



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

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**SECTION A. General description of project activity****A.1 Title of the project activity:**

>> **150 MW grid connected Wind Power based electricity generation project in Gujarat, India.**

Version 3

Date: 24/11/2008

A.2. Description of the project activity:

The DLF Limited is a leading real estate and infrastructure development company based in Gurgaon, India. The company has over 224 million sq. ft. of existing development and 738 million sq. ft. of planned projects. DLF is committed to quality, trust and customer sensitivity, and deliver on promises with agility and financial prudence.

Purpose

The project activity involves the establishment of a wind farm of 150 MW installed capacity enabling generation of electricity by state-of-art 1.5 MW capacity Wind Turbine Generators (WTGs) (One of the latest available technologies in the country developed by Suzlon Energy Limited) in the state of Gujarat. The electricity generation from this wind farm will contribute to annual GHG reductions estimated at 313755 tCO₂e (tonnes of carbon dioxide equivalent). Although the project life is envisaged as 20 years, it is proposed that the project activity needs to mitigate the risks involved in Renewable Energy Technology for the first 10 years. The associated risks for the renewable energy technology identified by the project proponent are technological, financial, policy, and regulatory nature as elaborated in the section B5 of this PDD. The project activity will evacuate approximately 348 Million units of renewable power annually to the Western regional Grid.

In the absence of the project activity, the accordant amount of electricity would be delivered through the grid, which to a large extent is fed by fossil sources, leading to carbon dioxide emissions. Demand for electricity in Gujarat is growing quickly, therefore the additional capacities are necessary. There is a deficit of 17.2 % in energy supply and 21.9 % in peak power demand in year 2007 in Gujarat². This supply demand gap is likely to be met through the fossil fueled power stations. PP do not have any prior experience of installation of similar wind mills.

The total installed capacity in Gujarat is about 10150 MW, renewables contribute only 306 MW in this capacity which is only 3% of the total installed capacity³. Hence addition of renewables and especially from wind does not represent the business as usual scenario.

² India stats.com (Region/State-wise Peak Demand and Peak Met of Power in India (April to July, 2007))

³ Indiatats.com (Region/State-wise Allocated Shares of Installed Capacity of Hydro/Thermal/ Nuclear Power Utilities by Ownership Sector in India (As on 30.06.2006))

*Salient Features of the project activity*

The main purpose of the project activity is to generate electrical energy through sustainable renewable energy means using wind power and feed the generated output to the local grid in Gujarat and contribute to climate change mitigation efforts.

Apart from generation of renewable energy based electricity, the project has also been conceived for the following:

- To enhance the propagation of commercialisation of wind power generation in the region
- To contribute to the sustainable development of the region, socially, environmentally and economically
- To reduce the prevalent policy & regulatory risks for this wind park through revenues from the CDM

View of project participants on the contribution of the project to sustainable development

Ministry of Environment and Forests, Govt. of India has stipulated the following indicators for sustainable development in the interim approval guidelines for CDM projects:

Social well being- The CDM project activity should lead to alleviation of poverty by generating additional employment, removal of social disparities and contribution to provision of basic amenities to people leading to improvement in quality of life of people.

- The proposed projects will provide employment opportunities in the context of building infrastructure, installation and maintenance & managing the wind farm. Thus project activity helps in improving the quality of life of the people.

Economic well being- The CDM project activity should bring in additional investment consistent with the needs of the people.

The proposed project activity leads to alleviation of poverty by establishing direct and indirect employment benefits accruing out of infrastructure development of wind farms, installation work, operation and management of wind farm, providing daily needs, etc. The infrastructure in and around the project area will also improve due to project activity. This includes development of road network and improvement of electricity quality, frequency and availability as the electricity is fed into a deficit grid.

The project activity leads to an investment of about INR 8833 million to a developing region which otherwise would not have happened in the absence of project activity. The generated electricity is fed into the Western regional Grid through local grid, thereby improving the grid frequency and availability of electricity to the local consumers (villagers & sub-urban habitants) which will provide new opportunities for industries and economic activities to be setup in the area thereby resulting in greater local employment, ultimately leading to overall development. The project activity also leads to diversification of the national energy supply, which is dominated by conventional fuel based generating units.

Environmental well being- This should include a discussion of impact of the project activity on resource sustainability and resource degradation, if any, due to proposed activity; bio-diversity friendliness; impact on human health; reduction of levels of pollution in general.

The project utilizes wind energy for generating 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/unit of energy generated) including GHG emissions. As wind power projects produce no end products in the form of solid waste (ash etc.), they address the problem of solid waste disposal encountered by most other sources of power. Being a renewable resource, using wind energy to generate electricity contributes to resource conservation. Thus the project causes no negative impact on the surrounding environment and contributes to environmental well-being.

On the area assigned for turbine foundation the natural vegetation will be removed. The vegetation that will be removed is common for wild areas, therefore it is implausible, that the species will vanish. Only the biomass loss will occur.

Birds often strike the high tension lines and windows, however they rarely collide with the wind turbines. Turbines will influence the birds flying routes. In case of wind turbines of 60m diameter, the routes are shifted of approx. 100- 200m. The high tension lines connecting the wind farm are more dangerous than the wind station itself.

Since the project is located on coastal and undulated site, the birds flying routes can easily comply with this topography and adopt the turbine shapes.

Technological well being- *The CDM project activity should lead to transfer of environmentally safe and sound technologies with a priority to the renewables sector or energy efficiency projects that are comparable to best practices in order to assist in upgradation of technological base.*

The project activity leads to the promotion of 1.5 MW WTGs into the region, demonstrating the success of wind turbines, which feed the generated power into the nearest sub-station, thus increasing energy availability and improving quality of power under the service area of the substation. Hence the project leads to technological well being.

As the project developer is a Indian company using the self developed wind power technology, there is no transfer of technology in the project activity.

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)
Government of India (Host)	DLF Limited (Private entity)	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the party (ies) involved is required.

Note: When the PDD is filled in support of a proposed new methodology (forms CDM-NBM and CDM-NMM), at least the host Party (ies) and any known project participant (e.g. those proposing a new methodology) shall be identified.

A.4. Technical description of the project activity:

**A.4.1. Location of the project activity:**

>> Kachchh Region Villages⁴: Lathedi, Jakhau, Nani Sindhodi, Moti Sindhodi, Chachhi, Sandhan, Budhia, Ranpar, Rapargarh, Sayra, Suthari, Vanku, Dhutai

A.4.1.1. Host Party(ies):

>>
India

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

>>
Kutch, Gujarat

A.4.1.3. City/Town/Community etc:

>>
Taluka Abdasa, Kutch district

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

WTGs installed by the project proponent are distributed across the Kachchh region. In the villages of Lathedi, Jakhau, Nani Sindhodi, Moti Sindhodi, Chachhi, Sandhan, Budhia, Ranpar, Rapargarh, Sayra, Suthari, Vanku, and Dhutai of Gujarat state.

Table 1: Latitude and Longitude details of the wind farm

Location	Latitude N	Longitude E
	Range Deg.Min	Range Deg.Min
Kachchh Region Villages ⁵ : Lathedi, Jakhau, Nani Sindhodi, Moti Sindhodi, Chachhi, Sandhan, Budhia, Ranpar, Rapargarh, Sayra, Suthari, Vanku, Dhutai	As attached in Appendix 1	

The geographical location of the projects can be depicted from the maps on the following page.

⁴ Refer Appendix 1 for the locational details, Khasra numbers, and unique identification numbers of WTGs

⁵ Refer Appendix 1 for the locational details, Khasra numbers, and unique identification numbers of WTGs

Figure 1: Location of Gujarat in India

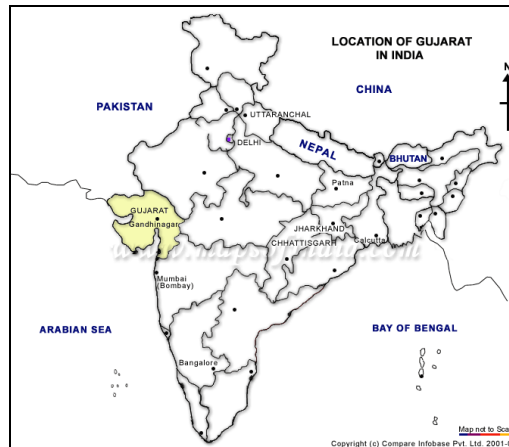
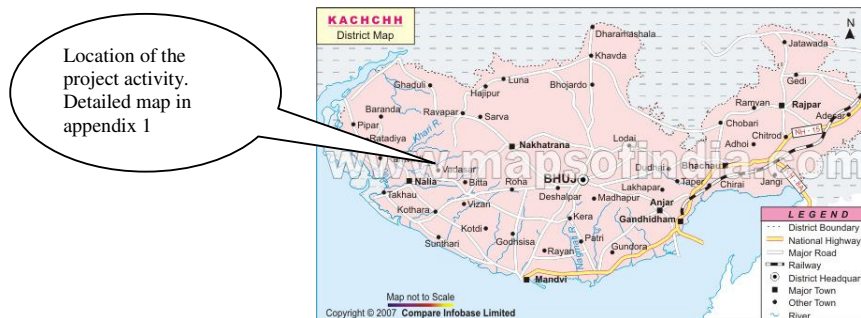


Figure 2: State Map of Gujarat showing Districts



Figure 3: District Map Kachchh



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

>>

The project activity is considered under “Zero emissions grid-connected electricity generation from renewable sources”, the project activity has a capacity more than 15 MW and generates electricity in excess of 60 GWh per year (limit for small scale project). Therefore as per the scope of the project activity enlisted in the ‘list of sectoral scopes and related approved baseline and monitoring methodologies’, the project activity may principally be categorized in:

Scope Number 1

Sectoral Scope – Energy Industries (renewable/non-renewable sources).

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

Technology

In wind energy generation, kinetic energy of wind is converted into mechanical energy and subsequently into electrical energy.

Wind has considerable amount of kinetic energy when blowing at high speeds. The kinetic energy passes through the blades of the wind turbines is converted into mechanical energy and rotates the turbine. When the wind blades rotate, the connected generator rotor also rotates, thereby producing electricity. The technology is a clean technology since there are no GHG emissions associated with the electricity generation.

The project installs Suzlon make WTGs of individual capacity 1.5 MW. The salient Features of Suzlon S-82- 1.5 MW WTG are as Follows: -

1. Unique Micro pitch system
2. Unmatched flexislip mechanism
3. Advanced control system
4. High quality power generation
5. well balanced design
6. ISO-certified vendors confirm high quality components
7. ISO 9001:2000 for Design, Development, Manufacture and Supply of Wind Turbines
8. ISO 9001:2000 certification for Installation, Commissioning, Operation and Maintenance
9. Type certification by Germanischer Lloyd, Germany
10. Approved by the Ministry of Non-Conventional Energy Sources (MNES)⁶
11. Rated Voltage 690 V, 3 phase AC

Wind energy presents various environmental benefits compared to other primary energy sources: wind energy does not result in emissions of pollutants into the atmosphere nor does it emit residuals that can have a negative impact on soil, water etc. As a renewable energy source wind energy can be used without putting the supply of primary energy sources into danger for future generations. The proposed project will

⁶ <http://www.cwet.tn.nic.in/Docu/Manufacturers.pdf>



also contribute to a reduction in other emissions than GHG related to conventional electricity generation, like emissions of sulphur dioxide, nitrogen oxides and particulates.

Scenario existing prior to the start of the project activity

The project activity is installation of 100 WTGs (New) of 1.5 MW each. The project activity installs the wind farm at a barren land. The WEGs planned to be installed are new.

Scope of activities/measures that are being implemented within the project activity

The project activity involves the establishment of a wind farm of 150 MW installed capacity at the project location. This involves installation of WTGs, transformers, laying down the transmission lines/cables, establishment of a control room, etc.

Baseline Scenario

In the absence of the project activity, the accordant amount of electricity would be delivered through the grid, which to a large extent is fed by fossil sources, leading to carbon dioxide emissions. The electricity generation from this wind farm will contribute to GHG reductions estimated at 2196285 tCO₂e (tonnes of carbon dioxide equivalent) during the crediting period. The project activity will evacuate approximately 300 Million units of renewable power annually to the Western regional Grid. The expected PLF of the WEGs is of the order of 26.5%.

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

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Table 2: Estimated amount of emission reductions over the chosen crediting period

Year	Annual Emission Reduction tCO ₂ e
2009	313755
2010	313755
2011	313755
2012	313755
2013	313755
2014	313755
2015	313755
Total estimated reductions (tonnes of CO ₂ e)	2196285
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tones of CO ₂ e)	313755

A.4.5. Public funding of the project activity:



>> The project participants have no recourse to any public funding. The project proponent hereby confirm that there is no diversion of Official Development Assistance into the project activity. The project proponents also hereby confirm that there is no Central Financial Assistance into the project activity. Project participants also confirm that there is no funding from Annex 1 party(ies).

SECTION B. Application of a baseline and monitoring methodology

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

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Methodology Number: ACM0002.

Title: – “Consolidated Baseline Methodology for grid connected electricity generation from renewable sources”, Version 07 (EB36), Sectoral scope: 1

The methodology ACM0002 refers to the latest approved versions of the following tools:

- Tool to calculate the emission factor for an electricity system (Version 1.1);
- Tool for the demonstration and assessment of additionality (Version 5.2);
- Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion (Version 1).⁸

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

>>

Grid connected electricity generation from renewable source (wind energy) has been considered as the project activity, for which geographic and system boundaries for the relevant grid (Western regional Grid) can be clearly defined and information on the characteristics of the grid are also available. The other conditions that favour the application of the selected methodology are as follows:

- The project activity does not involve switching from fossil fuels to renewable energy at the site of the project activity.
- Sufficient publicly available information is available to document in a transparent and conservative manner the nature of prohibitive barriers to the project activity.
- Sufficient information exists to demonstrate that project activity is not a common practice at the present time in the Gujarat Region.

The Western regional Grid is not dominated by generating sources with zero or low operating costs such as hydro, geothermal, wind, solar, nuclear and low cost biomass.

The project activity do not involve switching from fossil fuels to renewable energy sources at the site of the project activity.

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

>> ACM0002 specifies that the project boundary will be:

⁸ The project activity do not involve any fossil fuel combustion, fuel handling (extraction, processing, and transport), and land inundationhence, hence the project emissions and leakage are considered as Zero.



For **emissions sources**, only CO₂ emissions from electricity generation in fossil fuel fired power that is displaced due to the project activity.

The **spatial extent** of the project boundary includes the project site and all power plants connected physically to the electricity system that the project power plant is connected to.

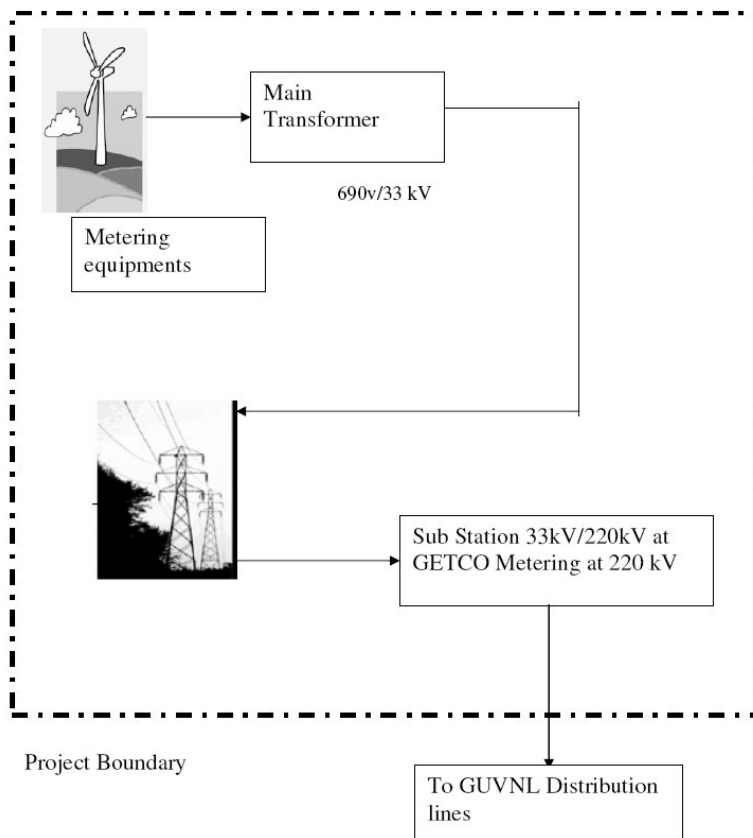
The proposed project would be feeding the electricity in the Western regional grid, managed by Western Region Electricity Board (WREB) which constitutes five states (viz Maharashtra, Madhya Pradesh, Chhatisgarh, Gujarat and Goa) and two Union territories (Daman & Diu and Dadar & Nagar Haveli). The proposed project would have marginal impact on all the generation facilities in the Western grid. Thus all the power generation facilities connected to this grid form the project boundary for the purpose of baseline estimation. The Western grid is also connected with other regional grids, however, the net exchange of energy within the regional grids is very small, and thus the other regional grids are not included in the boundary (however for conservative and accurate estimation, the imports of electricity from other regional grids has been included in the baseline calculation).

