	0	53,122	0	53,122
Year 6	0	53,122	0	53,122
Year 7	0	53,122	0	53,122
Total (tonnes of CO_2e)		**371,851**		**371,851**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**$EG_{facility,y}$**
Data unit:	MWh/year
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data to be used:	Certificate for share of electricity generated by the State Electricity Board
Value of data applied for the purpose of calculating expected emission reductions in section B.5	56,000
Description of measurement methods and procedures to be applied:	Monitoring: a) At WTG yard: Electrical Energy Meters which are electronic tri-vector meter of accuracy class 0.2s b) At substation: Electrical Energy Meters which are electronic tri-vector ABT meter of accuracy class 0.2s Data type: Measured & Calculated[15]. Archiving: Paper & Electronic Monitoring Frequency: Continuous measurement and at least monthly recording Responsibility: a) At WTG yard: The O&M site-in-charge shall be responsible for the regular recording of data b) At substation: The representative of the state electricity board at the Vandhiya substation shall be responsible for the regular recording of data Calibration Frequency: The meters shall be calibrated once every year.
QA/QC procedures to be applied:	The Quantity of net electricity generation from the certificate for share of electricity will be cross-checked with the invoices for the sale of power by Powerica. Meter calibration shall be conducted once every year.
Any comment:	The data will be kept for two years after the end of the crediting period or the

	last issuance of CERs for this project activity, whichever occurs later. In the case of the crediting period start & end dates of the project activity falls in – between the billing cycles, then for emission reduction calculations, the daily generation reports provided by the O&M service provider, shall be considered.

B.7.2 Description of the monitoring plan:

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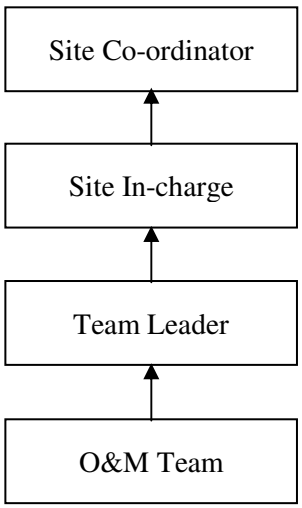
The project activity is in accordance with approved large scale methodology ACM 0002, Version 12.3.0, EB 66, and therefore, can use the monitoring methodology for the same.

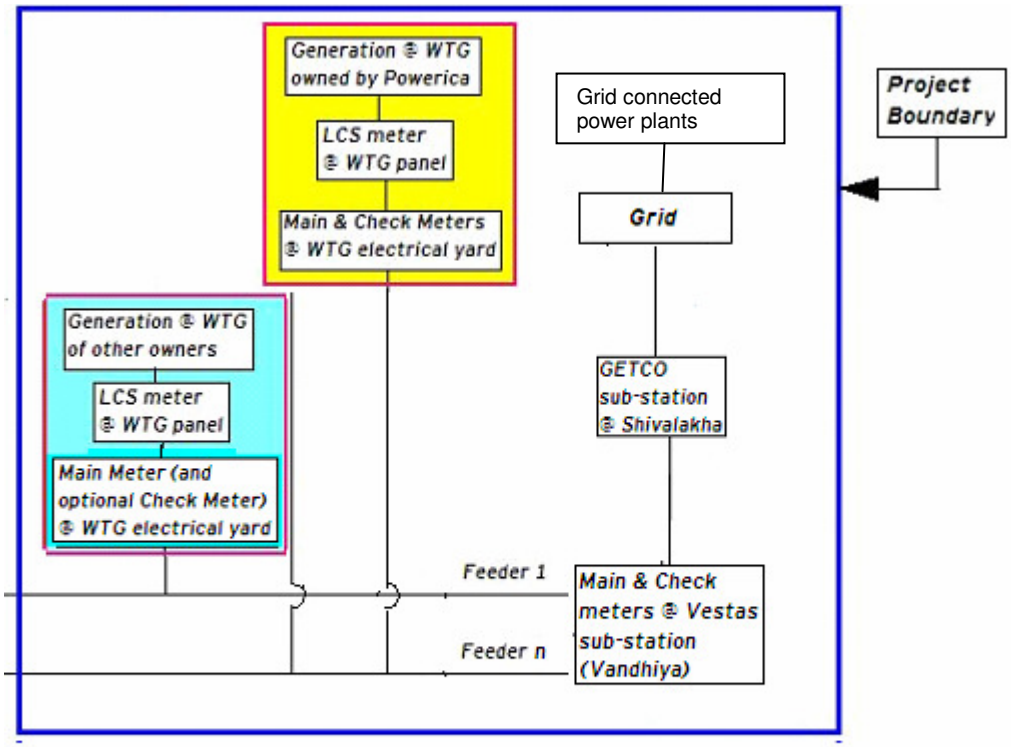
The monitoring methodology specified in the methodology requires that the project-monitoring plan to consist of metering the electricity supplied to the grid by the renewable technology. In order to monitor the mitigation of GHG due to the project activity, the total energy exported needs to be measured. The net energy supplied to grid by the project activity multiplied by emission factor for regional grid, would form the baseline for the project activity.

