

**CLEAN DEVELOPMENT MECHANISM  
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)  
Version 03 - in effect as of: 22 December 2006**

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**Revision history of this document**

| <b>Version Number</b> | <b>Date</b>      | <b>Description and reason of revision</b>  |
|-----------------------|------------------|--|
| 01                    | 21 January 2003  | Initial adoption   |
| 02                    | 8 July 2005      | <ul style="list-style-type: none"><li>• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.</li><li>• As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <a href="http://cdm.unfccc.int/Reference/Documents">http://cdm.unfccc.int/Reference/Documents</a>.</li></ul> |
| 03                    | 22 December 2006 | <ul style="list-style-type: none"><li>• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.</li></ul>   |

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

&gt;&gt;

5 MW Wind Power Project of Alembic Ltd at Bhavnagar , Gujarat, India

Version 04,

02<sup>nd</sup> November 2007**A.2. Description of the small-scale project activity:**

&gt;&gt;

Alembic Limited (henceforth referred to as 'Alembic' in the PDD) was started in 1907 at Vadodara. It is ISO – 9001 and ISO – 14001 certified company and one of the Asia's most respected integrated pharmaceutical companies with manufacturing practices and facilities that conform to WHO – GMP guidelines. Alembic is in the business of improving the quality of life and healthcare in over 75 countries around the world.

Alembic considers the protection of the environment as its direct responsibility and all its processes and technologies incorporate this feature. A clean and a green environment is an absolute necessity and Alembic has ensured this by using renewable energy through the considered project activity of conceptualization and installation of the 5 MW Wind Power Project to satisfy a part of its energy requirements.

The group has developed this project keeping in consideration of the funding available under the Clean Development Mechanism (CDM) of the United Nations Framework Convention on Climate Change. This is because the project activity qualifies as a CDM project because it would reduce the power consumption from the electricity grid (Western grid, India) thereby helping in significant reduction of GHG emissions.

The project activity is also responsible for sustainable economic growth and conservation of environment through use of wind as a renewable source.

The Project activity would generate 5 MW of electricity with efficient utilization of the available wind energy through adoption of the latest, efficient and modern technology. The generated electricity was to displace equivalent electricity procured from Gujarat Urja Vikas Nigam Limited (GUVNL) in the Panelav and Vadodara plants, shared between the plants in a ratio of 35:65 plant of Alembic Ltd. With

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effect from 1 April 2006 the entire amount of electricity generated will be used to displace an equivalent amount of electricity from the Vadodara and Panelav plants<sup>1</sup>, as per the Alembic Limited's requirements.

M/S Alembic Ltd., Vadodara would have the ownership rights for the project activity and would be the sole transaction entity with the Executive Board of the United Nations Framework Convention on Climate Change.

The 5 MW Wind Power Project comprises of Wind Energy Generators (WEG's) each of capacities 1.25 MW supplied by M/S Suzlon Energy Ltd.

The contributions of the project to sustainable development are:

- Generation of eco-friendly power;
- Conserving fossil fuel reserves in vision of long-term sustainability;
- Reducing GHG emissions compared to a business-as-usual scenario;
- Reducing other pollutants (SOx, NOx, PM, etc.) resulting from power generation in the grid;

**A.3. Project participants:**

>>

| Name of Party involved ((host)<br>indicates a host Party) | Private and/or public entity(ies)<br>project participants (as<br>applicable) | Kindly indicate if the Party<br>involved wishes to be considered<br>as project participant (Yes/No) |
|---|--|---|
| <b>India (Host)</b>                                       | <b>Alembic Limited (Private<br/>entity)</b>                                  | <b>No</b>   |

**A.4. Technical description of the small-scale project activity:**

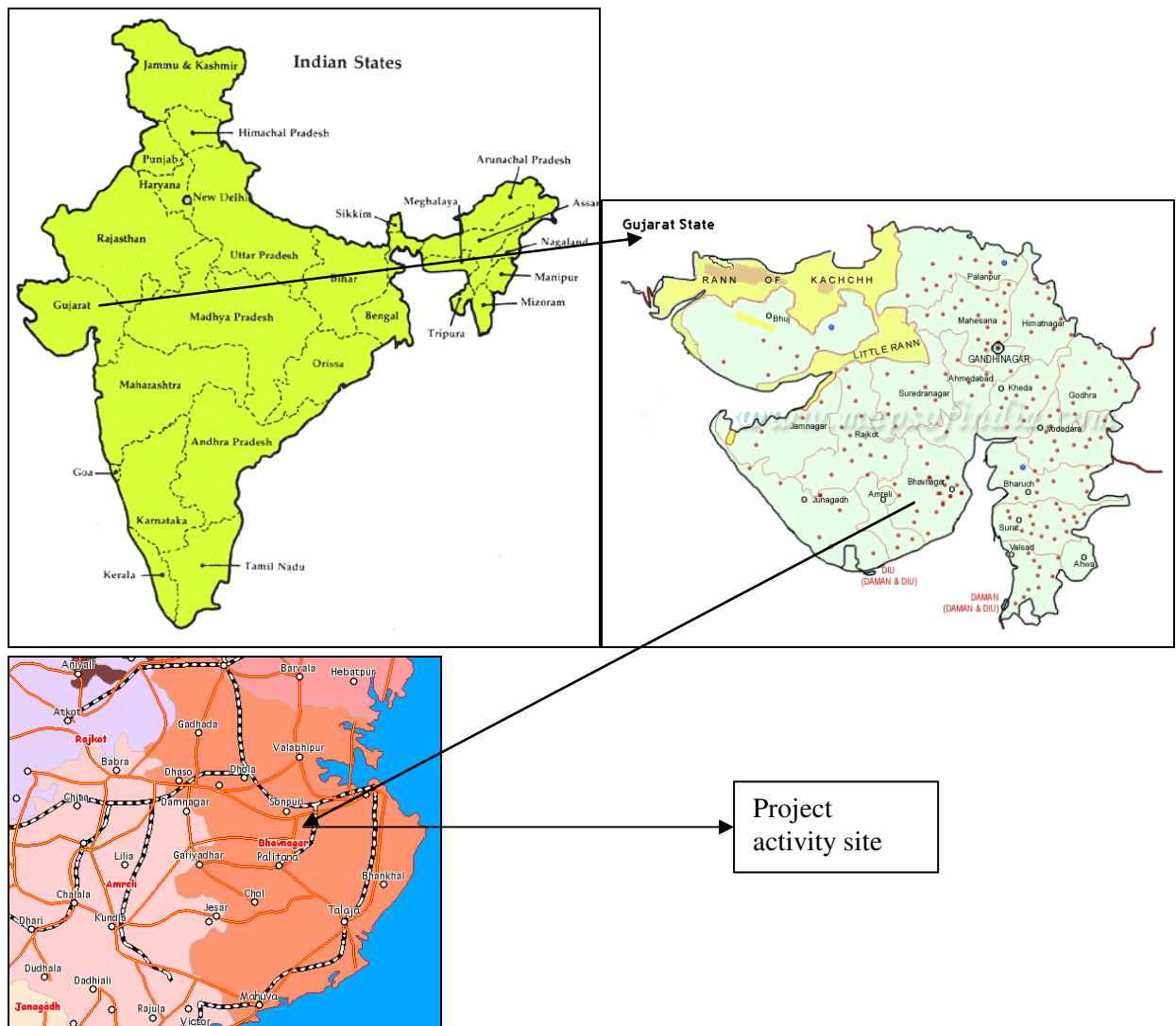
The technology applied for project activity is the power generation from renewable energy i.e. wind. The project proponent used the highly efficient technology for wind power generation. The technology is supplied by Suzlon limited.

**A.4.1. Location of the small-scale project activity:**

>> The detailed location of the site is shown in the map below:

<sup>1</sup> GETCO Wheeling Agreement.