Table 3: Baseline and project emission sources

	Source	Gas	Included?	Justification / Explanation
Baseline	Power Generation in the Western Regional Electricity Grid	CO ₂	Yes	Main emission source
		CH ₄	No	Not applicable as per ACM0002
		N ₂ O	No	Not applicable as per ACM0002
Project Activity	On site fossil fuel consumption due to project activity	CO ₂	No	Electricity generation through wind does not lead to emission of greenhouse gases. The CO ₂ emission through fossil fuels are neglected.
		CH ₄	No	Electricity generation through wind does not lead to emission of greenhouse gases.
		N ₂ O	No	Electricity generation through wind does not lead to emission of greenhouse gases.

The project boundary is composed of the Wind Energy Generators, main transformers, grid, transmission lines, sub station and the metering equipment for each generator and substation, and the grid which is used to transmit the generated electricity.

Figure 4: Project Boundary



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

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The baseline for the project has been identified according to ACM0002 (version 07) where in for the project activities that do not modify or retrofit an existing electricity generation facility, the baseline scenario is the following:

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

The “tool to calculate the emission factor for an electricity system”, version 01 calculates the CM in the following steps:

STEP 1. Identify the relevant electric power system.

STEP 2. Select an operating margin (OM) method.

STEP 3. Calculate the operating margin emission factor according to the selected method.

STEP 4. Identify the cohort of power units to be included in the build margin (BM).



STEP 5. Calculate the build margin emission factor.

STEP 6. Calculate the combined margin (CM) emissions factor.

STEP 1: Identify the relevant electric power system – The tool defines the *electric power system* as 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.

Keeping this into consideration, the Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into two grids⁹ (see table 4).

Table 4: Regional grids in Indian electric power system

Regional grid	Northern	Western	Southern	Eastern	North Eastern
States	Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand, Delhi	Gujarat, Madhya Pradesh, Maharashtra, Goa, Chattisgarh	Andhra Pradesh, Karnataka, Kerala, Tamil Nadu,	Bihar, Orissa, West Bengal, Jharkhand	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura

Source: Ministry of power http://powermin.nic.in/JSP_SERVLETS/internal.jsp

Since the project supplies electricity to the Western grid, emissions generated due to the electricity generated by the western regional grid as per CM calculations will serve as the baseline for this project. The detailed CM calculations have been provided in the Section B.6 (STEP 2 onwards) of the PDD.

Description of the identified baseline scenario:

The Western Region grid managed by Western Region Electricity Board (WREB) constitutes five states (viz Maharashtra, Madhya Pradesh, Chhattisgarh, Gujarat and Goa) and two Union territories (Daman & Diu and Dadar & Nagar Haveli). These states under the regional grid have their own power generating stations as well as centrally shared power-generating stations. While the power generated by own generating stations is fully owned and consumed through the respective state's grid systems, the power generated by central generating stations is shared by more than one state depending on their allocated share. WREB facilitates the share of power generated by the central generating stations. Presently the share from central generating stations is a small portion of their own generation.

The installed capacity of Western Region at the end of financial year 2005-06 as per CEA was 35118.95 MW (effective capacity 33866.70 MW). The total installed capacity comprises of Hydro – 6658.83 MW, Gas – 5102.31 MW, Coal- 20941.50 MW, Nuclear- 1300 MW, RES – 1098.83 MW and Diesel – 17.48 MW. The Hydro : Thermal ratio is of the order of 24.37 : 75.63.

The Western Regional grid registered maximum demand of 26575 MW in October 2005 during the year, indicating an increase of 3.22% over the previous year. The unrestricted maximum demand was 33065 MW in the month of December 2005. The capacity shortage in the region was of the order of 14.10 % to 24.04% during the year 2005-06. The capacity shortages were of the order of 2.72 % to 24.94 % in Madhya Pradesh, 6.18 % to 22.24% in Gujarat, 13.16 % to 28.09 % in Maharashtra and 2.77 % to 14.57 % in Chhattisgarh.

⁹ Ministry of power http://powermin.nic.in/JSP_SERVLETS/internal.jsp



The maximum gross energy availability of Western Region was 576.99 Mus/day during the month of February 2006. The total net energy consumption of the Western Region for the year 2005-06 was 187483.92 Mus, which was 3.06 % more than the previous year. The monthly regional energy shortages varied from 4.94 % to 18.24 %. The maximum monthly energy shortages were of the order of 24.21% in Maharashtra , 23.83 % in Madhya Pradesh, 12.28% in Gujarat and 7.13% in Chhattisgarh.

The proposed project activity lies in the state of Gujarat. From the above data it is clear that the state of Gujarat, along with other states in the western grid is incurring high energy shortages. The following tables illustrate the installed capacity of power generation in Gujarat:

Table 5: Installed Capacity (in MW)

	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Thermal	4586.48	4836.48	4836.48	4836.48	4836.48	4836.48	4961.48	5086.48
Hydro	547.00	547.00	547.00	547.00	563.00	563.00	713.00	745.00
Gas	1673.04	1673.04	1673.04	1802.10	1757.10	1836.72	1863.72	1908.72
Others	166.90	166.90	166.90	166.90	166.90	173.10	236.67	306.88
Total	6973.42	7223.42	7223.42	7352.48	7323.48	7436.30	7774.87	8047.08

Reference: Western Region Power sector profile – Ministry of Power (November 2006)

Table 6: Installed Capacity by Ownership (in MW)

	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
State Sector	4333.62	4583.62	4583.62	4712.68	4683.68	5210.30	5685.30	5769.73
Private Sector	2639.80	2639.80	2639.80	2639.80	2639.80	2226.00	2289.57	2277.35
Total State And Private Sector	6973.42	7223.42	7223.42	7352.48	7323.48	7436.30	7974.87	8047.08
Share in Central Sectors Stations	-	-	1538.30	1538.30	1538.30	1538.30	1538.37	1801.29
Total	-	-	8761.72	8890.78	8861.78	8974.60	9513.17	9848.37

Reference: Western Region Power sector profile – Ministry of Power (November 2006)

*The gaps illustrate non availability of data for that period.

It is further clarified from the above tables that the Gujarat state power sector is dominated by fossil fuel based installations and depends on them for meeting its power requirements. The share of other power generation sources such as hydro and others is comparatively small. The following table further illustrates the power supply position in the state of Gujarat:

Table 7: Power Supply Position in Gujarat



	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Energy (Mus)								
Requirement	45685.00	51202.00	53038.00	53693.00	60175.00	57171.00	59681.00	57129.00
Availability	42835.00	46994.00	47787.00	47530.00	53316.00	50292.00	52724.00	52428.00
Shortage (%)	6.20	8.20	9.70	11.50	11.40	12.00	11.70	8.20
Peak (MW)								
Requirement	7018.00	7554.00	7801.00	8005.00	8641.00	9820.00	10162.00	9783.00
Peak Met	5877.00	5962.00	6905.00	6700.00	7336.00	7204.00	7578.00	7610.00
Shortage (%)	16.30	21.10	11.50	16.30	15.10	26.60	25.40	22.10

Reference: Western Region Power sector profile – Ministry of Power (November 2006)

The table depicts that the average requirement of power in Gujarat is much higher than the availability leading to consistent power shortages in the state for various years reaching to a maximum energy shortage of 12% in the year 2003-04. The peak load is further showing an increasing trend in the amount of shortage between peak requirement and peak met.

Thus in the absence of the proposed CDM project activity by DLF, taking into account high energy shortages in the region and specifically the state of Gujarat, the electricity delivered to the grid by the project would have otherwise been generated by the continued operation of grid-connected power plants and by the addition of new generation sources to meet the existing and future power requirement which is the chosen baseline scenario.

Steps 2-5 of “tool to calculate the emission factor for an electricity system” are explained in section B5 of the 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):

Baseline Scenario

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

The project activity is grid-connected electricity generation from renewable energy source i.e. wind. The project activity involves implementation and operation of 100 WTGs of individual capacities 1.5 MW at Kutch region in Gujarat totalling an installed capacity of 150 MW.

As per the decision 17/cp.7 Para 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered project activity. As per the selected methodology ACM0002, the project developer is required to establish that the GHG emission reductions due to the project activity are additional to those that would have occurred in the absence of the current project activity as per the “tool for the demonstration and assessment of additionality” version 5.2

CDM revenue was seriously considered in the decision to proceed with the project activity. DLF appointed Dr. Sanjay Vashishtha (having good knowledge of CDM and has worked in Senergy Global Private Limited, a carbon advisory company), on 13th July 2007 for carbon credit activities. DLF directors had a meeting on date 3rd September 2007, before placing a formal purchase order to Suzlon Energy Limited to discuss the associated project risks. CDM benefits through the projects have been discussed in the meeting. The chronology of events for CDM consideration is as follows:



S.No.	Date	Events
1	03/09/2007	BOARD RESOLUTION FOR CDM BENEFITS
2	07/09/2007	CONTRACT OF SUPPLY & COMMISSION WITH SUZLON
3	10/12/2007	SUBMISSION OF THE PDD's FOR DNA APPROVAL
4	03/01/2008	CONTRACT SIGNING WITH BUREAU VERITAS FOR VALIDATION
5	08/01/2008	PRESENTATION AT MOEF FOR HOST COUNTRY APPROVAL
6	14/02/2008	START FOR GLOBAL STAKEHOLDER COMMENTS
7	31/03/2008	COMMISSIONING OF ALL THE 100 WTG's
8	21/07/2008	HOST COUNTRY APPROVAL RECEIVED

STEP 1. Identification of alternatives to the project activity consistent with mandatory laws and regulations

The proposed project activity involves implementation of 100 WTGs of individual capacity 1.5 MW to generate electricity and export it to the Western regional grid. The alternatives which were available with the project participants are as follows:

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

Alternative 1 – The proposed project activity not undertaken as a CDM project activity.

In the said alternative DLF would have gone ahead with the implementation of project activity, generating renewable electricity and exporting the same to the state electricity grid under a power purchase agreement thereby displacing equivalent units of power generated by fossil fuel based plants in the grid. There would be no emissions of greenhouse gases to atmosphere. This alternative is in compliance with all applicable legal and regulatory requirements and may be a part of the baseline scenario. However there exist barriers to the implementation of the proposed project activity without CDM as explained in step 2 and step 3 below.

Alternative 2 – No project activity and equivalent amount of energy would have been produced by the project grid electricity system through its currently running power plants and by new capacity addition to the grid i.e. Continuation of current situation.

The “no project option” where in the equivalent amount of energy would have been produced by the project grid electricity system through its currently running power plants and by new capacity additions (which are mostly thermal) is the most plausible alternative as baseline option for the project. Thus, suitable grid mix has been selected as baseline option and therefore for calculation of baseline emission¹⁰. So, the baseline scenario of the project is Equivalent annual electricity supplied by Western regional Grid, which is the continued operation of the existing power plants and the addition of new generation sources on the Western regional grid to meet the electricity demand. The project involves constructing a wind-farm by using wind resources for power generation. The emission reductions of the project are equal to the baseline emissions since the project emissions and leakage is zero respectively.

¹⁰ PDD do not consider coal or gas fired power plants as the viable alternative to the wind farm. As per the tool for additionality “a coal/gas -fired power station or hydropower may not be an alternative for an independent power producer investing in wind energy.



Alternative 3- Construct a power plant using other renewable energy with equivalent annual power supply

This alternative is to construct renewable power plants whose annual power supply is equivalent to the projects. However, those kinds of renewable power plants, such as photovoltaic, tidal/wave, hydro, geothermal and renewable biomass etc., are strongly dependent on climate and natural resources. There are not exploitable renewable (tidal/wave/hydro), and biomass energy source at the project site since the project is located in dry land site. Further the solar photovoltaic power generation of the comparable size 150 MW is not feasible because of its cost of electricity generation¹¹. Therefore, the Alternative 3 is not a possible baseline scenario.

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

The alternative(s) shall be in compliance with all applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution. (This sub-step does not consider national and local policies that do not have legally-binding status.).

All the above alternatives are in compliance with all applicable legal and regulatory requirements as follows:

The implementation of project activity is a voluntary initiative and it is not mandatory or a legal requirement. For power generation, the electricity act 2003 does not restrict the developer or empower any authority to restrict the fuel choice, the applicable environmental regulations do not restrict the use of wind energy and there is no legal requirement on the choice of a particular technology.

Thus, considering that all the alternatives are in line with the applicable legal and regulatory requirements, the “no project option” i.e. continuation of current practice where in the equivalent amount of energy would have been produced by the project grid electricity system through its currently running power plants and by new capacity additions is the chosen baseline scenario which would have happened in the absence of the proposed project activity.

Step 2. Investment analysis

Determine whether the proposed project activity is economically or financially less attractive than at least one other alternative, identified in step 1, without the revenue from the sale of certified emission reductions (CERs). To conduct the investment analysis, use the following sub-steps:

Sub-step 2a. Determine appropriate analysis method

As the electricity generated from the DLF wind farm will be sold to Gujarat state electricity utility, it will generate financial benefits in terms of revenues from the sale of electricity units. Thus simple cost analysis (option I) cannot be applied to the proposed CDM project activity.

Amongst the other two options – investment comparison analysis (option II) and benchmark analysis (option III), the benchmark analysis has been adopted wherein the Internal Rate of Return (IRR) of the project activity serves as a benchmark to assess the financial attractiveness of the project activity. Option III assesses if the project’s returns are sufficient for investors to make the initial investment and further

¹¹ Cost of electricity generation is about Rs. 15 per kWh.

http://mnes.nic.in/pdf/guidelines_spg.pdf



bear the associated costs of successfully operating the project activity over the crediting period of the project.

Sub-step 2b (Option III) – Apply benchmark analysis

In order to apply a benchmark comparable to the project IRR the project participant selected to use the Prime Lending Rate (PLR) published by the Reserve Bank of India (RBI). The PLR is the benchmark interest rate at which commercial banks in India lend to their most credit worthy customers. The RBI publishes the average PLR of the five major nationalized banks in India in its weekly publication.

Typically, projects in India would be borrowing debt at a rate equal to or higher than the PLR. Hence, for any project to be financially attractive, the IRR of the project must be higher than the rate of borrowing on debt (i.e. higher than the PLR). Accordingly, if any project's IRR does not exceed the PLR, it could be considered a financially unattractive project.

The use of the PLR is consistent with the *Tool for the demonstration and assessment of additionality* which suggests that “...benchmarks for IRR, NPV, etc. can be derived from....Estimates of the cost of financing and required return on capital (e.g. **commercial lending rates** and guarantees required for the country and the type of project activity concerned), based on bankers views and private equity investors/funds' required return on comparable projects”.

The PLR contained in the PDD (12.75-13.25%) was the value quoted by the RBI on August 24th 2007¹². As the benchmark PLR varies between 12.75 %- 13.25%, we have considered 12.75% (lowest of the 12.75-13.25% PLR range) as benchmark for investment based project IRR.

In order to keep this benchmark conservative no risk premium associated with the project type or the project developer was added to it. Further, RBI's PLR is in itself a conservative benchmark as it does not take into account the commercial lending rates of private sector banks which are typically higher than that of nationalized banks. For example,

The PLR of ICICI Bank, India's largest private sector bank, was 16.5% p.a. from 1 July 2008¹³.