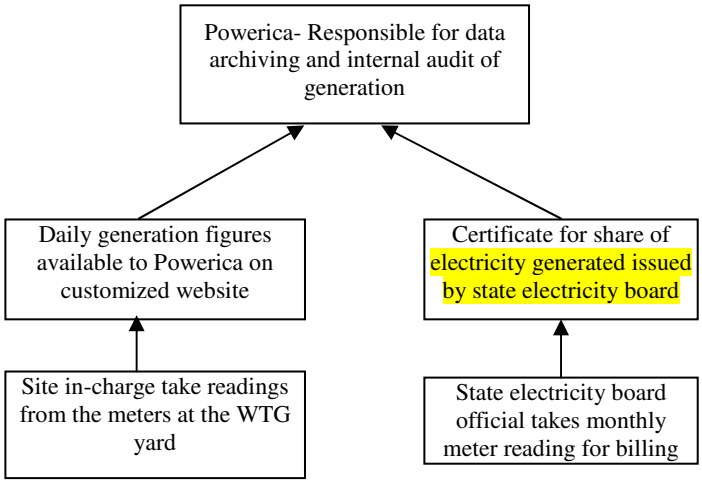
Since the baseline emission factor is based on an ex-ante determination, monitoring of this parameter is not required. The sole parameter for monitoring is the electricity exported to the grid. The Project is operated and managed by Vestas Wind Technology India Private Limited (Vestas). Vestas will have a designated Site-In-Charge (O&M) on site who will be responsible for monitoring the electricity exported from the project activity. The organizational structure of the O&M team by Vestas is as follows:



Further, all new technicians on site are trained by Vestas. Also, the O&M personnel are trained regularly in order to improve their technical skills.

The overall flow of information has been depicted using the following hierarchical structure:


Generation @ WTG owned by Powerica
LCS meter @ WTG panel
Main & Check Meters @ WTG electrical yard
Generation @ WTG of other owners
LCS meter @ WTG panel
Main Meter (and optional Check Meter) @ WTG electrical yard
Feeder 1
Feeder n
Grid connected power plants
Grid
GETCO sub-station @ Shivalakha
Main & Check meters @ Vestas sub-station (Vandhiya)
Project Boundary


Powerica- Responsible for data archiving and internal audit of generation
Daily generation figures available to Powerica on customized website
Certificate for share of electricity generated issued by state electricity board
Site in-charge take readings from the meters at the WTG yard
State electricity board official takes monthly meter reading for billing

Monitoring Process at Gujarat

Metering of wind power is done as under:

- Joint monthly meter reading is taken at Vandhiya substation meters, i.e. (both main and check) by representative of state electricity board and O&M service provider (on behalf of individual wind farm owners). Let the total generation recorded for particular month is 'X' units in sub-station meter.
- Daily meter reading is taken at Local Meter-(transformer yard meter of each WTG) by representative of O&M service provider (on behalf of individual wind farm owners) which is approved by representative of state electricity board on a monthly basis. Let us assume total approved generation of Powerica recorded for particular month is 'Y_1' units.
- Similarly joint meter reading for other wind farm owners is also taken. Let the generation of individual owner recorded for particular month are 'Y_2, Y_3,.....Y_n' units.
- The state electricity board apportions 'X' to individual wind farm owners using following formula and issues monthly certificates.
  Net units calculated for billing = $X * Y_i / \Sigma Y_n$
- For Powerica, net units calculated for billing = $X * Y_1 / \Sigma Y_n$
- It must be noted here that the meter readings as mentioned above are calculated as the product of meter multiplication factor and the difference of the current and previous meter readings

Based on the above procedure, the Certificate for share of electricity generated by Wind farm is provided to the project proponent. Additionally, all the WTGs at the site are connected to a central monitoring system located at that site only. This system captures daily generation figures which are later made available to Powerica on the customized website of Vestas. This will be used to check the generation figures.