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**A.4.1.1. Host Party(ies):**

&gt;&gt; India

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

&gt;&gt; Gujarat

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

&gt;&gt; Ukharla, Trambak, District Bhavnagar, PIN – 364001

**A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :**

&gt;&gt;

The project site is located at Ukharla Trambak in the district of Bhavnagar and in the Indian state of GUJARAT. Bhavnagar is approximately at 250 kms from AHMEDABAD. The site Ukharla has a latitude and longitude of around 21° 34' 23.2'' N & 72° 05' 52.1'' E respectively. It is located at approximately 225 meters from the mean sea level. These sites have been identified as ideally suited for wind power generation based on the studies and data analysis carried out by eminent agencies like M/S Suzlon Energy Ltd. The feasibility of these sites for wind power production has been established by Ministry of Non Conventional Energy Sources, Govt. of India

| Sr. No | Turbine | Survey number as per Power Wheeling Agreement with GETCO |
|--------|---------|--|
| 1      | S4      | 46/P1  |
| 2      | S5      | 30/P1  |
| 3      | S6      | 30/P2  |
| 4      | S7      | 30/P3  |

**A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:**

&gt;&gt;

**Type & Category**

The project meets the applicability criteria of the small-scale CDM project activity category, Type – I: Renewable Energy Projects (D: Grid connected renewable electricity generation) of the “Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories”

Main Category: **Type I – Renewable energy projects.**

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Sub Category: **D – Grid connected renewable electricity generation.**

As per the provisions of appendix B of simplified modalities and procedures for small scale CDM project activities (version 11), Type I D “comprises renewable energy generation units, such as photovoltaics, hydro, tidal / wave, wind, geothermal, and renewable biomass, that supply electricity to and / or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit”. The project activity is within the threshold values stated by the methodology.

The baseline and emission reduction calculations from the project would be based on paragraphs 9 of AMS-I.D (version 11) and the monitoring methodology would be based on guidance provided in paragraph 13 of AMS-I.D.

### Technology

Alembic has procured the Wind Energy Generators (WEGs) from Indian company M/S. Suzlon Energy Ltd. The technology is a clean and safe technology since there are no GHG emissions associated with the electricity generation.

A direct grid-connected high-speed horizontal axis generator, in combination with the multiple-stage combined spur / planetary gearbox delivers harmonics-free and grid-friendly power. The technical details of the WEG are as follows:

| <b>Operating Data</b>  | <b>S.64/1250<br/>(50 Hz)</b>       |
|------------------------|------------------------------------|
| Rotor diameter         | 64 m                               |
| Hub height             | 65 m (variable as per requirement) |
| Installed elec. Output | 1250 kW                            |
| Cut-in wind speed      | 3 m/s                              |
| Rated wind speed       | 12 m/s                             |
| Cut-out wind speed     | 25 m/s                             |
| Survival wind speed    | 67 m/s                             |

| <b>Rotor</b> | <b>S.64/1250<br/>(50 Hz)</b> |
|--------------|------------------------------|
| Blade        | 3 bladed horizontal axis     |

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|                  |                     |
|------------------|---------------------|
| Swept area       | 3217 m <sup>2</sup> |
| Rotational speed | 13.9 / 20.8 rpm     |
| Regulation       | Pitch-regulated     |

|                  |                              |
|------------------|------------------------------|
| <b>Generator</b> | <b>S.64/1250<br/>(50 Hz)</b> |
| Type             | Asynchronous 4/6 poles       |
| Rated output     | 250 / 1250 kW                |
| Rotational speed | 1006/1506 rpm                |
| Frequency        | 50 Hz                        |

|                |                                      |
|----------------|--------------------------------------|
| <b>Gearbox</b> | <b>S.64/1250<br/>(50 Hz)</b>         |
| Type           | Integrated (1 planetary & 2 helical) |
| Ratio          | 74.917 : 1                           |

|                   |   |
|-------------------|---|
| <b>Yaw System</b> | <b>S.64/1250<br/>(50 Hz)</b>            |
| Drive             | 4 electrically driven planetary gearbox |
| Bearings          | Polyamide slide bearings                |

|                       |   |
|-----------------------|---|
| <b>Braking System</b> | <b>S.64/1250<br/>(50 Hz)</b>              |
| Aerodynamic brake     | 3 independent systems with blade pitching |
| Mechanical brake      | Hydraulic fail-safe disc brake system     |

|                     |   |
|---------------------|---|
| <b>Control Unit</b> | <b>S.64/1250<br/>(50 Hz)</b>  |
| Type                | Programmable microprocessor-based; high speed data communication, active multilevel security, sophisticated operating software, advance data collection remote monitoring & control option, UPS back up, Real time operation indication |

|              |                              |
|--------------|------------------------------|
| <b>Tower</b> | <b>S.64/1250<br/>(50 Hz)</b> |
|--------------|------------------------------|

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|          |  |
|----------|--|
| Type     | Lattice / Tubular, Hot Dip Galvanized, Epoxy / PU coated |
| Erection | <b>S.64/1250<br/>(50 Hz)</b>                             |
| Type     | With crane   |

The salient features of the WEGs are as follows:

- *Higher Efficiency*  
Designed to achieve increased efficiency and co-efficient of power (Cp)
- *Minimum Stress and Load*  
Static stresses are taken care of by a well-balanced weight distribution design while wind induced dynamic radial loads are picked up by the separate main shaft bearing, which is integrated into the gearbox housing.
- *Shock Load-free Operation*  
Peak loads are compensated by a torque adjustable advanced hydrodynamic fluid coupling which also acts as an excellent vibration separation and shock-dampening device.
- *Intelligent Control*  
‘Next gen’ technologies applied by extensive operational experience maximizes yield
- *Maximum Power Factor*  
High-speed asynchronous generator with a multi-stage intelligent switching compensation system delivers power factor up to 0.99
- *Climatic Shield*  
Hermetically sheltered against thermal stresses, moisture, salinity, dust, snow, lightning strikes and extreme wind conditions, advanced over-voltage and lightning protection system
- *Unique Micro-Pitching Control*  
Unmatched fine pitching with 0.1° resolution to extract every possible unit of power
- *Grid-friendly*  
Grid friendly design generates harmonics-free pure sinusoidal power

The WEG is designed according to the Germanischer Lloyd (GL) design standards.

|   |
|---|
| <b>A.4.3 Estimated amount of emission reductions over the chosen <u>crediting period</u>:</b> |
|---|

&gt;&gt;

The project activity would result into CO<sub>2</sub> emission reduction of 89698 tons for 10 years crediting period.

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| Years  | Annual estimation of emission reductions in tonnes of CO <sub>2</sub> -e |
|--|--|
| 2008   | 9247   |
| 2009   | 9247   |
| 2010   | 9247   |
| 2011   | 9247   |
| 2012   | 8785   |
| 2013   | 8785   |
| 2014   | 8785   |
| 2015   | 8785   |
| 2016   | 8785   |
| 2017   | 8785   |
| Total estimated reductions (tonnes of CO <sub>2</sub> e)                                       | <b>89698</b>   |
| Total no of crediting years  | 10   |
| Annual average over the crediting period of Estimated reductions (tonnes of CO <sub>2</sub> e) | <b>8969</b>  |

**A.4.4. Public funding of the small-scale project activity:**

&gt;&gt;

No public funding from parties included in Annex I to the UNFCCC, is available to the project.

**A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:**

According to appendix C of simplified modalities and procedures for small-scale CDM project activities, ‘*debundling*’ is defined as the fragmentation of a large project activity into smaller parts. A small-scale project activity that is part of a large project activity is not eligible to use the simplified modalities and procedures for small-scale CDM project activities.

According to para 2 of appendix C<sup>2</sup>

<sup>2</sup> Appendix C to the simplified M&P for the small-scale CDM project activities, <http://cdm.unfccc.int/Projects/pac/ssclistmeth.pdf>

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A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point

Since there is no small-scale activity registered and/or applied for registration in the name of project participant, which belongs to any of the categories of small-scale CDM project or meeting any of the debundling criteria stated above, the Alembic's project activity therefore considered as small scale CDM project activity.

**SECTION B. Application of a baseline and monitoring methodology**
**B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:**

&gt;&gt;

The methodology used for this project is **I. D. – Grid connected renewable electricity generation (version 11)** under the small scale methodologies **Type I – Renewable energy projects**.

For calculation of the combined margin baseline emission factor, the approved consolidated baseline methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”, Version 06 is applied.

**For additionality**

Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities; Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories

**Reference:** [http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB\\_SSC\\_AttachmentA.pdf](http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB_SSC_AttachmentA.pdf)

**B.2 Justification of the choice of the project category:**

&gt;&gt;

As per the provisions of simplified modalities and procedures for small scale CDM project activities (version 11), Type I. D “comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal, and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit. If the unit added has both renewable and non-renewable components (*e.g.* a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.