The PLR of HDFC Bank was 16% p.a. from 1 July 2008¹⁴.

For determining the tariffs for wind power projects, Gujarat Electricity Regulatory Commission (GERC) has considered a 14 % post tax return on equity for projects in private sector (Source: GERC order, dated 11th August 2006). The RBI's PLR is conservative as the post tax equity IRR of GERC tariff order 14% is higher than the RBI's PLR. Further GERC tariff order considers the CDM revenue in its tariff determination^{15, 16}.

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

¹² Reserve Bank of India Bulletin, Weekly statistical supplement, September 7 2007. Vol 22. Page 2

<http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/79730.pdf>

¹³ http://www.icicibank.com/pfsuser/aboutus/investorelations/pressrelease/icicibank_pressrelease/IBAR.pdf

¹⁴ <http://www.hdfcbank.com/wholesale/default.htm>

¹⁵ annual report of GERC 2005-06

¹⁶ discussion paper on wind energy tariff by GERC



The project proponent has calculated IRR for the proposed project activity with and without CDM revenues was computed for a period of 20 years, corresponding to the lifetime of the project based on the following assumptions:

Table 8: Assumption for financial analysis of the project

Parameter	Value applied	Justification
Project details		
Capacity of Machines in kW	1,500	As per the contract with Suzlon
Number of Machines	100	As per the contract with Suzlon
Project Capacity in MW	150.00	As per the contract with Suzlon
Project Commissioning Date	31/03/2008	Commissioning certificate
Operations		
Plant Load Factor	26.5%	As per GERC Tariff order dated 11/08/2006. the highest PLF achieved in Kutch is 25.68% ¹⁷ . PP assume a higher PLF of 26.5 As the WTGs are the latest quality machines of Suzlon.
Operation & Maintenance Cost base year @ % of capital cost	1.50%	As per GERC Tariff order Dated 11/08/2006.
% of escalation per annum on O & M Charges	5.0%	As per GERC Tariff order Dated 11/08/2006.
Tariff		
Base year Tariff for 10 years - Rs./kWh	3.37	As per GERC Tariff order Dated 11/08/2006.
Annual Escalation (Rs./kWh per Year)	0.00	
Tariff applicable after 10 years (Rs./kWh)	3.37	As per GERC Tariff order Dated 11/08/2006.
Project Cost (Rs Million) Land and Infrastructure, Generator & Electrical Equipments, Mechanical Equipments, Civil Works, Instrumentation & Control, Other Project Cost, Pre operative Expenses, etc.		
Project cost	8,833	As per the contract with Suzlon
Means of Finance		
Own Source	30%	As per GERC Tariff order Dated 11/08/2006.
Term Loan	70.0%	As per GERC Tariff order

¹⁷ Page 4 of GERC Tariff order dated 11/08/2006.



		Dated 11/08/2006.
Terms of Loan		
Interest Rate (%)	10.25%	As per the loan document
Tenure (Years)	7.0	As per the loan document
Moratorium (Months)	12	As per the loan document
Book Depreciation Rate (Straight Line Method basis)		
On all assets	5.28%	As per the standard rate
Income Tax		
Income Tax rate	30%	As per standard rate
Minimum Alternate Tax	10%	As per standard rate
Surcharge	10%	As per standard rate
Cess	3%	As per standard rate
CER Revenues		
CER Price in Euro	12.00	Assumed based on the prevailing markets ¹⁸
Exchange rate Rs./Euro	55.14	Exchange rate on 3 rd Sept the decision date
Residual value Rs. in Million	441.65	5% of the capex, as per the standard rate.

The project IRR for the project activity without CDM benefits was found to be 8.78 % which is lower than the 12.75 % IRR benchmark considered for this project activity. The project IRR (at 26.5% PLF) for the project activity with CDM benefits is 11.51%. At +10% PLF (i.e. 29.15% PLF) the Project IRR with CDM crosses the benchmark IRR and reaches to 12.98 %. PP plans to implement better O&M practices and adopt improved WTG O&M technologies in future to enhance the wind farm availability to further improve the PLF of the project activity to make the project viable. Therefore the incentive through sale of the emission reductions would improve the returns from the project activity. Hence, it can be justifiably concluded that CDM revenue that the project activity would obtain through sale of the emission reductions, is very crucial to sustain the operations of the project activity.

Sub-step 2d. Sensitivity analysis

Sensitivity analysis of the project IRR to the Plant Load Factor (the most critical assumption) has been carried out considering a plant load factor variation by +/- 10%, the project IRR for the project activity without CDM benefits was found to be 10.35 % at (29.15% PLF), the project IRR of the project activity improves to 12.98% with CDM benefits at 29.15% PLF. Plant Load Factor is the key variable encompassing variation in wind profile, variation in off-take (including grid availability) including machine downtime. The project IRRs at the stated PLFs are as follows:

Table 9: Sensitivity analysis of the project IRR with PLF

Sensitivity Analysis	Base PLF	(+10% PLF)	(-10% PLF)
PLF	26.50%	29.15%	23.85%

¹⁸ India carbon market conclave 2007.



Project IRR without CDM	8.78%	10.35%	7.10%
Project IRR with CDM	11.51%	12.98%	9.98%

The purpose of the sensitivity analysis is to demonstrate the sensitivity of the internal rate of return of project due to uncertainty in plant load factor. The risk of PLF remains outside the control of the project activity; it basically depends on wind pattern, infrastructure facility of the electricity board. From the above analysis it is apparent that there is significant risk associated with the project activity that impacts the viability of the project as highlighted through the sensitivity analysis.

The results of the sensitivity analysis conducted confirm that the project IRR for the project activity without CDM revenues is lower than that which would make the project economically attractive for the investors, under circumstances which could bring about variations in the critical factor used for the IRR computations.

Hence, it can be justifiably concluded that CDM revenue that the project activity would obtain through sale of the emission reductions, is very crucial to sustain the operations of the project activity.

Step 3: Barrier Analysis:

Herein the project proponent is required to determine whether the proposed project activity faces barriers that:

(a) Prevent the implementation of this type of proposed project activity; and

(b) Do not prevent the implementation of at least one of the alternatives through the following sub-steps:

Sub-step 3a: Identify barriers that would prevent the implementation of the type of the proposed project activity.

The following barriers have been identified by the project proponent that would hinder the implementation of the proposed project activity:

Barriers due to prevailing practice

The WTG installations have a lower PLF and comparable / higher per MW installation cost as compared to the conventional generation methods (hydro, thermal, biomass)¹⁹. The electricity policy of the state of Gujarat limits the investor to either sell the generated electricity from wind power projects to DISCOMS or to put it to captive utilisation as third party sale is not allowed in the state. It has been observed that the new investments as well as the existing installation of WTGs, essentially depend on the public policy. A non-conducive, stagnant policy in the state brought the investments at a standstill leading to no (0 MW) installations in the state for four consecutive years (1998 – 2002)²⁰. The description below highlights the changes in policy along with the investment made in WTG during that particular policy regime.

January 1993 – September 2001:

Purchase of electricity at INR 1.75 /kWh (US\$ 0.039 /kWh) with wheeling charges of 2% of the energy generated by windmills and provision of banking for a period of 6 months. Electricity duty and demand cut to the extent of 30% of installed capacity of wind farm has been exempted along with 50% sales tax incentives. Additionally the generator was exempted from the electricity duty over the generated electricity. Prior to the first policy, the state was having 16.1 MW of WTG installations. The first public

¹⁹ <http://www1.timesofindia.indiatimes.com/articleshow/6703992.cms>

²⁰ Refer Table 11.



policy for wind sector could attract investment, and the state enjoyed installation of 10.6 MW in 1993-94 followed by 37.7 MW in 1994-95 followed by 51.2 MW in the year 1995-96. The investors were looking forward to further improvement in tariff for this sector, but the public policy continued to remain stagnant leading to reduction in investment, leading to installation of 31.1 MW in 1996-97 and 20.1 in 1997-98²¹. The manufacturers could not further attract the investors because of non-conductive policy and the installation level dropped to Nil during rest of the policy period.

October 2001 – June 2002:

Purchase of electricity at INR 2.25 /kWh (US\$ 0.05/kWh) with 1994-95 as base year with 5% escalation per annum for a period of 10 years from the date of commencement of generation of power. The purchase price after 10 years of commissioning of the project shall be equal to the purchase price at the end of that year or as may be negotiated between the stakeholders. The wheeling charges doubled from 2% to 4% of the generated energy. A provision of banking for 12 months along with 3rd party sale was permitted. The policy was changed after a gap of 7 years, but the new policy was couldn't meet the expectations of the investors, because of the less profitable nature of business as compared to available options for investment, hence for all practical purposes, this policy was a total failure and not even a single installation of WTG took place during this regime²².

June 2002 – August 2006:

Purchase of electricity at INR 2.60 /kWh (US\$ 0.057 /kWh) with an increase of INR 0.05/ kWh per annum (US\$ 0.001 /kWh p.a.) for a period of 10 years and after 10th year, the rate to be negotiable. The wheeling charges were kept constant at 4%, whereas the banking period had been reduced from 12 months to 6 months. The permission for 3rd party sale of electricity not permitted. Payment of electricity duty and demand cut to the extent of 30% of the installed capacity of the wind farm had been exempted²³. Some relief to the investors were given with increase in tariff, but because of proactive action by manufacturers playing in the market, some investors were convinced to invest in the wind sector and again a marginal growth had been observed leading to 6.2 MW in 2002-03, 28.9 MW in 2003-04, 51.5 MW in 2004-05 and 84.6 MW in 2005-06.

August 2006 onwards:

Purchase of electricity at INR 3.37/kWh (US \$ 0.075 /kWh) fixed for entire project lifetime of 20 years. The wheeling charges are kept constant at 4% in accordance with the previous policy including the banking period of 6 months. The permission for 3rd party sale of electricity is still not allowed although it is allowed under Electricity Act 2003.

Table 10: Wind tariff policies in different states

²¹ (Source: (a) Para (v)-(ix), pp. 2-3, Incentive Scheme for Wind Power Generation 1993, Govt. Resolution No. EDA-1092- M (I)-8(1)-E, dated 27.1.1993. (b) Para 6, page 4, Sales-tax incentive scheme for Wind Power Generation, 1993, Govt. Resolution No. EDA-1092-M (I)-8(2)-E, dated 27.1.1993)

²² (Source: Para 3, 7, 8-9, pp. 1-3, Incentive scheme for energy generation through Renewable Sources-2001, Govt. Resolution No. REP-102000-502-B, dated 27.9.2001).

²³ (Source: Para 5, 8-11, pp. 2-4, Wind Power Generation Policy-2002, Govt. Resolution No. EDA-10-2001-3054-B (Part-II) dated 20.6.2002).



Items	Buy-back	Third party-sales	Penalty on kVARh consumption
Andhra Pradesh	Presently INR.3.37 w.e.f 01.04.2004 (frozen for 5 years)	Allowed as per Electricity Act 2003 subject to APERC Regulations	Reactive energy l @ 0.10p/unit.
Tamilnadu	INR. 2.90/kwh (No Escalation)	Not Allowed	25 paise per kVARh if the ration of kVARh drawn to KWh exported is upto 10% and 50 paise per KVARh for more than 10%.
Karnataka	INR. 3.40 / kwh without escalation for 10 years	Allowed to HT consumers	Penalty on kVARh consumption 0.40p/unit
Kerala	3.14 for 20 years	Allowed as per Electricity Act 2003 subject to SERC Regulations	-
Uttar Pradesh	INR. 2.25/kwh (5% Esc. 95-96)	Allowed	-
West Bengal	To be decided on case to case basis	Not Allowed	-
Gujarat	2.60 /kWh with an increase of INR 0.05/ kWh per annum (till 2006) Present INR. 3.37/kwh (without any escalation for 20 yrs)	Not Allowed	Penalty on kVARh consumption - 10 paise per kVARh upto 10% & 25 paise per kVARh above 10%
Madhya Pradesh	INR. 3.97 in 1st year, INR. 3.80 in 2nd year, INR. 3.63 in 3rd year, INR. 3.46 in 4th year and INR. 3.30 for 5th to 20th year	Allowed	27 paise per kVARh
Maharashtra	INR. 3.50/kwh	Allowed	25 paise per KVARh
Rajasthan	INR. 3.71/kWh (EHV) and INR 3.60/kWh (33/11kV) for Jodhpur, Barmer and Jaisalmer	Allowed	4 paise per kVARh with escalation of 5% per year.



	districts. INR. 3.89/kWh (EHV) and INR 3.78/kWh (33/11kV) for the rest of the districts.		
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It is observed that power purchase price in the state of Gujarat from wind power was the lowest in comparison to all the other states with wind potential till the new policy which has recently come up in August 2006. The tariff according to the new policy has been fixed at INR. 3.37/kWh which is still less than wind power tariff in states like Rajasthan, Madhya Pradesh, Maharashtra and Karnataka. It is to be emphasised here that out of the total installed capacity of wind electricity generators in the state of Gujarat, most of the private wind-farm owners are under the wheeling and banking agreement using the generated output from their WTGs for captive utilisation. The electricity act 2003 allows third party sale, however the Gujarat Electricity Regulatory Commission (GERC) prohibits third party sale leaving investors to either sell the generated output to the utility at a low tariff or utilise it for captive consumption. As a result most of the investors in Gujarat have opted for captive consumption only. The following table provides the year wise addition of wind power projects to the installed capacity (in MW) in the state of Gujarat:

Table 11: Year wise addition of wind power capacity in Gujarat (in MW)

Upto Mar 1992	1992 to 1993	1993 to 1994	1994 to 1995	1995 to 1996	1996 to 1997	1997 to 1998	1998 to 1999	1999 to 2000	2000 to 2001	2001 to 2002	2002 to 2003	2003 to 2004	2004 to 2005	2005 to 2006	Total as On March 31, 2007
14.51	1.63	10.62	37.74	51.15	31.13	20.1	0	0	0	0	6.2	28.90	51.5	84.6	570.47

Source: www.inwea.org, GEDA <http://www.geda.org.in/pdf/wind/Windfarms-PowerGeneration.pdf>

From the above table it is clear that after the year 1998, there was literally no investment by private entrepreneurs in Gujarat till the year 2002 due to unfavourable policy and huge losses faced by the erstwhile Gujarat state electricity board when all other states with wind power potential saw rise in the installed capacity e.g. Maharashtra, Tamil Nadu and Karnataka in the same period recorded a capacity addition of 372.34, 267.28 and 104.69 MW respectively.

As wind power is infirm, it is not amenable to grid dispatch instructions. Most of the costs of wind energy generation are fixed in nature. For these reasons the GERC decided to have a Single Part tariff for wind power. However, this implies a higher investment risk for the proposed project activity than the utility scale fossil fuel and hydro projects where the investment recovery is decoupled from the level of actual generation achieved by the project due to variations in off-take. Thus, transmission unavailability, back-down of generation or part-load operations, which are beyond the control of the investors are likely to affect the project activity more severely and therefore the project activity investors would require higher rate of return to compensate them for these risks²⁴. Furthermore, the tariff is specified ex ante for the proposed project activity whereas in case of utility scale fossil fuel and hydro projects, these are usually by reference to cost-plus approach whereby the projects recover their full investment cost including a

²⁴ <http://www.thehindubusinessline.com/2005/08/29/stories/2005082901140900.htm>



post-tax return on equity if they are able to reach specified level of plant availability. Thus the utility scale fossil fuel and hydro projects are ensured of equity returns from the first year of operation. This increases the investment risks in the project activity compared to the alternatives.

As stated earlier, out of the total installed capacity in the state, most of the projects have been developed to use the generated power for captive consumption by the investors. The DLF wind farm is thus one of the very few projects in Gujarat developed for selling the generated output to the state electricity utility. Additionally a large scale investment of this nature has been the “**first of its kind**” in the state and it is the largest wind farm by Suzlon Energy Limited to be commissioned in Gujarat.