Emergency Preparedness

In case of failure of the main meter, generation value would be taken from the check meter and the grid officials would immediately replace the faulty meter with a calibrated meter. If both main mater and check meter are found faulty, energy generation is monitored in accordance with procedures described in PPA as follows.

"In case, both the main meters and check meter are found to be beyond permissible limit of error, both the meters shall be calibrated immediately and the correction applicable to main meter shall be applied to the energy registered by the main meter at the correct energy for the purpose of energy account/billing for the actual period during which inaccurate measurements were made, if such period can be determined or, if not readily determinable, shall be the shorter of:

- ✓ *The period since the immediately preceding test of the relevant main meter, (OR)*
- ✓ *One hundred and eighty (180) days immediately preceding the test at which the relevant Main meter was determined to be defective or inaccurate."*

The project promoters have contracted the technology supplier for providing O&M services for the power project. The service provider would be responsible for maintenance of the necessary spare parts and consumables for the maintenance of the WTGs such as anemometers, wind vanes and sensors, oil filters, batteries, auxiliary motors and pumps, WTG controllers, slip rings, limit switches and sensors, detergents & solvents etc. The service provider would also be responsible for supply of necessary main components of the WTG such as main gearboxes, blades, generators, towers, hubs, main shafts & bearings, ground and top controller and hydraulic systems. The service provider would also ensure that occupational health and safety procedures are adhered to during the operation & maintenance activities. Additionally, spare

meters would also be kept available at the site for replacement in case of failure of any of the monitoring equipments.

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):

>>

Powerica and their associate consultants.

Person Responsible: Mr. Pradeep Gupta
Designation: Head of Wind Energy
Date of Completion: 15/07/2011
The detailed information is provided in Annex I.

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:

>>31/03/ 2011 Date of signing of supply agreement

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

>> 20 years 00 months

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

C.2.1. Renewable crediting period

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

>> 05/10/2012 or the date of registration, whichever is later.

C.2.1.2. Length of the first crediting period:

>> 7 years 00 months

C.2.2. Fixed crediting period:

>> Not Applicable

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

>>

SECTION D. Environmental impacts

>>

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

>>

In the applicable EIA notification i.e. S.O. 3067[16], dated 01st December 2009, Ministry of Environment & Forests (MoEF), Govt. of India, the wind projects are not included in the list of projects that has to get Prior Environmental Clearance (EC) either from State or Central Govt. authorities and hence no EIA study was conducted.

The project does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. However due weightage has been given to environmental aspects.

Some of the significant impacts taken into consideration during the construction and operation of the wind farm are as follows:

1. Land Use: Due consideration has been taken in order to ensure that the land available for the setting up of the wind farm has no alternative use. Furthermore, no forest land was used for the purpose. Stringent measures were followed in order to prevent any soil erosion during the construction phase.

2. Noise Pollution: Typically, the wind farms are located in isolated areas and thereby the noise impacts on the neighbouring population are reduced. Also during the construction phase, suitable noise prevention and reduction measures were employed in order to reduce the ill-effects of noise pollution on the construction labourers.

3. Water Pollution: The nearest large water body present is the Arabian Sea. However, no significant impacts are envisaged due to the project activity.

4. Air Pollution: The implementation of the project activity will reduce the dependence on fossil fuel generated power and thereby lead to the improvement in air quality during the operational phase.

5. Visual Impact: As gathered in the stakeholder analysis, the wind mills do not have a negative impact on the surrounding villagers in terms of visual intrusion/impact.

6. Local Flora and Fauna: The land used for the purpose of setting up the wind farm was a barren land and therefore did not require any destruction of local flora. The only vegetation in the vicinity was shrubs and weeds.

Hence it can be concluded that the proposed project activity does not have any major negative impacts.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

The environmental impacts of the project activity are not considered to be significant by the project participant or the host party.

SECTION E. Stakeholders' comments

>>

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

>>

Powerica identified the following local stakeholders to be associated with the project activities, directly or indirectly:

1. Vestas Employees
2. Local Villagers
3. Government officials (District Magistrate, etc.)

In order to address and incorporate the concerns of the local stake-holders, Powerica directly handed over the invitation letters to the identified stake-holders on 26/04/2011. The timeframe given to stakeholders was 9 days and the stakeholders could provide their comments during the stakeholders meeting. The local stakeholders were chosen from all factions of the society. The invitation letter contained information of the date & site of the meeting along with a clear picture of the agenda of the meeting along with a broad description of the project activity. An advertisement for the meeting was displayed in the Kutch Mitra newspaper on 15/04/2011.