Project activity meets the applicability conditions of the methodology in following manner:

| S. No. | Methodological requirement  | Justification  |
|--------|---|--|
| 1      | This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal and renewable biomass, that supply electricity to and/or displace electricity from an electricity | The project is a wind mill project hence applicable to this category. Due to project activity, there is an equivalent displacement of electricity (which is generated by fossil fuel) by renewable |

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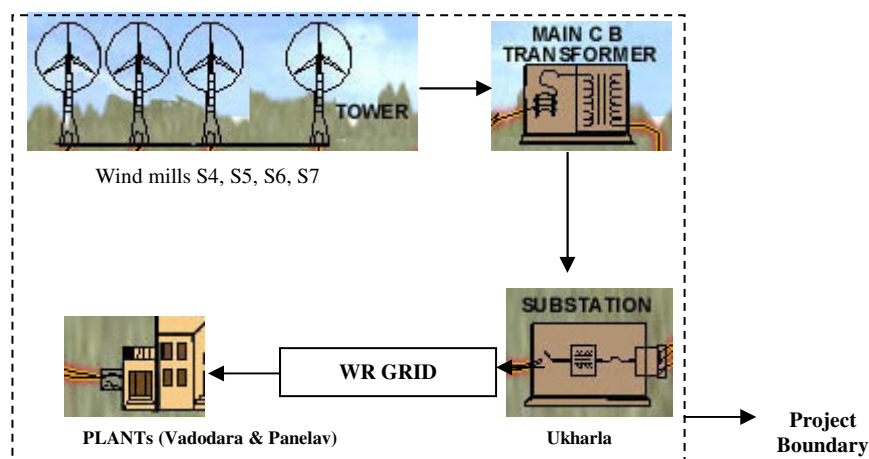
|   |   |   |
|---|---|---|
|   | distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.  | source (wind) by using WTG technology.  |
| 2 | If the unit added has both renewable and non-renewable components (e.g.. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW. | There is neither non-renewable component added, nor co-firing is required for the proposed project activity. The renewable project capacity is 5 MW, well below the limit of 15 MW.   |
| 3 | Combined heat and power (co-generation) systems are not eligible under this category.   | Not applicable. This project is not a Combined heat and power (co-generation) systems. Project activity is displacing partial grid power (which is dominated by fossil fuel) by renewable source (wind) by using WTG technology |
| 4 | In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.                         | Not applicable, the entire windmills are new and this project is not capacity enhancement or up gradation project.  |
| 5 | Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category. To qualify as a small scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.   | Not applicable. This project is not a retrofit or modification of existing facility.  |

**B.3. Description of the project boundary:**

&gt;&gt;

As per the methodology, “the project boundary encompasses the physical, geographical site of the renewable generation source”.

In this project the project boundary would include the WEGs, main transformer, sub station, western region grid and the power receiving plant

**B.4. Description of baseline and its development:**

&gt;&gt;

The baseline methodology has followed the one specified under Project Category I.D. in Appendix B of the Simplified M&P for small scale CDM project activities.

All existing sources of power generation have been considered from various sources like the WREB web-site, CEA web-site and other power related websites. Percentage share of power generation from different fuel sources has been calculated. The IPCC emission factors for different sources of power generation have been considered.

The NET BASELINE EMISSION FACTOR as per COMBINED MARGIN (ACM002 Ver06)

Calculation of Operating Margin

Based on CEA data<sup>3</sup>

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

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|                |              |
|----------------|--------------|
| 2003-04        | 0.990        |
| 2004-05        | 1.012        |
| 2005-06        | 0.993        |
| <b>Average</b> | <b>0.998</b> |

**Build margin**

|         |              |
|---------|--------------|
| 2005-06 | <b>0.630</b> |
|---------|--------------|

$$\begin{aligned}
 \text{Emission factor} &= (0.75 \times \text{OM} + 0.25 \times \text{BM}) \\
 &= (0.75 \times 0.998 + 0.25 \times 0.63) \\
 &= 0.906 \text{ kg CO}_2/\text{kWh}
 \end{aligned}$$

The baseline calculations are CEA data base “CENTRAL ELECTRICITY AUTHORITY: CO<sub>2</sub> BASELINE DATABASE”.

|   |
|---|
| <b>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 <u>small-scale</u> CDM project activity:</b> |
|---|

The project reduces anthropogenic emissions of greenhouse gases by sources below those that would have occurred in absence of the proposed CDM project activity.

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 proposed CDM project activity.

***Barriers and Additionality***

Referring to attachment A to appendix B document of “indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories”, project participants are required to provide a qualitative explanation to show that the project activity would not have occurred anyway, **at least one** of the listed elements. should be identified in concrete terms to show that the activity is either beyond the regulatory and policy requirement or improves compliance to the requirement by removing barrier(s); The guidance provided herein has been used to establish project additionality. The barriers that were considered are listed below:

- Investment barrier
- Technological barrier
- Barrier due to prevailing practice
- Other barriers

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The following section addresses some barriers faced by Alembic to implement the new retrofit technology in their plant.

### Investment Barrier

The power situation in India is particularly grim due to reliance on financially weak State Electricity Boards. The situation is particularly acute in Gujarat state. According to a study done by a premier institute<sup>4</sup>, captive power generation in 2002 amounted to 20% of total electricity produced in Gujarat, a response to the poor quality supply from GEB. In the year 2003, Alembic decided to go ahead with implementation of wind turbine generators to meet power demand in its manufacturing units. The source of finance for the project was 70% from loan and 30% from internal accruals<sup>5</sup>. The decision on the project was based on CDM revenues and the same is reflected from management note<sup>6</sup>.

To have self reliance on electricity, Alembic went ahead with analyzing different alternative captive power options. It could have either continued to use current generation mix of electricity or set up a captive unit based on coal or diesel<sup>7</sup>. There was also an option going for WTG's considering CDM benefits to achieve project approval.

The project proponent identified the following options as the source of power to meet its electrical energy requirement –

Alt 1: Continuation of current practice

Alt-2: Thermal power plant based on lignite / coal as fuel.

Alt-3: Captive power plant based on Natural Gas

Alt-4: Energy generation using renewable source of wind power.

Continuous of current practice: This option was the cheapest option for the project proponent. In this option there was no capital investment was requirement. Other than no capital investment there was no barriers associated with this option because of the project proponent was already using these options. Therefore this option was one of the baseline scenario for proposed project activity.

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<sup>4</sup> Captive Power Plants: Case Study of Gujarat, India

<sup>5</sup> Estimated sources of finance V.H.Gandhi and CO. (Chartered Accountants), dated 20/04/2006.

<sup>6</sup> Capital Expenditure Authorization dated 02/04/2003.

Copy of resolution passed by the Board of directors of the company in its meeting held at Vadodara dated 24/07/2003.

<sup>7</sup> Alembic was having three type of power sources during the decision making process:

1. Grid electricity
2. Natural gas based cogeneration turbines
3. Diesel generating (DG) set (It was used in emergency conditions)

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Coal based power generation may be a preferred option for the project proponent for the reasons – It is the most economical option for generating electrical power. Technology is available in the country, which are the latest and the most efficient one from these systems. The load factor is a certainty with these power plants and is the highest. Coal based captive power generation is preferred option in state of Gujarat. Captive power plants based on natural gas was another option for the alembic as they were already using the natural gas based turbine generators. This was not feasible due to unavailability of Natural Gas. The letters for declining gas is submitted to DOE.

Alternatively Alembic could also invest into wind energy and wheel the power to its manufacturing unit. Although this wasn't the best possible option to meet power requirements, however after considering CDM benefits, a decision to invest in wind energy was taken. Wind energy is clean energy as there is no GHG emission from it and this makes it an option for the project proponent. The board approval is submitted for same.

Out of various options available to the project promoter wind is not the most attractive option to generate power. Though wind energy is a clean energy, it is a costlier option, especially in India where availability of coal is abundance. Due to high capital cost & low PLF per unit power generation cost is higher compared to other fuel options such as coal or diesel/FO. A comparative study of costs of electricity generation from different alternatives of power production is given below.

| S No.  | Source      | Power Generation cost/ kWh |
|--|-------------|----------------------------|
| Alt-1  | Coal        | Rs 2.27/ kWh               |
| Alt-2  | Fuel Oil    | Rs 3.57/ kWh               |
| Alt-3  | Wind Energy | Rs 4.24/ kWh               |
| <b>Reference Nagda hills Registered wind PDD (Annex 4)</b> |             |                            |

Also according to the World Energy Council report<sup>8</sup> 'India's Energy Scenario In 2020' wind remains a costly option to generate power than other conventional fossil fuel based sources. Wind power projects provide lower IRR as these projects entail high project cost and low PLF. To promote these technologies state government provides incentives like accelerated depreciation, wheeling of power to user etc, however even with these incentives the return from wind energy projects is lower than that from the other generation options.

The above unit generation cost is can be cross verified with one other study available for the Gujarat.