DLF is selling power to GUVNL through a 20 year Power Purchase Agreement (PPA) contract. As per the data available till 2002-03, erstwhile Gujarat Electricity Board (GEB) had been incurring heavy commercial losses since last one decade. The commercial loss (with subsidy) for erstwhile GEB (off-taker) in the year 2001-02 was INR 3146 Crore year 2002-03 was INR 2267 Crore, in the year 2003-04 was INR 3031 Crore and in the year 2004-05 it was INR 2125 Crore. Although the situation has improved in the past few years, but the amount of losses are still huge. For their cash in-flows the project proponent is dependent on the payments from electricity utility against the sale of electricity to the grid and it is very likely that there could be problems with the cash inflows of project. However DLF signed a PPA with GUVNL only with the hope that CDM funding would help to off-set the anticipated losses.

Table12: Commercial Profit, Loss (w/o subsidy) in Gujarat (2001-2002 to 2004-2005)

Year	2001-02	2002-03	2003-04	2004-05
(INR.in Crore)	(3146)	(2267)	(3031)	(2125)

Source: Indiatats.com

Along with the above stated barriers, GERC in its order on 11/08/2006 has mandated the private investors to share 25% of the gross benefit from CDM with the respective distribution licensee which means that the anticipated revenue from CDM will also not be fully available to the project participant²⁵. There is a risk that the quantity of CDM revenue shared between the project proponent and DISCOM may increase in the future in view of CER sharing arrangement in other states e.g. Karnataka where there is a proposal of 30:70 sharing of CDM revenue between the project proponent and the state electricity utility/DISCOM²⁶.

Other barriers:

Wind turbines convert kinetic energy of the moving air into rotational energy, which in turn is converted to electricity. Since wind speeds vary from month to month and even second to second, the amount of electricity wind can produce varies constantly. For substantial period, a wind turbine will produce no power at all. In certain years wind potential is very low. The Plant Load Factor (PLF) is a ratio of actual energy produced in a given period to the hypothetical maximum possible, i.e. that produced by a turbine running full time at its rated power. As per the study conducted by CICERO for Gujarat, the PLF achieved in Gujarat during are falling short by 19% then the estimated²⁷. As the sites identified previously to be suitable sites for wind power generation have been exploited fully, new sites are being identified,

²⁵ GERC tariff order dated 11/08/2006

²⁶ PPA between KPTCL and Siddaganga oil extraction Ltd. Dated 09/07/2003.

²⁷ CICERO working paper 1997: Institutional barriers to commercialization of wind power in India: The case of Gujarat <http://www.cicero.uio.no/media/192.pdf>



which have a comparatively lower PLF leading to lower generation potential for new investors like DLF. Moreover, in most of the wind power projects the PLF predicted in the preinvestment studies and that obtained after the installation of wind power plant vary; in most cases, the actual PLF is much less than that predicted in the studies.

The study conducted by CICERO for wind farm implementation in Gujarat highlights that sited along the coast of Gujarat have very low local demand, the generated power from wind projects has to be transported over long distances by the GETCO. Frequent grid outages caused through overloading of sub-stations has meant that in order to reduce system failures, restrictions are imposed on the times at which wind power may be evacuated. Thereby preventing wind power projects from operating at their full potential capacity²⁸.

As stated the above alternatives are specifically hindering the implementation of wind farm projects including the proposed project activity. None of these barriers are applicable to either of the two other alternatives.

Step 4: Common practice analysis

As on 31/03/2007, the total installed capacity of power generation in India through all power generation (coal, gas, nuclear, hydro and others) sources is 132329.21 MW²⁹ whereas the installed capacity of wind power in India is 7114.6 MW³⁰. Thus only 5.37 % of the total installed capacity in India is through wind generation sources. Given that the gross potential for wind power in India is 45195 MW, the exploitation of the technology is very low.

- The state of Gujarat has the highest gross potential for wind power generation among all other states; however the installed capacity in the state is much lesser than states such as Tamil Nadu, Gujarat, only 570.4 MW of wind power has been installed till 31/03/2007 which is just 5.8% of the gross potential (9675 MW) of wind power in the state³¹.
- Out of the total installed capacity of 10490.79 MW³² from all the generation sources in Gujarat, only 570.4 MW comprises of installations utilizing wind energy to generate power i.e. only 5.43 % of total installed capacity lying way behind Tamil Nadu, Maharashtra and Karnataka.
- Out of 570.4 MW installed capacity of wind in Gujarat, most of the private investors in the region have opted for captive utilization of the generated output and the proposed project activity of such a large scale opting to sell the generated output to the state electricity utility would be the first in the region and no existing project activity can thus be compared to the proposed project.
- Most of the wind energy produced in Gujarat is utilized for captive consumption. For example, in 2004-05, out of the approximately 248 Million Units produced by wind farms in Gujarat, only 24 Million Units were purchased by GEB and its successor entities. The balance generation was for captive consumption³³.

²⁸ CICERO working paper 1997: Institutional barriers to commercialisation of wind power in India: The case of Gujarat <http://www.cicero.uio.no/media/192.pdf>

²⁹ Annual Report 2006-07 Ministry of Power : Central Electricity Authority July 2007 Annexure 10B

³⁰ <http://www.windpowerindia.com/statstate.html>

³¹ The wind power potential in Gujarat is 9675 MW. (Wind Power Directory 2007)

³² Annual Report 2006-07 Ministry of Power : Central Electricity Authority July 2007 Annexure 10B

³³ GETCO Tariff Order dated 6th May 2006



In 2004–05, wind electricity generation in Gujarat was 350 GWh³⁴ and the total electricity generation in the state of Gujarat was 44230 GWh³⁵. This works out to 0.8%, showing that wind energy power generation is insignificant as compared to other power project generation sources in Gujarat.

- DLF is installing 150 MW in Gujarat since this is the **largest installation by any investor in Gujarat as well as in the India**. Most of the investors using the WTGs supplied by Suzlon are under wheeling and banking agreement with the state electricity utility. DLF project activity is thus one of the first wind farms utilising the Suzlon WTGs in Gujarat under a power purchase agreement with the state electricity utility for selling the generated power to the grid. Although there are some more new investments coming up in Gujarat for selling the generated electricity to the grid, these investments are very small in comparison to the DLF project activity making it the first largest wind farm project in Gujarat selling the generated output to the electricity utility.

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

According to additionality tool version 5.2, similar project activities are those that rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing etc. The project activity under consideration is a large scale project activity with installed capacity 150 MW. Similar project activity has been defined as any large scale project activity with size above 15MW and set up by a single project proponent within a particular time frame in the state of Gujarat for the sale of power to the grid.

The wind projects of similar scale commissioned in state of Gujarat at the time of investment in the project activity i.e. as on 7th September 2007, (prior to the start date of DLF's wind project) were analysed from the list of projects commissioned and under operation in Gujarat available in the Indian wind Power Directory 2007. This data was further confirmed by the data obtained from largest WEG supplier in India i.e. Suzlon Energy Limited. Further the data on private wind farm owners in India with an aggregate capacity of 15 MW and above in India as on 31st March 2007¹⁶ was also analysed for large scale private investment in Gujarat for comparison to DLF project activity. Table 13 provides the list of projects of large scale project activity above 15 MW capacity in the state of Gujarat

.Table 13: Projects of large scale project activity above 15 MW capacity in the state of Gujarat

Name of the project activity	Size in the state of Gujarat
Gujarat NRE Coke	26.25 MW
Gujarat Guardian Limited	31.6 MW
Patnaik Minerals Private Limited	30.2 MW
Indian Petrochemicals Co. Ltd	15.315 MW
SREI	24.8 MW
Hindustan Zink Limited	88.8 MW
MSPL Limited	30 MW
Ratnamani Metals and tubes Limited	17.5 MW

³⁴ Table 3.4 titled "Gross Electrical Energy Generation (Utilities Only) Primemoverwise, Regionwise / Statewise During 2004-05" in chapter 3 of the CEA general review 2006 available at http://www.cea.nic.in/power_sec_reports/general_review/index_general_Review.html -

³⁵ Table 5.3 titled "Statewise System Losses During 2004-05" in chapter 5 of the CEA General review 2006 available at http://www.cea.nic.in/power_sec_reports/general_review/index_general_Review.html -



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Source Wind Power Directory 2007 and Wind turbine suppliers data³⁶.

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

As per tool of additionality version 5.2, If similar activities are widely observed and commonly carried out, it calls into question the claim that the proposed project activity is financially unattractive (as contended in Step 2) or faces barriers (as contended in Step 3). Therefore, if similar activities are identified above, then it is necessary to demonstrate why the existence of these activities does not contradict the claim that the proposed project activity is financially/economically unattractive or subject to barriers. This can be done by comparing the proposed project activity to the other similar activities, and pointing out and explaining essential distinctions between them that explain why the similar activities enjoyed certain benefits that rendered it financially/economically attractive

Following types of projects are excluded from the definition of a similar scale project and the justification for the exclusions is as follows:

Table 14: projects for common practice analysis

Project type	Justification
Captive power projects	<i>A captive project is essentially implemented to meet the power requirements of an industry. The baseline scenario will be different for captive investor and the risk undertaken by a captive investor will be different from an investor selling power to the grid.</i>
Small scale wind power project activities bundled together from a large scale CDM project	<i>The scale of investment is not comparable to the project activity under consideration.</i>
CDM Project activities	<i>Projects which are under the CDM pipeline have to be excluded as per the guidance provided by the tool for demonstration and assessment of additionality.</i>
<i>Project activities implemented post the start date of the project activity</i>	<i>As per the guidance, only those projects can be compared which are under operation prior to the start of the proposed project activity by DLF.</i>

Following projects are excluded from the common practice analysis due to the reasons stated alongside:

Table 15: Project activities (15 MW and above in Gujarat

³⁶ Data obtained from Suzlon



Name of the project activity	Size in the state of Gujarat	Reason for exclusion
Gujarat NRE Coke	26.25 MW	<i>The project activity is under CDM^{37, 38}</i>
Gujarat Guardian Limited	31.6 MW	<i>It is a captive installation utilizing the generated output from its project for self utilization at its industry premises. Further the Project activity is also considering carbon finance and has already received carbon benefits through the Voluntary VER route³⁹.</i>
Patnaik Minerals Private Limited	30.2 MW	<i>The project is under CDM⁴⁰ -</i>
Indian Petrochemicals Co. Ltd	15.315	<i>The project is a captive project⁴¹ and hence has been excluded due to reasons stated above. Additionally the project was commissioned phase-wise in March 1997, the regulatory environment then prevailing and the policies pursued were different from those existing at the time of the start of proposed project activity by DLF. During 1993-1998 Gujarat Government provided special incentives for wind power generation, and the aforesaid project was installed in year 1996-1997⁴². The project was installed under the Incentive scheme for wind power generation 1993 which was applicable for the period from January 1993 – September 2001. The salient features of the scheme are as follows: Purchase of electricity at INR 1.75 /kWh with wheeling charges of 2% of the energy generated by windmills and provision of banking for a period of 6 months. Electricity duty and demand cut to the extent of 30% of installed capacity of wind farm has been exempted along with 50% sales tax incentives. Additionally the generator was exempted from the electricity duty over the generated electricity. [Source: (a) Para (v)-(ix), pp. 2-3, Incentive Scheme</i>

³⁷ Part of 22.3 MW Bundled grid connected Wind Power based electricity generation project in Gujarat

<http://cdm.unfccc.int/Projects/Validation/DB/OW17ZTWQUDGVXQGE059WCB0C9C6LIR/view.html>

³⁸ Part of 26.25 MW wind electricity generation project of Gujarat NRE Coke Limited at Jamnagar and Kachchh

<http://cdm.unfccc.int/Projects/Validation/DB/2WHFROEPK85ARNQ1TVKJIV4WC8ATMAB/view.html>

³⁹ <http://www.carbonneutral.com/cnregistry/uploaded/Jamnagar%20Wind%20Power%20Projects%20PDDs.pdf>

⁴⁰ <http://cdm.unfccc.int/Projects/Validation/DB/GQ56N39MLSZ9QDRL6RUF5YJSFDPD1U/view.html>

⁴¹ <http://sebidifar.nic.in/documents/IPCL/ar032002.pdf>

⁴² http://www.geda.org.in/wind/wind_power.htm



		<i>for Wind Power Generation 1993, Govt. Resolution No. EDA-1092- M (I)-8(1)-E, dated 27.1.1993. (b) Para 6, page 4, Sales-tax incentive scheme for Wind Power Generation, 1993, Govt. Resolution No. EDA-1092-M (I)-8(2)-E, dated 27.1.1993]</i>
SREI	24.8	<i>The Annual Reports of the company for the year 2006-07 and 2007-08 specifically bear a mention of availing CDM benefits for its renewable energy projects^{43,44}.</i>
Hindustan Zink Limited	88.8 MW	<i>The project is under CDM⁴⁵</i>
MSPL Limited	30 MW	<i>The Project is under CDM as part of the project activity - "30 MW wind power project at Surajbari, Gujarat in India"⁴⁶</i>
<i>Ratnamani Metals and tubes Limited</i>	<i>17.5 MW</i>	<i>The Project is under CDM as part of the project activity - "22.3 MW bundled grid connected wind power based electricity generation in Gujarat"⁴⁷, and 13.7 MW bundled wind power based electricity generation in Gujarat⁴⁸. project at Surajbari, Gujarat in India</i>

Thus, after exclusion of the above project activities, as stipulated by the guidance for conducting common practice analysis provided by the additionality tool, **it can be concluded that there are no similar scale**

⁴³ http://www.srei.com/srei_pdf/sreiannual/2006-07.pdf

⁴⁴ http://www.srei.com/srei_pdf/sreiannual/2007-08.pdf

⁴⁵ <http://cdm.unfccc.int/Projects/DB/BVQI1211956663.14/history>

⁴⁶ <http://cdm.unfccc.int/Projects/Validation/DB/L59OGCJY0XLZUC0W8MMB84A2T4NKNX/view.html>

⁴⁷ <http://cdm.unfccc.int/UserManagement/FileStorage/X6RZB5RJQDTY6C6PF4A38DSNXH2FL4>

⁴⁸ <http://cdm.unfccc.int/Projects/Validation/DB/HAZNBLU455HVN7R7OGA4I3R7T5JWWT/view.html>



project activities under operation in the state of Gujarat at the time of start of the proposed project activity by DLF.

The summary:

- Only 5.37 % of the total installed capacity in India is through wind generation sources
- Installed capacity in Gujarat is just 5.8% of the gross potential
- Electricity generation through wind power in Gujarat is only 0.8%, of the total electricity generation
- The project activity is the largest wind farm installation by a single investor in Gujarat as well as in the India.
- There are no similar wind farm projects in Gujarat of 15 MW or more capacity undertaken by public/private companies which can be comparable to the DLF project after exclusion of CDM projects.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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This section offers a detailed description of the application of the ACM002 (“Consolidated Baseline Methodology for grid connected electricity generation from renewable sources”, Version 07, Sectoral scope: 1.) methodology to the DLF’s wind power project, where the project emissions, the baseline emissions and the emission reductions are estimated.

According to the approved methodology ACM0002 (Version 07) Emission Reductions are calculated as

$$ER_y = BE_y - PE_y - L_y$$

Where:

BE_y Baseline Emissions in year y (t CO₂e/yr)

PE_y Project Emissions in year y (t CO₂e/yr)

L_y Leakage Emissions in year y (t CO₂e/yr)

A. Project emissions (PE_y)

The methodology clearly states that for all renewable projects other than geothermal power plants and Hydro power plants, Project emissions (PE_y) = 0.

Therefore, (PE_y) for the project = 0

B. Baseline emissions (BE_y)

The baseline emissions which include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity is calculated with the help of the following equation:

$$BE_y = (EG_y - EG_{baseline}) \cdot EF_{grid,CM,y}$$

Where:

BE_y = Baseline emissions in year y (tCO₂/yr).

EG_y = Electricity supplied by the project activity to the grid (MWh).



$EG_{baseline}$ = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (since this is not the case in this project this can be considered as zero) (MWh). For new power plants this value is taken as zero.