The stakeholder meeting was conducted on 06/05/2011

E.2. Summary of the comments received:

>>

Powerica Limited is in process of receiving all necessary approvals / clearances / permissions from various local bodies which represent the local stakeholders. The stake holders meetings was conducted at the respective project sites and was attended by the office bearers and residents of the nearby villages and those employed in the project activity. The local villagers and the office bearers expressed their happiness with the setting up of an environment friendly power project in their village as it had resulted in generation of direct and indirect employment opportunities both for literate and illiterate people. Development of infrastructure in the locality was highly appreciated. The employees hired for the project activity from the local area stated that the project activity has provided them with a means of livelihood in their own village and will help them in getting equipped with technical skills.

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

>>

Powerica Limited has taken care of all the conditions stipulated in the relevant clearances and no adverse comment has been raised.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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URL:	www.powericaltd.com
Represented by:	
Title:	Head of Wind Energy
Salutation:	Mr.
Last Name:	Gupta
Middle Name:	
First Name:	Pradeep
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Direct FAX:	+91 22 40012679
Direct tel:	+91 22 6656 2590
Personal E-Mail:	pradeep.gupta@powericaltd.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding for this project activity including any funding form ANNEX 1 countries. Thus the project participant hereby confirms that no diversion of Official Development Assistance is caused due to the project activity.

Annex 3

BASELINE INFORMATION

The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, has estimated the Build Margin and the Simple Operating Margin for the NEWNE grid, the details of which is available on the following website and is detailed below as well:

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

Version 6.0 of the database has been used.

Gross Generation Total (GWh)

	2007-08	2008-09	2009-10
NEWNE	531,539	548,956	586,311

Net Generation Total (GWh)

	2007-08	2008-09	2009-10
NEWNE	496,119	510,693	544,915

20% of Net Generation (GWh)

	2007-08	2008-09	2009-10
NEWNE	99,224	102,139	108,983

Net Generation in Operating Margin (GWh)

	2007-08	2008-09	2009-10
NEWNE	401,642	421,803	458,043

Net Generation in Build Margin (GWh)

	2007-08	2008-09	2009-10
NEWNE	100,707	102,589	109,064

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)

	2005-06	2006-07	2007-08	2008-09	2009-10
NEWNE	18.0%	18.5%	19.0%	17.4%	15.9

Imports

	2007-08	2008-09	2009-10
NEWNE	8,482.5	5,897.1	5,341.1

Emission Data

Absolute Emissions Total (tCO_2)

	2007-08	2008-09	2009-10
NEWNE	406,861,785	430,502,442	453,067,520

Absolute Emissions OM (tCO_2)

	2007-08	2008-09	2009-10
NEWNE	406,861,785	430,502,442	453,067,520

Absolute Emissions BM (tCO_2)

	2007-08	2008-09	2009-10
NEWNE	60,193,616	69,297,387	88,593,337

Emission Factor

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

	2007-08	2008-09	2009-10
NEWNE	1.00	1.01	0.98

Build Margin (tCO_2/MWh) (not adjusted for imports)

	2007-08	2008-09	2009-10
NEWNE	0.60	0.68	0.81

Annex 4

MONITORING INFORMATION

Monitoring plan has been discussed in section B.7 of this document.

Community Development:
Powerica would also use at a minimum, 2% of the revenues accrued from the sale of Certified Emission Reductions (CERs) on an annual basis for community related activities. The details of such expenditure made would be included in the monitoring report for the period following the transaction and the format proposed by Powerica is as follows:

Action Plan for expenditure incurred through 2% of CER revenues									
Financial Year (A)	**Activity (B)**	**Issued CERs (C)**	**CER Price (D)**	**Total CDM Amount (E=CxD)**	**Expenditure in Current year (F)**	**Expenditure Carried forward (G)**	**Net Expenditure for Current Year (H = F+G)**	**Expenditure as % of CDM amount for current year (I = H/E)**	**Reference Documentation (J)**
Indicates the year for which the assessment is being provided	*Provides details of the social/ community activities on which the expenditure has been incurred*	*Quantity of CERs issued for the assessment year*	*CER price at which the transaction has happened*	*Total amount CDM amount received*	*Expenditure made on the social/ community development activity in the current assessment year*	*Additional expenditure incurred on capital goods in the previous assessment years being carried forward to the current assessment year*	*Net Expenditure on social/ community development activity for the current year*	*Indicates the % of the total CDM amount spent on social/community development activity*	*Indicates the documentation to be provided to the DOE during the verification to evidence the amount spent on social/community development activity*

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