**According to one study<sup>9</sup> in Gujarat for the same period the following results are obtained:**

<sup>8</sup> INDIA'S ENERGY SCENARIO IN 2020 by SARMA, E.A.S., Secretary, Ministry of Power, Government of India; MAGGO, J.N., Joint Adviser, Planning Commission, Government of India SACHDEVA, A.S., Deputy Adviser, Planning Commission, Government of India

<sup>9</sup> Captive Power Plants: Case Study of Gujarat, India, P.R. Shukla, Debashish Biswas, Tirthankar Nag, Amee Yajnik, Thomas Heller and David G. Victor, Working paper.

| Fuel Type          | Installation cost (million rupees per MW) | Generation cost (rupees per unit) |
|--------------------|---|-----------------------------------|
| <b>Lignite</b>     | <b>50 - 52.5</b>                          | <b>1.59 – 1.90</b>                |
| <b>Coal</b>        | <b>42.5 – 45</b>                          | <b>1.78 – 1.92</b>                |
| <b>Natural Gas</b> | <b>42.5 - 50</b>                          | <b>2.3 - 3.3</b>                  |
| <b>Wind</b>        | <b>40</b>                                 | <b>&gt; 5<sup>10</sup></b>        |

According to the analysis the lignite and coal based power plants were the best options for the Alembic. The project proponent would have opted for the coal and lignite based power plant in absence of the project activity. Looking forward the environmental benefit and CDM revenue project proponent decided to go for the wind energy. Although the IRR for wind power project was well below the weighted average cost of capital of Alembic power. The same is discussed below in details:

Before accepting any project, the finance department at Alembic conducts a thorough evaluation of the project. The Internal Rate of Return (IRR) for the project is calculated and then compared with the annualized Return on Capital. Specifically for the wind mill project previous three years' annualized Return on Capital was considered. The project activity commenced on 01 June 2003, hence the Return on Capital for this project would be considered for the years 2000 – 01; 2001 – 02 and 2002 – 03. Following is the detailed calculation for the return on capital for the above mentioned years:

|                                  | 2000 – 2001    | 2001 – 2002    | 2002 – 2003    |
|----------------------------------|----------------|----------------|----------------|
| <b>Equity + Free reserves</b>    | <b>10.57 %</b> | <b>5.49 %</b>  | <b>8.69 %</b>  |
| <b>Borrowings</b>                | <b>8.77 %</b>  | <b>7.55 %</b>  | <b>6.68 %</b>  |
| <b>Total</b>                     | <b>19.34 %</b> | <b>13.04 %</b> | <b>15.37 %</b> |
| <b>Average Return on Capital</b> |                | <b>15.92 %</b> |                |

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<sup>10</sup> Comparison of options for distributed generation in India

**Table 8: Barrier analysis**

| <b>Alternative scenario</b>                                    | <b>Investment barriers</b>   | <b>Technological barriers</b>  | <b>Barriers due to prevailing practices</b>  | <b>Other barriers</b> |
|--|--|--|--|-----------------------|
| Alt 1: Continuation of current practice                        | No initial capital investment required. In the absence of the project activity this is a most likely scenario. | No technological barriers. The plant will operate with this scenario in absence of the project activity.                   | This is the prevailing practice. No barriers.  | No                    |
| Alt-2: Thermal power plant based on lignite / coal as fuel.    | Initial capital investment.  | May be technological barriers, project proponent is not having experience for operation of coal/lignite based power plant. | There will not be any barrier due to prevailing practice because this is prevailing practice in Gujarat. | No                    |
| Alt-3: Captive power plant based on Natural Gas                | Capital investment   | No   | Not possible due to unavailability of natural gas.   | No                    |
| Alt-4: Energy generation using renewable source of wind power. | Huge capital investment  | May be technological barriers, project proponent is not having experience for operation of wind power plant.               | The project activity was first in the region.  | No                    |

It is clear that the alternative 1 is the baseline scenario for the project activity as this is facing no barrier.

**IRR calculation:**


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Rangan Banerjee,1

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IRR of the project is calculated as per the standard industrial practice. The project IRR is calculated based on cash inflow and outflow without the consideration of source of financing (as per tool for demonstration and assessment of additionality page 5, footer 6 and Please refer enclosure 1 IRR an CER calculations submitted along with this document).

For the calculation of Project IRR following assumptions considered:

| Basic Data/ Assumptions                          | Unit       | Value | Source  |
|--|------------|-------|---|
| Investment cost                                  | Rs Mill/MW | 42.40 | Suzlon proposal   |
| Capacity   | MW         | 5     | Suzlon proposal   |
| No of WEG  | No         | 4     | Based on management decision  |
| Average PLF                                      | %          | 26.48 | Calculated based on the guaranteed generation given by technology supplier; conservatively higher based on the published literature |
| Grid unavailability                              | %          | 4     | Suzlon proposal   |
| Wheeling Charges                                 | %          | 4     | Suzlon proposal, wheeling agreement   |
| Transmission Losses (between substation and WEG) | %          | 4     | Suzlon proposal   |
| O&M for first 4 years                            | %          | 2     | Purchase order given to suzlon  |
| O&M from 4th year                                | %          | 2     | Purchase order given to suzlon  |
| Annual escalation in O&M after 4 years           | %          | 5     | Purchase order given to suzlon  |
| De-rating of equipment post 5th years            | %          | 5.0   | Referred from purchase order  |
| Working Capital (Days                            | Days       | 100   | Based on industry standard  |

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sale) Days 100

|                               |   |    |  |
|-------------------------------|---|----|--|
| Interest rate                 | % | 12 | Based on industrial rates applicable for the project |
| Minimum alternative tax (MAT) | % | 8  | Based on last three years data of actual tax paid    |

The IRR of the project is 14.80 % considering the cash inflow as savings due to electricity generated by wind mills and cash outflow as operational & maintenance cost, insurance cost and interest to be paid on loan.

When the project was conceived, CDM funds were considered as cash inflow with criteria of cost of CERs to be 9 Euros per ton equivalent of CO<sub>2</sub> emission reduction.

After considering the CDM funds the IRR of the project improved to 16.39 % (more than the average value of return on capital calculated earlier as 15.92 %).

The IRR calculation for the project was based on certain assumptions for considering power cost and on the actual market conditions. Together these were factored in by finance experts of Alembic Ltd. The power cost used for IRR calculation was considered as INR 3.67 for the entire life time of the project. This was done as per the weighted average cost of the power used by the plant in the year 2000-01, 2001-02, 2002-03. The detailed calculation is submitted here:

| Weighted Average Cost                 |     | 2002-03         | 2001-02         | 2000-01         | Reference                            |
|---------------------------------------|-----|-----------------|-----------------|-----------------|--------------------------------------|
| Gross generation                      | kWh | 77852400        | 98786250        | 65358720        | Balance sheet                        |
| Net unit generated                    | kWh | <b>71233432</b> | <b>90281366</b> | <b>60602136</b> |                                      |
| Auxiliary                             | kWh | <b>6618968</b>  | <b>8504884</b>  | <b>4756584</b>  | Yearly statement of power generation |
| Total cost for cogen power generation | INR | 312575352       | 343925225       | 243461512       | As per SAP standard report           |

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|  |          |                    |                  |                  |                                      |
|--|----------|--------------------|------------------|------------------|--------------------------------------|
|  |          |                    |                  |                  |                                      |
| Quantity of steam generated                        | ton/year | <b>191206</b>      | <b>229368</b>    | <b>202991</b>    | Yearly statement of power generation |
| Steam cost   | INR/ton  | 445.0              | 612              | 516.0            |                                      |
| Steam credit                                       | INR      | <b>85094888</b>    | <b>140368625</b> | <b>104744519</b> |                                      |
|  |          |                    |                  |                  |                                      |
| Net cost for power generation                      | INR      | <b>227480463.6</b> | <b>203556599</b> | <b>138716993</b> |                                      |
| Unit cost of power generation                      | INR/unit | <b>3.19</b>        | <b>2.25</b>      | <b>2.29</b>      |                                      |
|  |          |                    |                  |                  |                                      |
| Generation   | Unit     | <b>113012</b>      | <b>131784</b>    | <b>32290</b>     | Balance sheet                        |
| Cost per unit                                      | INR/unit | 8.85               | 6.02             | 5.41             | Balance sheet                        |
| Total cost of power generation                     |          | 1000156.2          | 793340           | 174689           |                                      |
|  |          |                    |                  |                  |                                      |
| GEB purchase                                       | kWh      | <b>27796640</b>    | <b>16340053</b>  | <b>30575298</b>  | Balance sheet                        |
| Total amount                                       | INR      | 166960664          | 135357856        | 193136177        | Balance sheet                        |
| Cost per unit of GEB power                         | INR/kWh  | <b>6.0</b>         | <b>8.3</b>       | <b>6.3</b>       |                                      |
|  |          |                    |                  |                  |                                      |
| Gross unit generated/purchased                     | kWh      | 99143084           | 106753203        | 91209724         |                                      |
| Line loss  | kWh      | 1982862            | 2135064          | 1824194          |                                      |
| Net unit generated                                 | kWh      | <b>97160222</b>    | <b>104618139</b> | <b>89385530</b>  |                                      |
| Total cost for power generation                    | INR      | <b>395441284</b>   | <b>339707795</b> | <b>332027859</b> |                                      |
| Weighted average cost of power generation/purchase | INR/kWh  | <b>4.1</b>         | <b>3.20</b>      | <b>3.70</b>      | <b>3.67 (Average cost)</b>           |

The detailed IRR working is submitted as separate excel sheet working and same is attached in PDD.