$EF_{grid,CM,y}$ = Combined margin CO₂ 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”. Since this project is not a case of modified or retrofit facility is not the case in this project this can be considered as zero. Therefore, as a result the equation stands to be:

$$BE_y = EG_y * EF_{grid,CM,y}$$

Procedure to calculate Emission Factor $EF_{grid,CM,y}$

For calculating the emission factor the Methodological tool “Tool to calculate the emission factor for an electricity system”. This methodological tool determines the CO₂ emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the “operating margin” (OM) and “Build Margin” (BM) as well as “Combined Margin” (CM) through a step wise approach. The steps required are as follows:

STEP 1. Identify the relevant electric power system.

STEP 2. Select an operating margin (OM) method.

STEP 3. Calculate the operating margin emission factor according to the selected method.

STEP 4. Identify the cohort of power units to be included in the build margin (BM).

STEP 5. Calculate the build margin emission factor.

STEP 6. Calculate the combined margin (CM) emissions factor.

STEP 1: Identify the relevant electric power system.

Refer to section B.4

STEP 2. Select an operating margin (OM) method.

As per the tool, the calculation of Operating Margin emission factor ($EF_{grid,OM,y}$) should be based on any one of the four following methods:

(a) Dispatch Data Analysis OM

(b) Average OM

(c) Simple Adjusted OM

(d) Simple OM

Since the “Tool to calculate the emission factor for an electricity system”, version 01, gives the freedom to choose any of the four options of calculating the OM, Simple OM has been chosen to be the most appropriate method of calculating the emission reductions in the project.

STEP 3. Calculate the operating margin emission factor according to the selected method. ($EF_{grid,OM,y}$)

In the western regional the power generation is dominated by fossil fuel based power plants and the power generation by low cost/must run resources constitute less than 50% of total grid generation, so simple operating margin method is used for operating margin emission factor calculation. The Operating Margin emission factor $EF_{OM,y}$ is defined as the generation-weighted average emissions per electricity unit (tCO₂ / MWh) of all generating sources serving the system, excluding zero- or low-operating cost power plants (hydro, geothermal, wind, low-cost biomass, nuclear and solar generation), based on the latest three year average (2004-05,2005-06, 2006-07).

As per the CEA CO₂ Baseline Database, the OM has been calculated as :

$$(EF_{grid,OM,y}) = 1.0035 \text{ tCO}_2\text{e/MWh}$$

Table 16: Simple Operating Margin⁴⁹**Simple Operating Margin (tCO₂/MWh) (incl. Imports)**

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.9768	0.9778	1.0003	0.9872	0.9801	0.9992	0.9985
East	1.2198	1.1874	1.1704	1.1960	1.1745	1.1291	1.0909
South	1.0237	1.0027	1.0075	1.0048	1.0009	1.0079	1.0030
West	0.9782	1.0101	0.9850	0.9921	1.0129	1.0039	0.9936
North-East	0.7353	0.7107	0.7437	0.7366	0.9019	0.6994	0.7031
India	1.0132	1.0204	1.0171	1.0219	1.0236	1.0191	1.0106

STEP 4. Identify the cohort of power units to be included in the build margin (BM).

The value of the data has been taken from the data published by CEA as referred in earlier step. The CEA Baseline Database has been calculated as per the methodology ACM0002 and the details of the key assumptions considered to calculate the figure can be found in the User Guide⁷ of the same.

Two following options for years(s) *y* are present, in terms of vintage of data:

Option 1.

For the first crediting period, calculate the build margin emission factor *ex-ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2.

For the first crediting period, the build margin emission factor shall be updated annually, *ex-post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which Out of the above two, Option 1 is selected.

The Build margin emission factor has been calculated *ex-ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of the power plant capacity additions in the electricity system that comprise 20% of the system generation (in GWh) and that have been built most recently as this sample group comprises larger annual generation than the generation of the sample group *m* consisting of the five power plants that have been built most recently. For the second crediting period, the build margin emissions factor shall be calculated *ex-ante*, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The BM is calculated using latest year data calculated by Central Electricity Authority (CEA) in their CO₂ Baseline Database (Refer Annex 3).

STEP 5. Calculate the build margin emission factor (EF_{grid, BM,y})

⁴⁹ Operating Margin emission factor has been referred from the “Baseline Carbon Dioxide Emission Database of CEA Version 3”(dated: December 15, 2007)



As per the CEA CO₂ Baseline Database, the BM for the 2007-08 has been calculated to be :

EF_{grid, BM, y} = 0.5938 tCO₂e/MWh

Table 17: Build Margin

Build Margin (tCO₂/MWh) (not adjusted for imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North					0.5336	0.6006	0.6283
East					0.9043	0.9672	0.9281
South					0.7047	0.7101	0.7055
West					0.7700	0.6300	0.5938
North-East					0.1456	0.1489	0.2265
India					0.6944	0.6838	0.6771

STEP 6. Calculate the combined margin (CM) emissions factor (EF_{grid, CM, y})

The CM can be calculated as per the following:

Where:

EF_{grid, OM, y} = Build Margin CO₂ emission factor in the year y (tCO₂/MWh)

EF_{grid, BM, y} = Operating Margin CO₂ emission factor in the year y (tCO₂/MWh)

W_{OM} = Weighting of operating margin emission factor (%)

W_{BM} = Weighting of build margin emission factor (%)

Owing to their intermittent and non-dispatchable nature, the default weights for wind and solar projects are as follows:

W_{OM} = 75% and W_{BM} = 25%

Thus, the CM emissions factor (EF_{grid, CM, y}) for the project has been calculated to be:

EF_{grid, CM, y} = 0.90105 tCO₂/MWh

C. Leakage Emissions (LE_y)

The proposed CDM project activity engages neither transferring the energy generating equipment from another activity, nor is the existing equipment transferred to another activity. The project is installation of 100 WTG units of 1.5 MW each. So the leakage emissions are not applicable and hence not considered.

LE_y = 0

Where,

LE_y - Leakage Emissions in the yth year

D. Emission Reductions (ER_y)

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. The emission reduction ER_y by the project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (LE_y), as follows:

ER_y = BE_y – PE_y – LE_y

Since, both PE_y and LE_y are 0,

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

(Copy this table for each data and parameter)



Data / Parameter:	EF_{OM,y}
Data unit:	tCO ₂ /MWh
Description:	Operating Margin emission factor for Western regional grid
Source of data to be used:	Referred from CO ₂ Baseline Database for the Indian Power Sector prepared by Central Electricity Authority
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1.0035 Details of the calculations have been shown in the sectionB.6.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002.
Any comment:	Calculated as indicated in the simple OM baseline method

Data / Parameter:	EF_{BM,y}
Data unit:	tCO ₂ /MWh
Description:	Built Margin emission factor for western regional grid
Source of data to be used:	Referred from CO ₂ Baseline Database for the Indian Power Sector prepared by Central Electricity Authority
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.5938 Details of the calculations have been shown in the sectionB.6.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002.
Any comment:	Calculated as indicated in the simple BM baseline method

Data / Parameter:	EF_y
Data unit:	tCO ₂ /MWh
Description:	Combined Margin CO ₂ emission factor for Western regional grid
Source of data used:	Estimated figure based on 75% of OM and 25% of BM values, Version 3.0.
Value applied:	0.90105 tCO ₂ /MWh



Justification of the choice of data or description of measurement methods and procedures actually applied :
Any comment:

Combined Margin Emission Factor has been calculated in accordance with ACM0002.

B.6.3 Ex-ante calculation of emission reductions:

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

Baseline Emission Factor (Combined Margin) (EF_y): - 0.90105 tCO₂e/MWh

Annual electricity supplied to the grid by the Project Activity (EG_y)

= 150 MW (Capacity) x 26.5% (PLF) x 8,760 (hours)

= 348210 MWh

Annual Baseline Emissions Reduction: $ER_y = EF_y * EG_y$

= 0.90105 tCO₂e/MWh x 348210 MWh

= 313755 tCO₂e

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

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Years	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)
2009	313755	0	0	313755
2010	313755	0	0	313755
2011	313755	0	0	313755
2012	313755	0	0	313755
2013	313755	0	0	313755
2014	313755	0	0	313755
2015	313755	0	0	313755
Total (tonnes of CO₂ e)				2196285

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

The following parameter will be monitored during the project activity:

a) EG_y

**B.7.1 Data and parameters monitored:**

Data / Parameter:	EG _y
Data unit:	MWh
Description:	Electricity supplied to GUVNL
Source of data to be used:	Certificate for share of electricity generated by the wind farm.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	348210 MWh/yr
Description of measurement methods and procedures to be applied:	Net electricity generated will be calculated at the main meter connected to the incoming feeder of GUVNL. The procedures for metering will be as per the provisions of the power purchase agreement. The WEGs of a single customer (DLF in this case) at a particular site are connected to a Vacuum Circuit Breaker metering yard (VCB) which in turn connects to a feeder that ultimately leads to the main GETCO meter at the substation maintained by Suzlon. Data monitoring takes place at the VCB metering yard and GETCO meter at the substation. The electricity metered at the GETCO meter is proportionally divided among the customers connected to the meter on the basis of the prorata readings taken at the VCB end. The emission reduction calculations are done on the basis of the GETCO Main meter reading (net electricity exported to the grid) after deducting imports from the grid as mentioned in the share certificate issued by GEDA on monthly basis. The electricity measurements at VCB meter and GETCO meter are continuous and recorded on monthly basis.
QA/QC procedures to be applied:	Annual calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately. The data will be cross checked with sales receipts.
Any comment:	The data will be archived electronically for two years after the end of the last crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	EG _{y, Export}
Data unit:	MWh
Description:	Quantity of Electricity exported to GUVNL facility
Source of data to be used:	Share certificate issued by GEDA monitored from the main GETCO meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This data will be used to arrive at the net electricity exported.
Description of	Electricity exported to GUVNL will be measured at the main meter connected to



measurement methods and procedures to be applied:	the incoming feeder of GUVNL. The procedures for metering will be as per the provisions of the power purchase agreement.
QA/QC procedures to be applied:	Annual calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately.
Any comment:	The data will be archived electronically for two years after the end of the last crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	$EG_{y, Import}$
Data unit:	MWh
Description:	Quantity of Electricity imported from GUVNL
Source of data to be used:	Share certificate issued by GEDA monitored from the main GETCO meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This data will be used to arrive at the net electricity exported.
Description of measurement methods and procedures to be applied:	Electricity exported to GUVNL will be measured at the main meter connected to the incoming feeder of GUVNL. The procedures for metering will be as per the provisions of the power purchase agreement.
QA/QC procedures to be applied:	Annual calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately. The meters will be generated with 0.2 class of accuracy.
Any comment:	The data will be archived electronically for two years after the end of the last crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	EG_{WEG}
Data unit:	MWh
Description:	Electricity generated by each WEG
Source of data to be used:	Daily generation reports provided by Suzlon
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This data will not be used for the calculation of emission reductions per say but would act as a backup data for the net electricity generated.
Description of measurement methods and procedures to be applied:	Each WEG is equipped with an integrated electronic meter. These meters are connected to the Central Monitoring Station (CMS) of the entire wind farm through communication cables. The generation data of individual WEG can be monitored as a real-time entity at CMS. This data for each individual WEG will be recorded daily.



QA/QC procedures to be applied:	Annual calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately.
Any comment:	The data will be archived electronically for two years after the end of the last crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter:	EG _{VCB}
Data unit:	MWh
Description:	Electricity generation recorded at the Vacuum Circuit Breaker (VCB)
Source of data to be used:	Daily generation reports provided by Suzlon
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This data will not be used for the calculation of emission reductions per say but would act as a backup data for the net electricity generated. This data will also be recorded on daily basis.
Description of measurement methods and procedures to be applied:	Each WEG is equipped with an integrated electronic meter. These meters are connected to the Central Monitoring Station (CMS) of the entire wind farm through communication cables. The generation data of individual WEG can be monitored as a real-time entity at CMS. This data for each individual WEG will be recorded daily.
QA/QC procedures to be applied:	Annual calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately.
Any comment:	The data will be archived electronically for two years after the end of the last crediting period or the last issuance of CERs for this project activity, whichever occurs later.

B.7.2 Description of the monitoring plan:

The monitoring plan is being devised as per approved consolidated monitoring methodology ACM0002 - **“Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources”**.

The methodology requires monitoring of the following parameters:

- Electricity generation from the proposed project activity;

Data needed to recalculate the operating margin emission factor, if needed, based on the choice of the method to determine the operating margin (OM), consistent with “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (ACM0002);

- Data needed to recalculate the build margin emission factor, if needed, consistent with “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”(ACM0002);

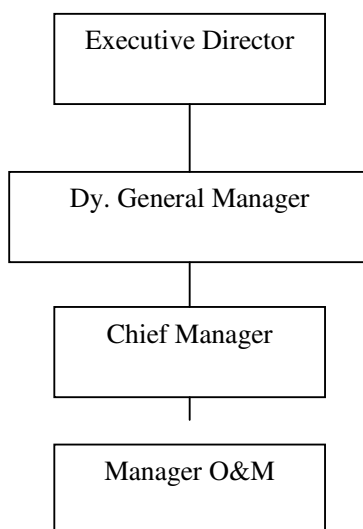
For the project activity to establish its creditable emission reduction, it has to record the actual electricity generation, which would displace equivalent units of electricity at the operating and build margin of the



grid. Since the simple OM emission factor is calculated based on a 3 year average, based on the most recent statistics available at the time of PDD preparation, its updation based on ex post monitoring is not required. For BM calculation, option 1 (refer ACM 0002) has been chosen, which is calculated ex ante based on the most recent information, hence its monitoring is also not required. Hence, under the monitoring protocol for the project it is required to: Monitor and record the electricity generated and exported by the wind farm to the Western regional grid.

To ensure trouble free operations and efficient generations through all the wind turbines, DLF has entered into a comprehensive Operation and Maintenance agreement with the manufactures of the turbines for a period of 20 years. The contractor Suzlon, under the O&M contract with DLF would be responsible for the operation and maintenance of the project activity for the entire crediting period.

The authority and responsibility of project management as well as registration, monitoring, measurement and reporting lies with DLF Limited. DLF has formulated a Project Team to ensure proper and continuous monitoring of the performance of turbines and generation of power. The same has been outlined as follows:



Responsibilities

Executive Director: To be responsible for overall project management.

Dy. General Manager: To be responsible for generation data CDM related monitoring , internal verification and presenting the same to the Executive director. To verify if the monitored data is normal. To calculate the emission reductions regularly and write the monitoring report.

Chief Manager: To conduct the monitoring task strictly based on the monitoring manual and registered PDD. To record required monitored parameters. To report the monitoring results to the Dy. General Manager.

Manager O&M. For O&M monitoring and coordinate with the O&M contractor Suzlon for smooth functioning of the wind farm. To assess regular maintenance of monitoring equipment.

The O&M personnel of Suzlon are qualified engineers and are trained at the WTG manufacturing facility of Suzlon Energy Limited at Daman for operating and ensuring best performance of the WTGs.

Metering layout

- The pooling meters at substation of GETCO main meter (M) and check meter (M') are installed at 220 KV side at the Suthri substation and 66 KV side at the Vanku substation. The WTGs are connected to a feeder (33KV) that ultimately leads to the main GETCO meter at the substations (Suthri and Vanku) maintained by Suzlon.
- The meters at WTG (m) are bidirectional meters recording the electricity export and import to the grid. The net electricity exported to the grid is calculated as difference of electricity exported minus the electricity imported.
- Data monitoring takes place at the GETCO main meter at substation (M), GETCO Check meter at substation (M'), and WTGs ($m_1, m_2, m_3, \dots, m_{100}$).
- The electricity metered at the GETCO meter (M) is proportionally divided among the customers connected to the meter on the basis of the prorata readings taken at the individual WTG meter (m).
- There is a transmission loss between the individual WTGs and the substation. This loss is proportionally divided among the WTGs connected to the meter on the basis of the prorata readings taken at the individual WTG meter (m). The final share certificate issued to the project proponent is based on the electricity generated minus the line losses. This is issued by GEDA.