### Sensitivity Analysis

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The project proponent has done sensitivity analysis for the robustness of financial calculation. Plant load factor of the wind mill is the most important factor in sensitivity analysis. The plant load factor is varied from 1 to 5% up and down and the following table is prepared for project IRR.

| Plant load factor (+) up) / (-) down by | Project IRR   |
|---|---------------|
| +5%                                     | 15.70%        |
| +4%                                     | 15.52%        |
| +3%                                     | 15.34%        |
| +2%                                     | 15.16%        |
| +1%                                     | 14.98%        |
| <b>0</b>                                | <b>14.80%</b> |
| -1%                                     | 14.61%        |
| -2%                                     | 14.43%        |
| -3%                                     | 14.25%        |
| -4%                                     | 14.07%        |
| -5%                                     | 13.89%        |

It is clear from above table than the project activity is not crossing the benchmark even after increasing the PLF by 5%.

**Barriers due to prevailing practice****B: Regulatory Risks:**

The state of Gujarat has witnessed a growth in wind turbine installations till the year 1998. The Wind Power sector witnessed nil installation over next four years up to December 2002. The WTGs installed by alembic were among the first few installed after a slump in investments in the Wind power sector in Gujarat.

*Wind Installations in Gujarat over the years<sup>11</sup>:*

| Years                  | Till<br>1992 | 92-<br>93 | 93-<br>94 | 94-<br>95 | 95-<br>96 | 96-<br>97 | 97-<br>98 | 98-<br>99 | 99-<br>00 | 00-<br>01 | 01-02 | 02-03 |
|------------------------|--------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------|-------|
| Installation<br>s (MW) | 14.5         | 1.6       | 10.6      | 37.7      | 51.2      | 31.1      | 20.1      | 0         | 0         | 0         | 0     | 0     |

<sup>11</sup> Wind power India-year wise installations statistics – <http://www.windpowerindia.com/statyear.asp>

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As clearly seen the Wind energy installations came to stand still after year 1998 till 2002-03. The slump in investments was attributed to poor state policy<sup>12</sup> as shown below-

| Year              | Policy  | Remarks   |
|-------------------|---|---|
| Jan1993 - Sep2001 | 1. Tariff rate of Rs.1.75/KWH<br><br>2. Banking for 6 months as compared to other states with banking option of 12 months.<br><br>3. No third party sales option available. | Policy attracted investments till 1998, but there after failed to attract investors due to stagnant policy. |
| Oct2001 - Jun2002 | 1. Tariff rate of Rs.2.25/KWH<br><br>2. Wheeling charges doubled from 2% to 4%.   | The policy failed to attract investments and was changed within 9 months of implementation.                 |
| Jun2002-till date | 1. Tariff of Rs.2.60/KWH<br><br>2. Banking period again reduced to 6 months.  | A marginal growth in 2002-03 and in 2003-04 was observed after this policy.                                 |

This table shows the irregular and non-conducive nature of government policy. The banking period is only six months in comparison to twelve months in states of Maharashtra, Tamilnadu and Karnataka. The tariff in state is among lowest in country<sup>13</sup>. Any change in the near future will have effect on the returns expected by project proponent and thereby added to the apprehensions. Similar policy planning affects have been observed in other states.

#### Other barriers

Among all energy sources available wind energy is never considered as base-load option. It is mainly due to the fact that wind power is infirm and is dependent on a number of factors which are beyond the control of power producer such as availability of wind, wind velocity and wind direction. The Wind

<sup>12</sup> Wind Power Policy – 2002; Government of Gujarat; Energy and Petrochemicals Department Government Resolution No.EDA-102001-3054-B Sachivalaya, Gandhinagar. Dated the 28 June, 2002.

<sup>13</sup> Incentives Declared by the State Governments for Private Sector Wind Power Projects <http://www.infraline.com/>

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turbines were installed in Gujarat after a gap of four years; this was the first time megawatt class wind mill was installed in state<sup>14</sup>. Since this was first time megawatt class WTG was installed in state the project proponent had apprehended technical issues relating to new technology. The main technological barrier apprehended were non-compliance of local components and foreign parts which in a way weakens the reliability of entire system. Since most of wind farms are located in far flung areas, failures due to lightning and control system damages are often marred by lengthy repair time and off-line periods.

Apart from above the only available authentic source of wind data for the Sanodar site is the Wind Energy Resources Survey in India, Vol. V based on the data collected in the period from September 1996 to August 1997.

Based on the same outdated data, Alembic Ltd. was the first company to take a risk and install the wind mills on project site. In spite of the IRR not being viable without CDM funds, Alembic Ltd. took the risk of installing the wind mill only because of Alembic's commitment towards a clean and green environment.

Till Alembic Ltd. installed their wind mill on the site, no other organization had taken the risk to install a wind mill on the site. The fact that Alembic Ltd. was the first to install the wind mills on the site can be verified by the certificate issued by M/S Suzlon Energy Ltd. stating the same (certificate attached in annexure V of this PDD).

The wind mill installation by Alembic Ltd. created a demonstration effect for other organizations who have now started installing their wind mills on the site.

The project faced many barriers during its construction phase like transportation of the raw material and equipment, installation of the equipment and the auxiliary machinery required for installation of the wind mills over the mountainous terrain at site location.

#### **B.6. Emission reductions:**

|  |
|--|
| <b>B.6.1. Explanation of methodological choices:</b> |
|--|

>>

The procedure followed for estimating the emissions reductions from this project activity during the crediting period are as per the following steps which corresponds with AMS-I.D.

The project category is Grid connected renewable electricity generation system hence as per Appendix B- 'indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories', Version- 10 of the simplified modalities and procedures for small scale CDM project activities (FCCC/KP/2005/8/ADD.1), the proposed CDM project falls under category ***I.D – Grid connected renewable electricity generation***. The applicability of the project activity as small scale as per approved methodology *AMS I.D* (Version 11) has been demonstrated in section B.2

<sup>14</sup> Wind power India-year wise installations statistics – <http://www.windpowerindia.com/statyear.asp>

**Baseline Estimation:**

Baseline methodology for project category *I.D* has been detailed in paragraphs 7-11 of the approved small scale methodology *AMS I.D.* (Version 11, date: EB31) Paragraph 9 of the approved methodology applies to this project activity, which states that:

‘For all other systems, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO<sub>2</sub>equ/kWh) calculated in a transparent and conservative manner as:

- a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use Simple OM and the Average OM calculations must be considered.

OR

- b) The weighted average emissions (in kg CO<sub>2</sub>equ/kWh) of the current generation mix.’
- Project proponent has opted for option (a) to calculate grid emission coefficient i.e Combined Margin (CM) consisting of the combination of operating margin (OM) and build margin (BM). CM has been estimated based on guidance in ‘Baseline’ section detailed between page no. 4 to page no. 10 of approved methodology ACM0002, Version 06.

Baseline emissions are calculated as the kWh produced by the renewable generating unit multiplied by an emission co-efficient for the Western region Grid, calculated in a transparent and conservative manner. ACM0002 provides two options for calculation of grid emission co-efficient for such project activities:

The baseline emission ( $BE_y$  in tCO<sub>2</sub>) is the product of the baseline emission factor ( $EF_y$  in tCO<sub>2</sub>/MWh) times the electricity supplied by the project activity to the grid ( $EG_y$  in MWh) minus the baseline electricity supplied to the grid in the case of modified or retrofit facilities ( $EG_{baseline}$  in MWh), as follows:

$$BE_y = (EG_y - EG_{baseline}) \times EF_y$$

Since the following project does not involve any modification or retrofit of the existing generation facility hence  $EG_{baseline} = 0$

EF<sub>grid,y</sub> is determined as follows:

$$EF_y = 0.75 \times EF_{OM} + 0.25 \times EF_{BM}$$

Where

EF<sub>OM</sub> = Operating Margin Emission Factor

EF<sub>BM</sub> = Build Margin Emission Factor

### ***1. Calculation of operating margin emission factor for the region based on simple OM***

For calculation of operating margin four options are available:

- (a) Simple operating margin;
- (b) Simple adjusted operating margin;
- (c) Dispatch data analysis operating margin;
- (d) Average operating margin.

According to ACM0002 / version 06 dispatch data analysis should be the first choice but for the current project, dispatch data analysis cannot be used because of unavailability of data.

The simple OM method was used as the low-cost/must run resources constitute less than 50% of the total grid generation of Western and Southern Grid in average of the five most recent years.

The simple OM emission factor ( $EF_{OM, simple, y}$ ) is calculated as the generation-weighted average emissions per electricity unit (tCO<sub>2</sub>/MWh or MU) of all generating sources serving the system, not including low-operating cost and must-run power plants.

$$EF_{OM} = \frac{\sum F_{i,j,y} * COEF_{ij,y}}{\sum GEN_{j,y}}$$

Where:

$F_{i,j,y}$  -is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y, j refers to the power sources delivering electricity to the grid, not including low-operating cost and must run power plants, and including imports to the grid,

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**COEF<sub>i,j,y</sub>** -is the CO<sub>2</sub> emission coefficient of fuel *i* (tCO<sub>2</sub> / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year(s) *y*, and

**GEN<sub>j,y</sub>** -is the electricity (MWh or MU) delivered to the grid by source *j*.

The CO<sub>2</sub> emission coefficient COEF<sub>i</sub> is obtained as

$$\text{COEF}_i = \text{NCV}_i * \text{EF}_{\text{CO}_2,i} * \text{OXID}_i$$

Where:

**NCV<sub>i</sub>** - is the net calorific value (energy content) per mass or volume unit of a fuel *i*,

**OXID<sub>i</sub>** - is the oxidation factor of the fuel.

**EF<sub>CO<sub>2</sub>,i</sub>** - is the CO<sub>2</sub> emission factor per unit of energy of the fuel *i*.

## 2. Calculation of build margin Factor for the region (ex ante):

Build margin can be calculated as the generation weighted average emission factor (tCO<sub>2</sub>/MWh or MU) of a sample of power plant *m*, as follows:

$$\text{EF}_{\text{BM}} = \frac{\sum \text{F}_{i,m,y} * \text{COEF}_{i,m}}{\sum \text{GEN}_{m,y}}$$

Where,

**F<sub>i,m,y</sub>**, **COEF<sub>i,m</sub>** are analogous to the variables described for the simple OM method for plants *m*.

### Baseline emission factor (EF<sub>y</sub>)

The baseline emission factor EF<sub>y</sub> is calculated as the weighted average of the operating margin emission factor (EF<sub>OM, simple</sub>) and the build margin emission factor (EF<sub>BM</sub>), where the weights *w<sub>OM</sub>* and *w<sub>BM</sub>*, by default, are 75% *w<sub>OM</sub>* and 25% *w<sub>BM</sub>* and EF<sub>OM</sub> and EF<sub>BM</sub> are calculated as described in Steps 1 and 2 of consolidated methodology ACM0002 and are expressed in tCO<sub>2</sub>/MWh or MU.

$$\text{EF}_{\text{GRID},Y} = 0.75 \times \text{EF}_{\text{OM}} + 0.25 \times \text{EF}_{\text{BM}}$$

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| Weighted Average Emission Rate (tCO <sub>2</sub> /MWh) (incl. Imports) |         |         |         |         |         |         |
|--|---------|---------|---------|---------|---------|---------|
|  | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
| North  | 0.72    | 0.73    | 0.74    | 0.71    | 0.72    | 0.72    |
| East   | 1.09    | 1.03    | 1.09    | 1.08    | 1.05    | 1.05    |
| South  | 0.74    | 0.75    | 0.82    | 0.84    | 0.78    | 0.74    |
| West   | 0.90    | 0.92    | 0.90    | 0.90    | 0.92    | 0.88    |
| North-East   | 0.42    | 0.41    | 0.40    | 0.43    | 0.48    | 0.33    |
| India  | 0.82    | 0.83    | 0.85    | 0.85    | 0.84    | 0.81    |

| Simple Operating Margin (tCO <sub>2</sub> /MWh) (incl. Imports) |         |         |         |         |         |         |
|---|---------|---------|---------|---------|---------|---------|
|   | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
| North   | 0.98    | 0.98    | 1.00    | 0.99    | 0.98    | 0.99    |
| East  | 1.22    | 1.19    | 1.17    | 1.20    | 1.17    | 1.13    |
| South   | 1.03    | 1.00    | 1.01    | 1.00    | 1.00    | 1.01    |
| West  | 0.98    | 1.01    | 0.98    | 0.99    | 1.01    | 0.99    |
| North-East  | 0.73    | 0.71    | 0.74    | 0.74    | 0.84    | 0.70    |
| India   | 1.01    | 1.02    | 1.02    | 1.02    | 1.02    | 1.02    |

| Build Margin (tCO <sub>2</sub> /MWh) (not adjusted for imports) |         |         |         |         |         |         |
|---|---------|---------|---------|---------|---------|---------|
|   | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
| North   |         |         |         |         | 0.53    | 0.60    |
| East  |         |         |         |         | 0.90    | 0.97    |
| South   |         |         |         |         | 0.71    | 0.71    |
| West  |         |         |         |         | 0.77    | 0.83    |
| North-East  |         |         |         |         | 0.15    | 0.15    |
| India   |         |         |         |         | 0.70    | 0.68    |

| Combined Margin in tCO <sub>2</sub> /MWh (incl. Imports) |         |         |         |         |         |         |
|--|---------|---------|---------|---------|---------|---------|
|  | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
| North  | 0.76    | 0.76    | 0.77    | 0.76    | 0.75    | 0.80    |
| East   | 1.06    | 1.05    | 1.04    | 1.05    | 1.04    | 1.05    |
| South  | 0.87    | 0.85    | 0.86    | 0.86    | 0.85    | 0.86    |
| West   | 0.87    | 0.89    | 0.88    | 0.88    | 0.89    | 0.81    |
| North-East   | 0.44    | 0.43    | 0.44    | 0.44    | 0.49    | 0.42    |
| India  | 0.85    | 0.86    | 0.86    | 0.86    | 0.86    | 0.85    |

*Values for all regional grids for FY 2000-2001 until FY 2005-2006, including inter-regional and cross-border electricity transfers. (CEA, User Guide: Version 2.0)*

$$BE = EG_y * EF_{grid}$$

Where:

**EG<sub>y</sub>** - is the net quantity of electricity generated by the project in year y, and

**EF<sub>grid</sub>** – is the carbon emission factor of the Grid

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For the calculations for emission factor the unit for OM and BM are used in terms of tCO<sub>2</sub>/GWh and same is specified under each calculation.

### **Emission Estimation:**

$$\text{Emission factor} = \text{Net Generation} * \text{CEF for fuel} * \text{Net Heat Rate} * \text{Conversion Factor}$$

*(tonnes of CO<sub>2</sub>)*                      *(GWh)*                      *(tonnes CO<sub>2</sub>/TJ)*                      *(TJ/GWh)*                      *(44/12)*

### **Baseline Emission Co-efficient calculation:**

$$\text{Baseline Emission Co-efficient} = \text{Total Baseline Emissions} / \text{Total Net Generation}$$

*(tonnes of CO<sub>2</sub>/GWh)*                      *(tonnes of CO<sub>2</sub>)*                      *(GWh)*

The grid emission factor for Indian power sector for the year 2006 has been calculated by CEA.

### **Emission reduction due to project activity**

$$\text{Emission Reduction} = \text{Baseline Emission} - \text{Project Emission} - \text{Leakage}$$

As wind power projects fall under clean energy sources for electricity generation, the emission from the project is taken as zero.

Leakage estimation is also not required.