Figure 5: The wire diagram for the meters at Suthri substation:

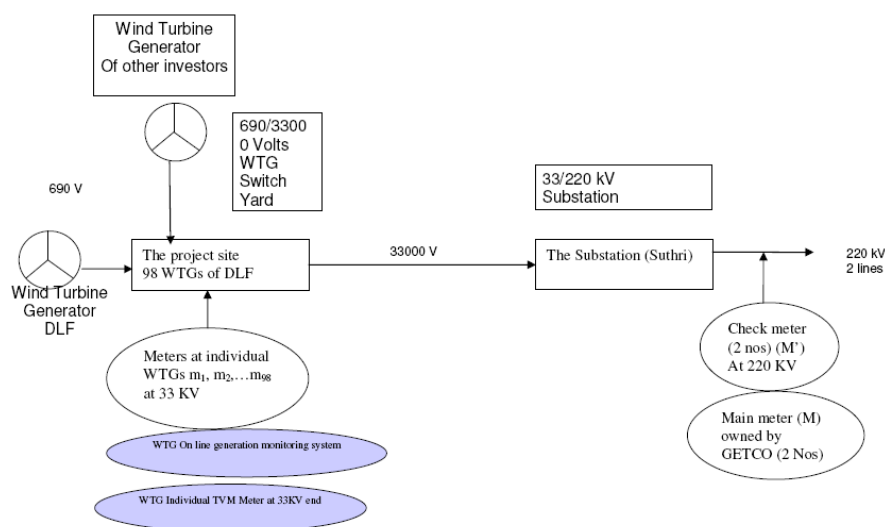
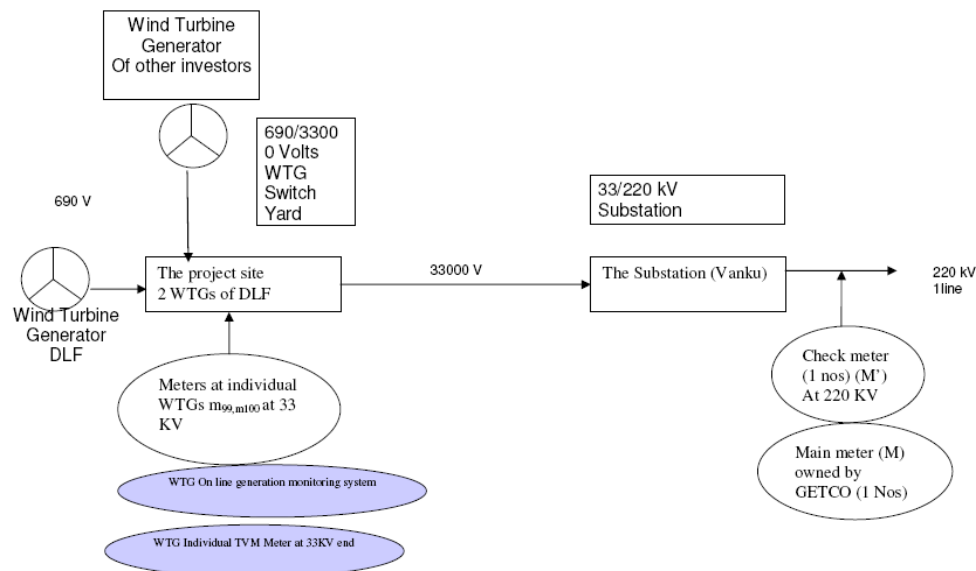


Figure 6: The wire diagram for the meters at Vanku substation



Metering and related issues

1. As the WEGs are owned by more than one investor at the site, the ABT compliant meter at the pooling sub-station will be installed by GETCO on 33/220 KV side. A tri vector meter shall be installed in the VCB metering yard. At the end of the month, GEDA will give in respect of DLF, a statement of active energy injection and reactive energy drawal of their WEGs. This statement will be the final measurement of the energy supplied to the GUVNL/DISCOM by the company for the preceding month for the purpose of payment.
2. Net electricity generated will be calculated at the main meter connected to the incoming feeder of GUVNL. The procedures for metering will be as per the provisions of the power purchase agreement. The WEGs of a single customer (DLF in this case) at a particular site are connected to a Vacuum Circuit Breaker metering yard (VCB) which in turn connects to a feeder that ultimately leads to the main GETCO meter at the substation maintained by Suzlon. Data monitoring takes place at the VCB metering yard and GETCO meter at the substation. The electricity metered at the GETCO meter is proportionally divided among the customers connected to the meter on the basis of the prorata readings taken at the VCB end. The emission reduction calculations are done on the basis of the GETCO Main meter reading (net electricity exported to the grid) after deducting imports from the grid as mentioned in the share certificate issued by GEDA on monthly basis.
3. Whenever there is a major difference between the readings of the Main meter (GETCO meter and the 33kV feeder at Suzlon Sub station / VCB meter at wind farm end), the following steps shall be taken.
 - i. Checking of CT and PT connections
 - ii. Testing of accuracy of meters at site and at GETCO meter

If the difference exists even after such checking or testing, then the defective meter shall be replaced with a correct meter.



4. In case of conspicuous failures like burning of meter and erratic display of metered parameters and when the error found in testing of meter is beyond the permissible limit of error provided in the relevant standard, the meter shall be immediately replaced with a correct meter.
5. Sealing and maintenance of meters:
 - i. The GETCO meter shall be sealed in the presence of representatives of DLF / Suzlon , GEDA and GETCO.
 - ii. Any meter seal(s) shall be broken only by the GEDA /GETCO/ representative in the presence of DLFs representative whenever the main metering system or the 33kV metering system is to be inspected, tested, adjusted, repaired or replaced.
 - iii. The GETCO meter at the substation will be calibrated once in a year . The calibration of the meters installed in an individual WEG will take place on yearly basis.
6. Records: DLF will maintain an accurate and up-to-date operating log at the project site with records of:
 - i. 24 Hours logs of real and reactive power generation, frequency, transformer tap position, bus voltage(s), Main meter and other meter readings and any other data mutually agreed.
 - ii. Any unusual conditions found during operation/inspections
 - iii. All the records 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.
7. The billing will be on monthly basis. DLF shall raise invoice and submit to GUVNL for payment based on joint meter reading as certified by GEDA at the end of each month for the energy supplied
8. The electronic data will be archived for 2 years or upto the end of the crediting period, whichever late.

Billing and meter failure related issues:

- a) The billing will be on monthly basis. DLF shall raise invoice and submit to GUVNL for payment based on joint meter reading as certified by GEDA at the end of each month for the energy supplied
- b) Billing for the failure period:
 - i. In the event that any GETCO meter fails to register or upon being tested is found not to be accurate within $\pm 0.2s$ of the energy injected in the grid, shall for the period be measured on the basis of the value registered by the corresponding meter at the feeder end.
 - ii. In the event that both GETCO meter and the corresponding check meter at the substation fail to register, or upon being tested, be found not to be accurate within $\pm 0.2 / 0.5s$ the energy injected in the grid, shall for the period be adjusted by immediately restoring and recalibrating the GETCO meter and the corresponding check meter at the substation end and the correction applied to the consumption registered by the GETCO meter.
 - iii. The period referred to in the two points above is the actual period during which inaccurate measurements were made if such period can be determined or, if not readily determinable, 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.

**CER Issuance**

- a) The emission reduction calculations will be done on the basis of net electricity supplied to the grid after subtracting the losses incurred due to transmission from the WEG to the GETCO feeder.
- b) In the event that the date of registration is in the middle of the month, while the share certificate for the electricity generation is issued on monthly basis. The CERs will be estimated based on the generation of VCB meter readings at the WTGs for the period from the start date of the project registration and the end of the month.
- c) In the event that the GETCO meter error is found at the time of the meter calibration after the issuance of CERs during the crediting period, the correction of the meter error for the CER calculation will be incorporated in the next issuance of the CERs.

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

>>

Date of completion of baseline study 31/01/2008

Name of the person completing the baseline study

Dr. Sanjay Vashishtha (Not a project participant)

Contact Information

Sanjay Vashishtha

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SECTION C. Duration of the <u>project activity</u> / <u>crediting period</u>

C.1 Duration of the <u>project activity</u>:

C.1.1. <u>Starting date of the project activity</u>:

>>

07/09/2007

The project start date is the first real action taken by the PP for the project implementation. On 07/09/2007, PP placed a formal purchase order to Suzlon Energy Limited. Hence the above date has been considered as project start date.

C.1.2. <u>Expected operational lifetime of the project activity</u>:

>>

20 years 00 months

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

>>

Renewable crediting period of 7 years, for two times renew

C.2.1. Renewable crediting period**C.2.1.1. Starting date of the first crediting period:**

>>

01/03/2009

DLF Limited hereby confirms that the crediting period will not commence prior to the date of registration.

C.2.1.2. Length of the first crediting period:

>>

7 years 0 Months

C.2.2. Fixed crediting period:**C.2.2.1. Starting date:**

>>

NA

C.2.2.2. Length:

>>

NA

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

>>

According to Indian regulation, the implementation of the wind park does not require an environmental impact assessment. The Ministry of Environment and Forests (MoEF), Government of India notification dated September 2006 regarding the requirement of Environment Impact Assessment (EIA) studies as per the Environment Protection Rule, any project developer in India needs to file an application to the Ministry of Environment and Forests (including a public hearing and an EIA) in case the proposed industry or project is listed in a predefined list⁵². Wind parks are not included in this list and thus an EIA is not required. Although an EIA is not required, the possible environmental impacts listed below were analysed:

Construction Phase:
Impact on Land use

⁵² S.O. 1533, Notification dated 14th September 2006. <http://envfor.nic.in/>



The land on which the project activity takes place is barren and unfertile. Prior to the project activity the land had no beneficial use. DLF has bought the land for a worthwhile application and obtained necessary approvals for installation of windmills. No dislocation of people is involved in the course of the project activity.

Impact on Soil Use

The minor quantity of solid / liquid discharge, likely to be generated during the construction phase has no noticeable impact on soil use and the project proponent has made arrangements to dispose them in an environmentally acceptable manner.

Impact on Air Environment

Wind Power plants are known to contribute to zero atmospheric pollution as no fuel combustion is involved during any stage of the operation. The source of emission that is anticipated is likely due to the exhaust released due to the running of the HEMV (Heavy Earth Moving Vehicle), during the movement of the construction material, which shall be properly maintained to minimize the smoke. The dust so generated during haulage shall be minimized by sprinkling of water.

Impact on Noise Environment

Personal protective equipments are provided to workers involved in the construction activity to mitigate the effects of noise pollution, but they have no impact on ambient noise level. The emissions involved in the construction of the wind power plant and the gridlines are negligible as a percentage of the total power generated. Taking into consideration the project life cycle, the magnitude of the impacts during construction phase is negligible and exists for a temporary period of time till the end of construction phase. Therefore, it would not affect the environment considerably.

Operation and Maintenance Phase:

Systematic and Scientific maintenance of all equipments would be carried out to ensure the best safety standards.

Impact on Land use

The project site is a barren land and unproductive area with no application and habitat. There are no migratory birds / endangered species in the region of project activity. Therefore, no harm on the ecological environment is envisaged.

Impact on Noise Environment

Noise is generated due to the movement of rotor blades. It has no direct effect on the population, as the area is less populated and noise generated will be attenuated by ambient conditions. Though noise is generated during the operation of Wind Turbine Generators, Considering the overall impact of the project in reducing GHG's, creation of employment etc., makes this effect negligible.

Socio-Economic Impacts

There is no inconvenience to the local community due to the transmission lines. The locals have benefited economically through land sales. The project activity helps the upliftment of skilled and unskilled manpower in the region. The project will be providing employment opportunities not only during the construction phase, but also during its operational lifetime. The project activity improves employment rate and livelihood of local populace in the vicinity of the project. Moreover, the project generates eco-friendly, GHG free power which contributes to sustainable development of the region.

Transboundary environmental or social impacts

Generating electricity from the resources, that were not used before, creates an additional income to the local community, influencing the poverty alleviation, particularly in the rural areas and accelerating the regional economic development.



Project development will promote the use of renewable energies in the region. It will also require widespread education and skills improvement, as the local people will be incorporated in the development and maintenance of the project.

Impact of oily and solid waste

The wind-farm consume very little (negligible) oil/grease during the operation and maintenance. The pollution due to oily and solid waste will not be severe, and can and will be mitigated to a proper level through taking effective management measures. The O&M contractor Suzlon has established and maintained procedures for disposal of oily and solid waste in a responsible manner. On behalf of DLF the O&M Contractor Suzlon will maintain an accurate and up-to-date record oily and solid waste disposed to the authorized agencies.

Conclusion

The net impact under environmental pollution category would be positive as all necessary abatement measures would be adopted and periodically monitored. The project activity does not have any major adverse impacts on environment during its construction or operational phase. The human interest parameters would show positive impacts due to increased job opportunities at the facility as well as other ancillary units coming up

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 are not considered significant in the project activity.

SECTION E. Stakeholders' comments

>>

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

>>

The following stakeholders were involved during and after implementation of the project.

1. Local villagers and representatives of village governing body
2. Gujarat Energy Development Agency
3. Gujarat Urja Vikas Nigam Limited
4. Supplier of WTG

Local villagers and representatives of village governing body including NGOs

The varied sections of the local population, village panchayat / NGO & local elected body of representatives administering the local area are a true representative of the local population in a democracy like India. Hence, their consents / permissions to set the project are necessary.

GEDA

GEDA – the state level nodal agency has leased out land for implementation of the project. The major portion of the project has been executed on GEDA leased land. The agency is responsible for promotion



of renewable energy technologies in the state. After confirming the inherent wind potential at the sites specified by MNES and the EPC contractor, the land was leased out for execution of project.

GUVNL

GUVNL is responsible for providing evacuation facility for the generated electricity. GUVNL has entered into power purchase agreement with the project proponent for transmission of power and sale to grid. The state electricity utility was contacted by the EPC contractor on behalf of the project proponent, and all the necessary modalities and procedures were followed and agreement for power purchase.

Supplier of WTGs

Suzlon Energy Ltd. is the supplier of WTGs and is also responsible for the operation and maintenance of the DLF's project activity.

DLF has organized a stakeholder consultation meeting with the local villagers on 10th and 11th January 2008 to inform them on the environmental and social impacts of the project activity and discuss their concerns regarding the project activity. The meeting was organized in six different locations (Suthari, Arikhana, Rapargarh, Jakhau, Lathedi, and Chachhi) at on the above specified dates. People from nearby villages at these locations were also called. Villagers were informed through oral (dhidhora) and written announcements about the meeting. The oral (dhidhora) announcements were made on 7th January 2008 to inform the villagers about the agenda of the stakeholder meeting. Written notices were also pasted on the main gate of the project site on 7th January 2008 for the stakeholder meeting. The oral (Dhindhora) announcements were also made on the day of the stakeholder meeting (i.e. 10th, 11th January 2008) to call the stakeholders on the venue. Registered letters to each village head (sarpanch) nearby the project activity was also sent on 7th January to send their written comments on the project activity.

The meetings were organized by the project proponent with the help of the developer Suzlon Energy Ltd. All participants were informed in their local language about the salient features and environmental benefits of the project activity. Over 100 villagers took part in the meetings at different location are people living or working in a close vicinity to the project area. The stakeholder consultation was widely announced by means of written notifications in town hall and of oral announcements, so that every interested person could attend the meeting.

At the beginning of each meeting representatives of DLF and Suzlon presented the project idea, discussed issues regarding the general energy production with the focus on wind power. Afterwards the presentation by officials was conducted, who explained in detail the aim of the meeting and the process of stakeholder evaluation, focusing on environmental and social aspects of the region in order to give all the participants the chance to follow and understand the project assets and advantages. After all the presentations, DLF and Suzlon officials answered the stakeholder's questions. In parallel all the comments were collected and documented. Afterwards no written comments were received.

E.2. Summary of the comments received:

>>

The overall response to the Project, from local stakeholders, was encouraging and positive. In all, no adverse reaction/comments/clarifications have been received during the hearing. The participants of the meetings have not raised any significant concerns related to potential impacts of the Project. The stakeholders admitted the sustainability of the project and sought more projects of a similar nature which would contribute towards regional and national growth. Moreover the project has been highly acclaimed



for a higher capital cost intensive renewable power generation for the objective of environmental sustainability.