Therefore:

### **Grid Emission Factor**

Western Regional Grid – 906 tCO<sub>2</sub>/GWh

Baseline emissions or CERs generated by the project are estimated to be:

$$\text{Baseline Emissions}_{(\text{project})} = \text{Grid Emission Factor} * \text{Power Generated from the Project}$$

*(tons of CO<sub>2</sub>)*                      *(tons of CO<sub>2</sub>/GWh)*                      *(GWh/year)*

| Steps | Description | Equation Used | Methodological Choices |
|-------|-------------|---------------|------------------------|
|-------|-------------|---------------|------------------------|

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- |    |   |   |  |
|----|---|---|--|
| 1. | Procedure followed for calculating baseline emissions (BE) in line with ACM0002- version 6. | The baseline emission is calculated as per equation $BE_y = EG_y * EF_y$  | The $EF_y$ has been calculated using operating and built margin emission factor (ex-ante) taken from CEA published data. |
| 2. | Procedure followed for estimating project emissions (PE)                                    | No Project emissions  |  |
| 3. | Procedure followed for calculating emission reductions (ER)                                 | The emission reductions are calculated as per equation $ER_y = (BE - PE)$ | -  |

**B.6.2. Data and parameters that are available at validation:***(Copy this table for each data and parameter)*

|   |  |
|---|--|
| <b>Data / Parameter:</b>  | $EF_{OM}$  |
| Data unit:  | tCO <sub>2</sub> /MWh  |
| Description:  | Operating Margin Grid Emission factor  |
| Source of data used:  | CEA reviews  |
| Value applied:  | 0.998  |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The value applied is taken from the CEA reviews of three years. The detailed calculation is shown in the baseline section above. |
| Any comment:  | Data will be kept for crediting period + 2 years.  |

|   |   |
|---|---|
| <b>Data / Parameter:</b>  | $EF_{BM}$   |
| Data unit:  | tCO <sub>2</sub> /MWh                                       |
| Description:  | Built Margin Grid Emission factor                           |
| Source of data used:  | CEA report  |
| Value applied:  | 0.63  |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The value applied is taken from the plant from CEA reviews. |
| Any comment:  | Data will be kept for crediting period + 2 years.           |

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|  |   |
|--|---|
| <b>Data / Parameter:</b>   | EF <sub>y</sub>   |
| <b>Data unit:</b>  | tCO <sub>2</sub> /MWh   |
| <b>Description:</b>  | Combined Margin Grid Emission factor  |
| <b>Source of data used:</b>  | CEA reviews   |
| <b>Value applied:</b>  | 0.906   |
| <b>Justification of the choice of data or description of measurement methods and procedures actually applied :</b> | The value applied is taken from the plant from CEA reviews. The weights used for calculating combined margin emission factor are 0.75 and 0.25 for operating margin and built margin respectively |
| <b>Any comment:</b>  | Data will be kept for crediting period + 2 years.   |

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

&gt;&gt;

#### **Combined Margin Emission Factor:**

$$EF_y = 0.75 * EF_{OM} + 0.25 * EF_{BM}$$

Applying the values given in section B.6.2 the value of EF<sub>y</sub> comes out to be 0.906 tCO<sub>2</sub>/MWh.

#### **Baseline Emission Calculations:**

The baseline emission is calculated as:  $BE_y = EG_y * EF_y$

where,

BE<sub>y</sub> = Baseline Emissions due to displacement of electricity during the year y (in tons of CO<sub>2</sub>)

EG<sub>y</sub> = Net units of electricity substituted in the grid during the year y (in MWh)

EF<sub>y</sub> = Emission Factor of the grid (in tCO<sub>2</sub>/ MWh) and y is any year within the crediting period of the project activity

Applying the values given in section B.6.2 and B.7.1 the value of BE comes out to be 9247 tCO<sub>2</sub>.

#### **Emission Reduction Calculations:**

$$ER = BE - PE$$

Applying the values given in section B.6.2 and B.7.1 the value of ER comes out to be 9247 tCO<sub>2</sub>.

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While calculating emission reduction below assumptions was considered:

1. Plant load factor = 26.48% (Suzlon proposal letter)
2. Availability of WTG = 100% for first four years then 95% for remaining crediting period (Suzlon purchase order)

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

&gt;&gt;

| Year   | Estimated Project Activity Emissions (tonnes of CO <sub>2</sub> e) | Estimated Baseline Emissions (tonnes of CO <sub>2</sub> e) | Estimated leakage(tonnes of CO <sub>2</sub> e) | Estimated Emission Reduction (tonnes of CO <sub>2</sub> e) |
|--|--|--|--|--|
| 2008   | 0  | 9247   | 0  | 9247   |
| 2009   | 0  | 9247   | 0  | 9247   |
| 2010   | 0  | 9247   | 0  | 9247   |
| 2011   | 0  | 9247   | 0  | 9247   |
| 2012   | 0  | 8785   | 0  | 8785   |
| 2013   | 0  | 8785   | 0  | 8785   |
| 2014   | 0  | 8785   | 0  | 8785   |
| 2015   | 0  | 8785   | 0  | 8785   |
| 2016   | 0  | 8785   | 0  | 8785   |
| 2017   | 0  | 8785   | 0  | 8785   |
| <b>Total estimated reductions</b><br>(tonnes of CO <sub>2</sub> e) | <b>0</b>   | <b>89698</b>   | <b>0</b>                                       | <b>89698</b>   |

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

As per the provisions of paragraph 14 of Draft simplified modalities and procedures for small scale CDM project activities [FCCC/CP/2002/7/Add.3, English, Page 21] the “*Project participants may use the simplified baseline and monitoring methodologies specified in appendix B for their project category*” if they meet the applicability criteria of small scale CDM project activity.

Since the project activity is a small-scale CDM project of Type I.D. category, the monitoring methodology and plan has been developed in line with the guidance provided in paragraph 9 of category I.D. of Appendix B.

As per the methodology, monitoring shall consist of metering of electricity generation.

**Monitoring plan:**

The sole objective of having a monitoring system is to have a constant watch on the emission reductions.

The delivered energy will be metered by Alembic Ltd., Vadodara; Gujarat Energy Development Agency, Porbandar; GETCO (66 KV S/S), Bhav Nagar; and PGVCL, Mamsa at the high voltage side of the step up transformer installed at the receiving station. Metering equipment shall be electronic trivector meters. The metering equipment shall be maintained in accordance with electricity standards and have the capability of recording half-hourly and monthly readings, which in turn are produced to Alembic Ltd., Vadodara. The meters installed should be capable of recording and storing the parameters for a minimum period of 35 days with digital output. The monthly meter readings at the project sites and the receiving station shall be taken simultaneously and jointly by the parties.

At the conclusion of each meter reading, an appointed representative of GETCO (66 KV S/S), Bhav Nagar, PGVCL Mamsa and Gujarat Energy Development Agency, Porbandar will sign a document indicating the number of kilowatt-hours indicated by the meter.

Each meter shall be jointly inspected and sealed on behalf of GETCO (66 KV S/S), Bhav Nagar, PGVCL Mamsa and Gujarat Energy Development Agency, Porbandar, in the presence of its authorised representatives.

All the Main and Check meters shall be tested for accuracy every calendar quarter with reference to a portable standard meter. As the instruments are calibrated and marked at regular intervals, the accuracy of measurement can be assured at all times. To ensure accurate and continuous monitoring, Alembic Ltd. has a standby meter, calibrated by an authorised agency.

The allocation of electricity is executed as per the following procedure:

1. Enter the value of electricity received from W/M at 33 KV (kWh).
2. Enter the value of electricity supplied to W/M at 33 KV (kWh).
3. Take the difference of electricity received and supplied to W/F at 33 KV (kWh).
4. Take the total of difference calculated as per step 3.
5. Divide individual difference by total calculated as per step 4 and multiply by 100 to find %.
6. Enter the value of electricity received from W/M at 66 KV (kWh).
7. Enter the value of electricity supplied to W/M at 66 KV (kWh).
8. Take the difference of electricity received and supply to W/F at 66 KV (kWh).
9. Multiply the value calculated as per step 8 by % allocation calculated as per step 5.

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

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(Copy this table for each data and parameter)

|  |  |
|--|--|
| <b>Data / Parameter:</b>   | EG <sub>y</sub>  |
| Data unit:   | MWh  |
| Description:   | Net units of electricity substituted in the grid during the year y   |
| Source of data to be used:                                       | Joint meter reading.   |
| Value of data  | 10206.45   |
| Description of measurement methods and procedures to be applied: | <u>Monitoring:</u> Trivector meter will be used for monitoring<br><u>Data Type:</u> measured<br><u>Frequency:</u> hourly measured<br><u>Recording:</u> Monthly from joint meter<br><u>Archiving Policy:</u> Paper & Electronic<br><u>Responsibility:</u> Manager (Wind Project) would be responsible for regular calibration of the meter.<br><u>Calibration Frequency:</u> Once a year. |
| QA/QC procedures to be applied:                                  | Yes, Quality Management System will be used and the same procedures would be available at the project site. The net electricity exported to the grid can be cross verified with the sales receipts received by electricity board.  |
| Any comment:   | Data archived: Data will be archived for two years after the end of crediting period or of the last issuance of CERs for this project activity, whichever occurs later   |

**B.7.2 Description of the monitoring plan:**

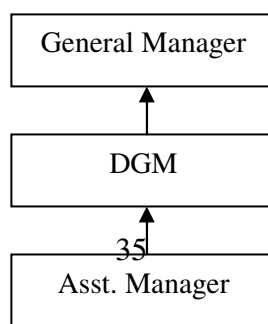
&gt;&gt;

**Roles and responsibilities:**

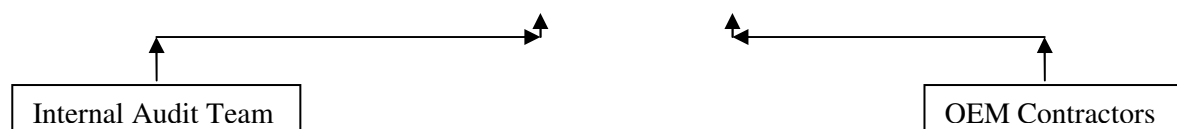
**General Manager:** In the project management structure General Manager is responsible for the project management. He is responsible to plan and allocate the annual budget for operation, estimation of the likely operating cost, electricity dispatch, organizing third party contractors, revenue collection etc.