There was appreciable participation from the audience and they got clarified on the various queries they had about the Kyoto protocol and CDM cycle. In totality they lauded DLF's concern for the environment and their efforts in developing the project activity as a CDM project activity. During the meetings with the village representatives Dr. Sanjay Vashishtha from DLF explained the environmental benefits of DLF's upcoming wind power project at Kutch, Gujarat. Mr. Dwijal Mamtara, from Suzlon, highlighted the different aspects of wind power technology and its associated benefits through green power generation. All the stakeholders encouraged the upcoming of the project activity of DLF.

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

>>

DLF perceives no negative comments by the stakeholders and any comments raised by the stakeholders during the stakeholder consultation meeting will be accounted for.

The project activity has complied with all the applicable conditions detailed in the consents and agreements. As per UNFCCC requirement the PDD will be published at the validator's /UNFCCC web site for public comments

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	DLF Limited
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Represented by:	Mr. C. P. Poonacha
Title:	Authorised representative
Salutation:	Mr.
Last Name:	Poonacha
Middle Name:	
First Name:	C.P.
Department:	
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in the project activity and the project participants hereby confirm that there is no diversion of overseas development assistance.

There is no funding to the project activity from Annex 1 party(ies).

Annex 3

BASELINE INFORMATION

CENTRAL ELECTRICITY AUTHORITY: CO2 BASELINE DATABASE

VERSION	3.0
DATE	15 December 2007
BASELINE METHODOLOGY	ACM0002 / Ver 07

EMISSION FACTORS

Weighted Average Emission Rate (tCO₂/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.72	0.73	0.74	0.71	0.71	0.71	0.72
East	1.09	1.06	1.11	1.10	1.08	1.08	1.03
South	0.73	0.75	0.82	0.84	0.78	0.74	0.72
West	0.90	0.92	0.90	0.90	0.92	0.87	0.85
North-East	0.42	0.41	0.40	0.43	0.32	0.33	0.39
India	0.82	0.83	0.85	0.85	0.84	0.82	0.80

Simple Operating Margin (tCO₂/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.98	0.98	1.00	0.99	0.97	0.99	0.99
East	1.22	1.22	1.20	1.23	1.20	1.16	1.13
South	1.02	1.00	1.01	1.00	1.00	1.01	1.00
West	0.98	1.01	0.98	0.99	1.01	0.99	0.99
North-East	0.74	0.71	0.74	0.74	0.71	0.70	0.69
India	1.02	1.02	1.02	1.03	1.03	1.02	1.01

Build Margin (tCO₂/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North					0.53	0.60	0.63
East					0.90	0.97	0.93
South					0.70	0.71	0.71
West					0.77	0.63	0.59
North-East					0.15	0.15	0.23
India					0.69	0.68	0.68

Combined Margin (tCO₂/MWh) (excl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.76	0.76	0.77	0.76	0.75	0.80	0.81
East	1.06	1.06	1.05	1.07	1.05	1.06	1.03
South	0.86	0.85	0.86	0.85	0.85	0.86	0.85



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West	0.87	0.89	0.88	0.88	0.89	0.81	0.79
North-East	0.44	0.43	0.44	0.44	0.43	0.42	0.46
India	0.86	0.86	0.86	0.86	0.86	0.85	0.85

GENERATION DATA

Gross Generation Total (GWh)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	144,292	151,185	155,385	165,735	168,438	179,751	191,104
East	58,936	64,048	66,257	75,374	85,776	93,902	101,959
South	129,035	131,902	136,916	138,517	144,086	147,355	161,897
West	162,329	165,805	177,399	172,682	183,955	188,606	199,346
North-East	5,319	5,332	5,808	5,867	7,883	7,778	6,970
India	499,911	518,272	541,764	558,175	590,138	617,392	661,277

Net Generation Total (GWh)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	135,230	141,415	144,743	155,043	157,291	168,206	179,223
East	53,350	58,097	59,841	68,428	77,968	86,014	93,818
South	121,158	123,630	127,789	128,373	134,676	138,329	152,206
West	150,412	153,125	164,448	159,780	170,726	176,003	185,493
North-East	5,195	5,213	5,671	5,752	7,762	7,655	6,828
India	465,345	481,479	502,492	517,376	548,423	576,206	617,567

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

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	25.9%	25.7%	26.1%	28.1%	26.8%	28.1%	27.1%
East	10.8%	13.4%	7.5%	10.3%	10.5%	7.2%	9.0%
South	28.1%	25.5%	18.3%	16.2%	21.6%	27.0%	28.3%
West	8.2%	8.5%	8.2%	9.1%	8.8%	12.0%	13.9%
North-East	42.2%	41.7%	45.8%	41.9%	55.5%	52.7%	44.1%
India	19.2%	18.9%	16.3%	17.1%	18.0%	20.1%	20.9%

Net Generation in Operating Margin (GWh)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	100,189	105,076	106,942	111,450	115,151	120,869	130,597
East	47,570	50,308	55,377	61,378	69,746	79,863	85,375
South	87,114	92,103	104,449	107,603	105,568	100,978	109,116
West	138,071	140,173	150,889	145,264	155,731	154,918	159,681
North-East	3,002	3,039	3,074	3,343	3,456	3,621	3,819
India	375,947	390,700	420,730	429,040	449,653	460,249	488,587

20% of Net Generation (GWh)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
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North	27,046	28,283	28,949	31,009	31,458	33,641	35,845
East	10,670	11,619	11,968	13,686	15,594	17,203	18,764
South	24,232	24,726	25,558	25,675	26,935	27,666	30,441
West	30,082	30,625	32,890	31,956	34,145	35,201	37,099
North-East	1,039	1,043	1,134	1,150	1,552	1,531	1,366
India	93,069	96,296	100,498	103,475	109,685	115,241	123,513

Net Generation in Build Margin (GWh)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North					32,064	34,340	36,511
East					15,818	17,567	18,907
South					28,513	28,228	30,442
West					35,257	35,425	38,242
North-East					2,055	1,793	1,437
India					113,707	117,353	125,538

Weighted Average Emission Rate (tCO₂/MWh) (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.72	0.73	0.74	0.71	0.72	0.73	0.74
East	1.06	1.03	1.09	1.08	1.05	1.05	1.00
South	0.74	0.75	0.82	0.84	0.79	0.74	0.72
West	0.90	0.92	0.90	0.90	0.92	0.89	0.86
North-East	0.42	0.41	0.40	0.43	0.52	0.33	0.40
India	0.82	0.83	0.85	0.85	0.84	0.81	0.80

Simple Operating Margin (tCO₂/MWh) (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.9768	0.9778	1.0003	0.9872	0.9801	0.9992	0.9985
East	1.2198	1.1874	1.1704	1.1960	1.1745	1.1291	1.0909
South	1.0237	1.0027	1.0075	1.0048	1.0009	1.0079	1.0030
West	0.9782	1.0101	0.9850	0.9921	1.0129	1.0039	0.9936
North-East	0.7353	0.7107	0.7437	0.7366	0.9019	0.6994	0.7031
India	1.0132	1.0204	1.0171	1.0219	1.0236	1.0191	1.0106

Build Margin (tCO₂/MWh) (not adjusted for imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North					0.5336	0.6006	0.6283
East					0.9043	0.9672	0.9281
South					0.7047	0.7101	0.7055
West					0.7700	0.6300	0.5938
North-East					0.1456	0.1489	0.2265
India					0.6944	0.6838	0.6771

Combined Margin in tCO₂/MWh (incl. Imports)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.76	0.76	0.77	0.76	0.76	0.80	0.81



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East	1.06	1.05	1.04	1.05	1.04	1.05	1.01
South	0.86	0.85	0.86	0.85	0.85	0.86	0.85
West	0.87	0.89	0.88	0.88	0.89	0.82	0.79
North-East	0.44	0.43	0.44	0.44	0.52	0.42	0.46
India	0.85	0.86	0.86	0.86	0.86	0.85	0.84

EMISSION DATA

Absolute Emissions Total (tCO₂)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	97,866,565	102,743,113	106,808,582	109,996,544	112,212,597	120,102,148	129,554,682
East	58,026,488	61,427,499	66,593,200	75,512,010	83,956,860	92,517,515	96,360,317
South	89,019,263	92,178,116	105,239,700	108,123,211	105,603,624	101,760,966	109,251,806
West	135,192,153	141,597,621	148,557,341	144,127,175	157,781,065	153,933,199	157,722,686
North-East	2,207,396	2,159,969	2,285,724	2,462,796	2,468,463	2,532,819	2,645,856
India	382,311,864	400,106,317	429,484,546	440,221,736	462,022,608	470,846,647	495,535,347

Absolute Emissions OM (tCO₂)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	97,866,565	102,743,113	106,808,582	109,996,544	112,212,597	120,102,148	129,554,682
East	58,026,488	61,427,499	66,593,200	75,512,010	83,956,860	92,517,515	96,360,317
South	89,019,263	92,178,116	105,239,700	108,123,211	105,603,624	101,760,966	109,251,806
West	135,192,153	141,597,621	148,557,341	144,127,175	157,781,065	153,933,199	157,722,686
North-East	2,207,396	2,159,969	2,285,724	2,462,796	2,468,463	2,532,819	2,645,856
India	382,311,864	400,106,317	429,484,546	440,221,736	462,022,608	470,846,647	495,535,347

Absolute Emissions BM (tCO₂)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North					17,108,583	20,625,908	22,941,127
East					14,303,611	16,990,438	17,547,736
South					20,092,752	20,045,639	21,475,360
West					27,148,870	22,318,133	22,707,948
North-East					299,124	267,051	325,491
India					78,952,941	80,247,168	84,997,662

IMPORT DATA

Net Imports (GWh) - Net exporting grids are set to zero



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	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0	0	0	0	3,616	5,748	6,612
East	489	555	357	1,689	0	0	0
South	1,162	1,357	518	0	0	0	0
West	321	0	797	962	285	11,982	10,473
North-East	0	0	0	0	2,099	0	92

Share of Net Imports (% of Net Generation)

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
North	0.0%	0.0%	0.0%	0.0%	2.3%	3.4%	3.7%
East	0.9%	1.0%	0.6%	2.5%	0.0%	0.0%	0.0%
South	1.0%	1.1%	0.4%	0.0%	0.0%	0.0%	0.0%
West	0.2%	0.0%	0.5%	0.6%	0.2%	6.8%	5.6%
North-East	0.0%	0.0%	0.0%	0.0%	27.0%	0.0%	1.3%



Annex 4

MONITORING INFORMATION

>>

The monitoring plan has been already explained in section B.7.2.



Appendix 1: Locational details and unique identification number

DLF LTD (Govt. land)							
No.	Village	S.R.No.	Type of land	Name of Customer	Capacity (MW)	Location No.	Sub-lease deed dated
1	Lathedi	436/p, 467/p	Govt.	DLF LTD	1.5	M-289	✓ 26/9/2007
2	Lathedi	426/p	Govt.	DLF LTD	1.5	M-293	✓ 26/9/2007
3	Lathedi	441/p	Govt.	DLF LTD	1.5	M-276	✓ 26/9/2007
4	Lathedi	468/p, 467/p	Govt.	DLF LTD	1.5	M-288	✓ 26/9/2007
5	Lathedi	496/p, 497/p	Govt.	DLF LTD	1.5	M-277	✓ 23/10/2007
6	Lathedi	442/p	Govt.	DLF LTD	1.5	M-270	✓ 23/10/2007
7	Lathedi	436/p, 469/p	Govt.	DLF LTD	1.5	M-286	✓ 23/10/2007
8	Lathedi	498/p	Govt.	DLF LTD	1.5	M-282	✓ 27/11/2007
9	Lathedi	434/p	Govt.	DLF LTD	1.5	M-280	✓ 19/12/2007
10	Jakhau	1433/p	Govt.	DLF LTD	1.5	M-765	✓ 19/12/2007
11	Nani Sindhodi	65/p	Govt.	DLF LTD	1.5	M-533	✓ 19/12/2007
12	Moti Sindhodi	289/p, 290/p	Govt.	DLF LTD	1.5	M-455	✓ 19/12/2007
13	Jakhau	1408/p	Govt.	DLF LTD	1.5	M-762	✓ 27/12/2007
14	Jakhau	1401/p	Govt.	DLF LTD	1.5	M-727	✓ 27/12/2007
15	Jakhau	1410/p	Govt.	DLF LTD	1.5	M-773	✓ 27/12/2007
16	Jakhau	1470/p	Govt.	DLF LTD	1.5	M-790	✓ 27/12/2007
17	Jakhau	1433/p	Govt.	DLF LTD	1.5	M-775	✓ 27/12/2007
18	Jakhau	1421/p	Govt.	DLF LTD	1.5	M-764	✓ 27/12/2007
19	Jakhau	1422/p	Govt.	DLF LTD	1.5	M-750	✓ 27/12/2007
20	Jakhau	1397/p	Govt.	DLF LTD	1.5	M-746	✓ 27/12/2007
21	Chhachhi	93/p	Govt.	DLF LTD	1.5	M-263	✓ 27/12/2007
22	Sandhan	206/p	Govt.	DLF LTD	1.5	M-264	✓ 27/12/2007
23	Lathedi	441/p	Govt.	DLF LTD	1.5	M-275	✓ 27/12/2007
24	Jakhau	1398	Govt.	DLF LTD	1.5	M-726	✓ 27/12/2007
25	Jakhau	1405	Govt.	DLF LTD	1.5	M-749	✓ 27/12/2007
26	Budia	111/p	Govt.	DLF LTD	1.5	M-632	✓ 27/12/2007
27	Chhachhi	83/p	Govt.	DLF LTD	1.5	M-262	✓ 10/1/2008
28	Jakhau	1470/p	Govt.	DLF LTD	1.5	M-791	✓ 13/2/2008
29	Chhachhi	82/p	Govt.	DLF LTD	1.5	M-260	✓ 10/3/2008

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DLF (Pvt. land)							
No.	Village	S.R.No.	Type of land	Name of Customer	Capacity (MW)	Location No.	Lease deed dated
1	Moti Sindhodi	106/p	Pvt.	DLF LTD	1.5	M-419 ✓	26/09/2007
2	Ranpar	14/p	Pvt.	DLF LTD	1.5	M-643 ✓	23/10/2007
3	Ranpar	4/p	Pvt.	DLF LTD	1.5	M-641 ✓	23/10/2007
4	Moti Sindhodi	80/p	Pvt.	DLF LTD	1.5	M-422 ✓	23/10/2007
5	Moti Sindhodi	71/p	Pvt.	DLF LTD	1.5	M-456 ✓	23/10/2007
6	Moti Sindhodi	116/p	Pvt.	DLF LTD	1.5	M-417 ✓	23/10/2007
7	Moti Sindhodi	119/1p	Pvt.	DLF LTD	1.5	M-418 ✓	23/10/2007
8	Nani Sindhodi	19/1p	Pvt.	DLF LTD	1.5	M-506 ✓	23/10/2007
9	Lathedi	211/2p	Pvt.	DLF LTD	1.5	M-299 ✓	23/10/2007
10	Lathedi	207/p	Pvt.	DLF LTD	1.5	M-296 ✓	23/10/2007
11	Lathedi	230/p	Pvt.	DLF LTD	1.5	M-292 ✓	23/10/2007
12	Ranpar	8/p	Pvt.	DLF LTD	1.5	M-640 ✓	23/10/2007
13	Moti Sindhodi	107/p	Pvt.	DLF LTD	1.5	M-420 ✓	23/10/2007
14	Moti Sindhodi	163/8p	pvt	DLF LTD	1.5	M-443 ✓	27/11/2007
15	Moti Sindhodi	83/P	Pvt.	DLF LTD	1.5	M-421 ✓	27/11/2007
16	Rapargadh	70/P	pvt	DLF LTD	1.5	M-479 ✓	27/11/2007
17	Moti Sindhodi	177/P	Pvt.	DLF LTD	1.5	M-464 ✓	27/11/2007
18	Moti Sindhodi	172/1P	pvt	DLF LTD	1.5	M-465 ✓	27/11/2007
19	Nani Sindhodi	50/P	Pvt.	DLF LTD	1.5	M-544 ✓	27/11/2007
20	Suthari	436/P	pvt	DLF LTD	1.5	M-213 ✓	27/11/2007
21	Rapargadh	88/1P	Pvt.	DLF LTD	1.5	M-478 ✓	27/11/2007
22	Rapargadh	25/P	pvt	DLF LTD	1.5	M-526 ✓	27/11/2007
23	Jakhau	1182/1p	pvt.	DLF LTD	1.5	M-745 ✓	19/12/2007
24	Jakhau	1044/P	pvt.	DLF LTD	1.5	M-774 ✓	19/12/2007
25	Jakhau	1087/1p	pvt.	DLF LTD	1.5	M-772 ✓	19/12/2007
26	Jakhau	861/1	pvt.	DLF LTD	1.5	M-793 ✓	19/12/2007
27	Rapargadh	56/p	pvt.	DLF LTD	1.5	M-439 ✓	19/12/2007
28	Suthari	38/p	pvt.	DLF LTD	1.5	M-97 ✓	19/12/2007
29	Rapargadh	58/p	pvt.	DLF LTD	1.5	M-440 ✓	19/12/2007



30	Sandhan	201/p	Pvt.	DLF LTD	1.5	M-265 ✓	27/12/2007
31	Lathedi	217/p	Pvt.	DLF LTD	1.5	M-272 ✓	27/12/2007
32	Chhachhi	66/p	Pvt.	DLF LTD	1.5	M-268 ✓	27/12/2007
33	Vanku	311/2	Pvt.	DLF LTD	1.5	M-586 ✓	27/12/2007
34	Vanku	32/p	Pvt.	DLF LTD	1.5	M-589 ✓	27/12/2007
35	Lathedi	362/1	Pvt.	DLF LTD	1.5	M-290 ✓	27/12/2007
36	Suthari	576/p	Pvt.	DLF LTD	1.5	M-202 ✓	27/12/2007
37	Dhutai	37/p	Pvt.	DLF LTD	1.5	M-266 ✓	27/12/2007
38	Jakhau	1136/p	Pvt.	DLF LTD	1.5	M-761 ✓	27/12/2007
39	Jakhau	1156/2	Pvt.	DLF LTD	1.5	M-744 ✓	27/12/2007
40	Moti Sindhodi	159/2p/2	Pvt.	DLF LTD	1.5	M-645 ✓	27/12/2007
41	Sayra	131/P	Pvt.	DLF LTD	1.5	M-172 ✓	10/01/2008
42	Sayra	272/2	Pvt.	DLF LTD	1.5	M-164 ✓	10/01/2008
43	Sayra	241/P	Pvt.	DLF LTD	1.5	M-170 ✓	10/01/2008
44	Sayra	238/P	Pvt.	DLF LTD	1.5	M-148 ✓	10/01/2008
45	Sayra	233/1	Pvt.	DLF LTD	1.5	M-145 ✓	10/01/2008
46	Jakhau	980/1	Pvt.	DLF LTD	1.5	M-634 ✓	10/01/2008
47	Jakhau	1098/P	Pvt.	DLF LTD	1.5	M-771 ✓	10/01/2008
48	Suthari	623/p	Pvt.	DLF LTD	1.5	M-230 ✓	10/01/2008
49	Suthari	383/p	Pvt.	DLF LTD	1.5	M-201 ✓	10/01/2008
50	Moti Sindhodi	200/6	Pvt.	DLF LTD	1.5	M-514 ✓	10/01/2008
51	Vanku	372/p	Pvt.	DLF LTD	1.5	M-587 ✓	10/01/2008
52	Jakhau	1122/P	Pvt.	DLF LTD	1.5	M-783 ✓	13/2/2008
53	Jakhau	1145/P	Pvt.	DLF LTD	1.5	M-748 ✓	13/2/2008
54	Chhachhi	28/1	Pvt.	DLF LTD	1.5	M-269 ✓	13/2/2008
55	Sayra	182/p	Pvt.	DLF LTD	1.5	M-150 ✓	4/3/2008
56	Jakhau	1048/p	Pvt.	DLF LTD	1.5	M-786 ✓	4/3/2008
57	Jakhau	1303/p	Pvt.	DLF LTD	1.5	M-810 ✓	4/3/2008
58	Jakhau	1138/1p	Pvt.	DLF LTD	1.5	M-747 ✓	4/3/2008
59	Jakhau	1055/2p	Pvt.	DLF LTD	1.5	M-789 ✓	4/3/2008
60	Jakhau	1102	Pvt.	DLF LTD	1.5	M-770 ✓	4/3/2008
61	Jakhau	1071/2	Pvt.	DLF LTD	1.5	M-785 ✓	4/3/2008
62	Jakhau	971	Pvt.	DLF LTD	1.5	M-792 ✓	4/3/2008
63	Moti Sindhodi	92	Pvt.	DLF LTD	1.5	M-431 ✓	4/3/2008
64	Moti Sindhodi	154/3	Pvt.	DLF LTD	1.5	M-444 ✓	4/3/2008
65	Moti Sindhodi	95	Pvt.	DLF LTD	1.5	M-667 ✓	4/3/2008
66	Moti Sindhodi	5	Pvt.	DLF LTD	1.5	M-508 ✓	4/3/2008
67	Suthari	89	Pvt.	DLF LTD	1.5	M-161 ✓	4/3/2008
68	Lathedi	372/1	Pvt.	DLF LTD	1.5	M-291 ✓	4/3/2008
69	Lathedi	225	Pvt.	DLF LTD	1.5	M-297 ✓	4/3/2008
70	Jakhau	1368 10/03/2008	Pvt.	DLF LTD	1.5	M-794 ✓	10/3/2008
71	Jakhau	1366 10/03/2008	Pvt.	DLF LTD	1.5	M-787 ✓	10/3/2008



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DLF SITE : SUTHARI, KUTCH, GUJARAT

Sl.No	Loc. No.	Latitude			longitude		
		Degree	Minute	Second	Degree	Minute	Second
1	M-97	23	03	17	68	52	41
2	M-145	23	06	05	68	53	43
3	M-148	23	05	52	68	53	43
4	M-150	23	04	58	68	54	08
5	M-161	23	04	09	68	53	38
6	M-164	23	06	11	68	54	27
7	M-170	23	05	35	68	54	26
8	M-172	23	05	54	68	55	26
9	M-201	23	03	47	68	55	26
10	M-202	23	01	59	68	55	47
11	M-213	23	04	44	68	55	21
12	M-230	23	02	28	68	57	25
13	M-260	22	58	20	68	58	29
14	M-262	22	58	18	68	58	47
15	M-263	22	58	49	68	59	27
16	M-264	22	59	11	68	59	42
17	M-265	22	59	26	69	00	03
18	M-266	22	58	36	68	58	46
19	M-268	22	58	30	68	59	29
20	M-269	22	57	34	69	00	06
21	M-270	22	57	18	69	00	33
22	M-272	22	59	04	69	00	19
23	M-275	22	57	29	69	00	49
24	M-276	22	57	16	69	00	53
25	M-277	22	57	03	69	00	60
26	M-280	22	57	45	69	01	04
27	M-282	22	56	58	69	01	26
28	M-286	22	57	11	69	01	43
29	M-288	22	57	36	69	01	52
30	M-289	22	57	21	69	02	01
31	M-290	22	59	20	69	00	51
32	M-291	22	59	04	69	01	09
33	M-292	22	58	52	69	01	15
34	M-293	22	58	38	69	01	15



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35	M-296	22	58	26	69	01	43
36	M-297	22	59	16	69	01	45
37	M-299	22	58	40	69	02	04

DLF SITE : MOTISINDODI, KUTCH, GUJARAT

Sl.No	Loc. No.	Latitude			longitude		
		Degree	Minute	Second	Degree	Minute	Second
1	M-417	23	6	35.8	68	46	28
2	M-418	23	6	23.7	68	46	34.2
3	M-419	23	6	13.1	68	46	43
4	M-420	23	6	0.1	68	46	40.8
5	M-421	23	5	51.5	68	46	54.5
6	M-422	23	5	34.7	68	46	55.5
7	M-431	23	6	43.4	68	46	54.2
8	M-439	23	4	54.4	68	47	42.6
9	M-440	23	4	44.3	68	47	48.4
10	M-443	23	9	3.4	68	45	44.7
11	M-444	23	8	52.6	68	46	0
12	M-455	23	6	35.4	68	47	14.2
13	M-456	23	6	23	68	47	24.6
14	M-464	23	9	29.9	68	46	1.1
15	M-465	23	9	15	68	46	3.3
16	M-478	23	5	37.7	68	48	22.3
17	M-479	23	5	22.1	68	48	10.2
18	M-506	23	6	10.6	68	48	8.6
19	M-508	23	5	51.2	68	48	18.2
20	M-514	23	9	30.4	68	46	49.5
21	M-526	23	4	59.2	68	49	32.4
22	M-533	23	6	32.2	68	48	46.4
23	M-544	23	6	12.5	68	49	13.6
24	M-586	23	7	4.4	68	50	34.2
25	M-587	23	6	53.3	68	50	43.8
26	M-589	23	6	13.1	68	51	38.9
27	M-632	23	9	42.9	68	43	16.8
28	M-634	23	10	29.8	68	43	39.4



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29	M-640	23	10	2.6	68	45	7.9
30	M-641	23	9	47.7	68	45	4.2
31	M-643	23	10	16.2	68	45	7.1
32	M-645	23	8	50.4	68	45	27.7
33	M-667	23	6	52.9	68	46	41.4

DLF SITE : JAKHAU, KUTCH, GUJARAT

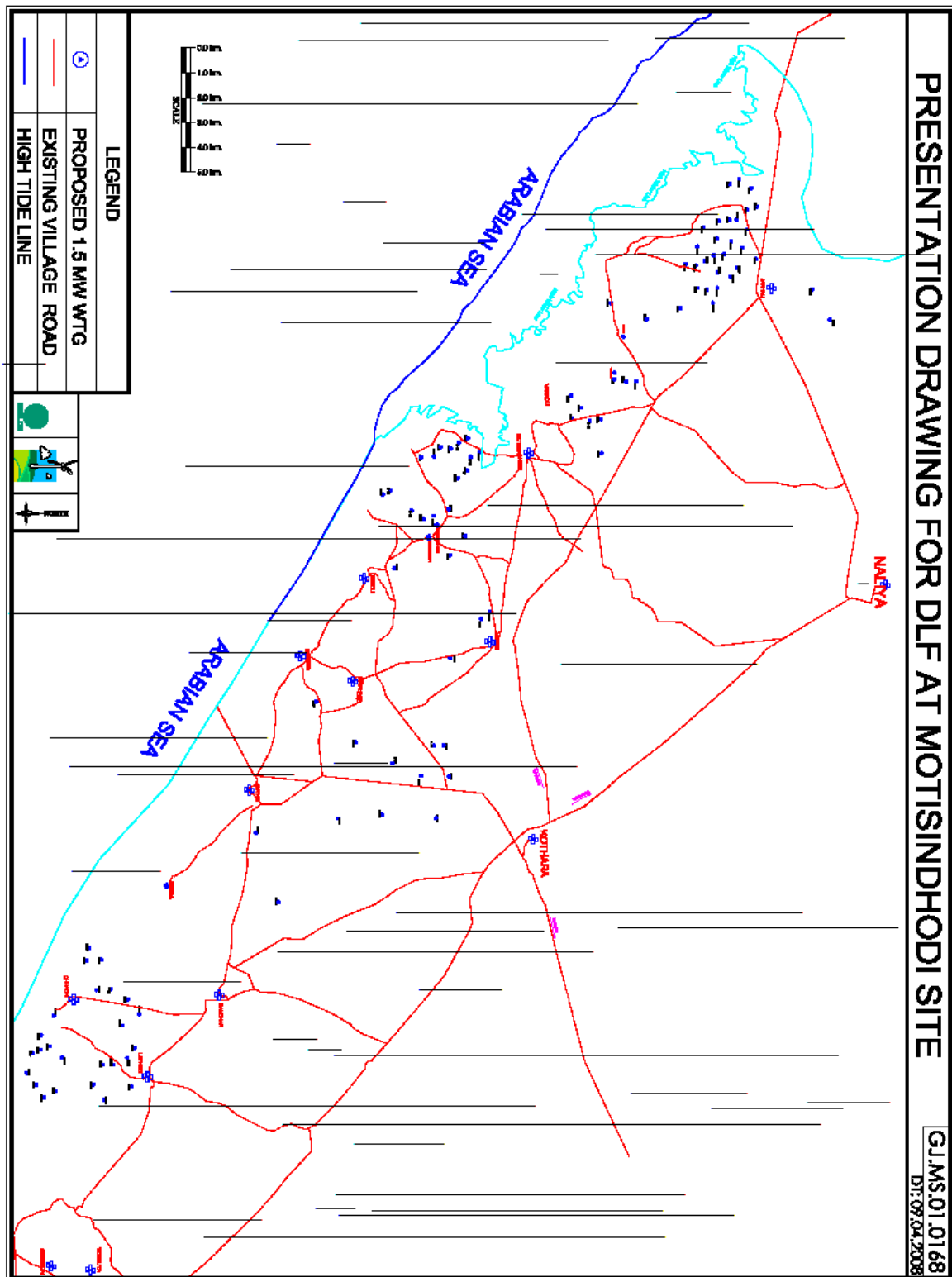
Sl.No	Loc. No.	Latitude			longitude		
		Degree	Minute	Second	Degree	Minute	Second
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2	M-727	23	12	17.9	68	40	27.8
3	M-744	23	12	45.9	68	40	33.5
4	M-745	23	12	53.5	68	40	59.4
5	M-746	23	12	40.9	68	41	3.9
6	M-747	23	12	27.2	68	41	18.1
7	M-748	23	12	17.7	68	41	18.6
8	M-749	23	12	4	68	41	20
9	M-750	23	11	43.5	68	41	29.7
10	M-761	23	12	40.8	68	41	31.7
11	M-762	23	12	1	68	41	44.6
12	M-764	23	11	35.7	68	41	56.2
13	M-765	23	11	20.5	68	42	21.6
14	M-770	23	12	34.3	68	41	57.7
15	M-771	23	12	20	68	41	49.2
16	M-772	23	12	10.6	68	42	6.9
17	M-773	23	11	57.1	68	42	8.6
18	M-774	23	11	45.2	68	42	16.3
19	M-775	23	11	33.7	68	42	23.5
20	M-783	23	12	52.8	68	42	13.7
21	M-785	23	12	27.8	68	42	26
22	M-786	23	12	1.9	68	42	32.5
23	M-787	23	11	35.3	68	42	55.1
24	M-789	23	12	19.1	68	42	39.3
25	M-790	23	12	1.9	68	42	54.7
26	M-791	23	11	48.4	68	42	57.3
27	M-792	23	11	13.6	68	43	23.3
28	M-793	23	11	57.8	68	43	23.7



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29	M-794	23	14	3.6	68	42	57.9
30	M-810	23	14	29.1	68	43	39.5



**ABBREVIATIONS**

ACM	Approved Consolidated Methodology
BEF	Baseline emission factor
BM	Build Margin
BAU	Business as usual
CO₂	Carbon dioxide
CER	Carbon Emission Reductions
CEA	Central Electricity Authority
CDM	Clean development mechanism
CM	Combined Margin
EIA	Environmental Impact Assessment
EB	Executive Board
ESCOM	Energy Supply Company
GHG	Green House Gas
GERC	Gujarat Electricity Regulatory Commission
GUVNL	Gujarat Urja Vitaran Nigam Limited
HCA	Host Country Approval
IPP	Independent Power Producer
INR	Indian National Rupees
IPCC	Inter Governmental Panel on Climate Change
IRR	Internal rate of return
ISO	International Standards Organisation
KW	Kilowatt
MW	Mega watt
MWh	Megawatt hour
MT	Metric tonnes
MU	Million Units
MoEF	Ministry of Environment and Forests
MNES	Ministry of non-conventional energy sources
NO_x	Nitrogen Oxides
OM	Operating Margin
PF	Power Factor
PGCIL	Power Grid Corporation of India Limited
PPA	Power Purchase Agreement
PCN	Project Concept Note
PDD	Project design document
UNFCCC	United Nations Framework Convention on Climate Change
WTG's	Wind Electric Generators
WTG's	Wind Turbine Generators