General Manager will check the monthly electricity generated and annual emission reduction calculations. He is responsible for any leakage of emissions in the project boundary.

Operation and maintenance of wind generators will be done by Suzlon energy Limited and they will be responsible to General Manager.



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↑ Direction of flow of information

**Deputy General Manager:** DGM is assisting to General Manager for completing the task discussed above. He is responsible for the electricity generations at the individual wind turbine installations. He will crosscheck the log book regularly and report to General Manager for any abnormality.

**Sr. Executive/Ass Manager:** Sr. Executive/asst. manger is responsible for recording the electricity meter reading.

**Record Handling:** OEM contractors are collecting daily report obtained from hourly monitoring with all the related parameters. All the records are given to General Manager every month. The GM has final responsibility for record keeping.

#### Internal Audits and performance review

These records are regularly audited and checked by the senior officials from Alembic Limited during their visits to the site. The senior officials visit once in a year and audit the records. The officials will crosscheck the emissions reductions claimed in PDD with respect to actual emissions reduction.

For any deviation from the actual emission reduction values and reported values corrective action will be suggested by senior official to calculate the conservative emission reduction. All corrective actions will be recorded in the logbook.

#### Monitoring and Calibration

As emission reductions from the project are determined by the number of units exported to the grid, it is mandatory to have a monitoring system in place and ensure that the project activity produces and exports

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the rated power at the stipulated norms. The sole objective of having monitoring system is to have a constant watch on the emission reductions.

The delivered energy shall be metered by Suzlon and state electricity board at the high voltage side of the step up transformers. Metering is done either for two /three / more wind mills depending on the location of wind mills and service connection number. Metering equipment is electronic trivector meters. The metering equipment is maintained in accordance with electricity standards and has the capability of recording hourly and monthly readings. Records of joint meter reading are maintained at site and a copy is maintained at the head office. All the meters shall be tested for accuracy every calendar year with reference to a portable standard meter. As the instruments are calibrated and marked at regular intervals, the accuracy of measurement can be assured at all times. Necessary records of calibration are maintained by state electricity board.

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

&gt;&gt;

**Date of completion of baseline:** 01/10/2007

**Name of person/entity determining the baseline:** The baseline has been prepared by Alembic Ltd (Please refer Annex I for detailed contact information for the person involved in baseline determination).

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**SECTION C. Duration of the project activity / crediting period****C.1 Duration of the project activity:****C.1.1. Starting date of the project activity:**

&gt;&gt;

The project activity started on 08<sup>th</sup> July 2003 (Date of purchase order released).**C.1.2. Expected operational lifetime of the project activity:**

&gt;&gt; Lifetime of the project: 20 y 0 m

**C.2 Choice of the crediting period and related information:****C.2.1. Renewable crediting period****C.2.1.1. Starting date of the first crediting period:**

&gt;&gt; Not applicable

**C.2.1.2. Length of the first crediting period:**

&gt;&gt; Not applicable

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

&gt;&gt; Starting date of crediting period is 01/01/2008 or date of registration of PDD whichever will be later.

**C.2.2.2. Length:**

&gt;&gt; 10 years 0 months

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**SECTION D. Environmental impacts**

&gt;&gt;

**D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:**

&gt;&gt;

This project activity does not fall under the purview of Environmental Impact Assessment notification of the Ministry of Environment and Forests -Government of India, but due consideration has been given to environmental aspects. Alembic Ltd., Vadodara already has an Environment Management system in place. All environmental related issues were identified and necessary steps to mitigate them have been put in place by the implementation of the Environmental Management system.

**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:**

&gt;&gt;

The project activity is wind based power generation and therefore no significant environmental impacts are envisaged from the project activity.

**The impacts are given as follows:**

- The minor quantity of solid / liquid discharge, generated during the construction phase has no noticeable impact on soil use and the project proponent had made arrangements to dispose them in an environmentally acceptable manner.
- Wind Power plants are known to contribute to zero atmospheric pollution as no fuel combustion is involved during any stage of the operation.
- 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.
- 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.

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.

**SECTION E. Stakeholders' comments**

&gt;&gt;

|  |
|--|
| <b>E.1. Brief description how comments by local stakeholders have been invited and compiled:</b> |
|--|

&gt;&gt;

Alembic Ltd., Vadodara has put up the 5 MW wind power project in Dist. Bhavnagar (Gujarat). Alembic Ltd., Vadodara communicated with the relevant stakeholders their plan to implement the 5 MW Wind Power Project. Representatives of Alembic Ltd., Vadodara approached all the stakeholders seeking their comments and support for the project.

The identified stakeholders are:

- Local government representatives.
- Designated National Authority, Government of India.
- Ministry of Non Conventional Energy Sources, Government of India.
- Local villagers
- O&M contractors
- GEDA
- GUVNL

The identified stakeholders were interviewed by relevant officials from Alembic Ltd. to understand their comments and reactions about the wind mill project. These interviews were recorded and converted in to a video CD which is available with Alembic Ltd. The stakeholders who were interviewed were asked to sign a declaration at the time of interview to establish the credibility of the interview. The stakeholder meeting was conducted on 03-12-2005 for local villagers, O & M contractors. From other stakeholders letters were obtained and the same has been attached with the PDD. A brief summary of the stakeholder comments is given in the next section.

|   |
|---|
| <b>E.2. Summary of the comments received:</b> |
|---|

&gt;&gt;

The local people are direct beneficiaries of the project. The construction and continuous operation of the mill constituted local manpower. The project does not require any major displacement of any local population. Also, the installation of transmission lines would not create any inconvenience to the local population. In summing up, the project activity has received complete support from the local populace.

The government of India, through Ministry of Non-conventional Energy Sources (MNES), has been promoting energy conservation, demand side management and renewable energy projects including wind, small hydro and hydro / bio-mass power. This implementation of the wind power project has been highly appreciated by them.

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The Ministry of Environment & Forests is the Designated National Authority in India. The government of India, through Ministry of Environment and Forests (MoEF) is encouraging project participants to take up such Climate Change initiatives.

Stakeholders had no objections from installations of WTGs instead they have openly said that wind power projects helped to them by

- Additional revenue generated thro' land / lease to outsiders like contractors & their employees.
- Job opportunities for day -to - day maintenance and security of WTGs
- Development of roads.
- No any adverse impact on rains, agriculture.

|   |
|---|
| <b>E.3. Report on how due account was taken of any comments received:</b> |
|---|

>>

In summing up, the project has not received any negative or discouraging feedback from the stakeholders concerned.

All the stakeholders have appreciated and encouraged M/S Alembic Ltd., Vadodara for taking up this project activity.

In view of various direct and indirect benefits (social, economical & environmental), all the stakeholders have supported the project activity.

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

|                  |  |
|------------------|--|
| Organization:    | Alembic Limited.   |
| Street/P.O.Box:  | Alembic Road   |
| Building:        | -----  |
| City:            | Vadodara   |
| State/Region:    | Gujarat  |
| Postfix/ZIP:     | 390003   |
| Country:         | India  |
| Telephone:       | 0091 – 0265 – 2280550  |
| FAX:             | 0091 – 0265 – 2281508  |
| E-Mail:          | <a href="mailto:infoal@alembic.co.in">infoal@alembic.co.in</a>                     |
| URL:             | <a href="http://www.alembic-india.com/">http://www.alembic-india.com/</a>          |
| Represented by:  |  |
| Title:           | Director & President   |
| Salutation:      | Mr.  |
| Last Name:       | Baheti   |
| Middle Name:     | K  |
| First Name:      | R  |
| Department:      | Finance  |
| Mobile:          | +91 98243 99359  |
| Direct FAX:      | 0091 –265 – 228 2506   |
| Direct tel:      | 0091 – 265 – 228 5124  |
| Personal E-Mail: | <a href="mailto:raj कुमार_baheti@alembic.co.in">raj कुमार_baheti@alembic.co.in</a> |

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**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

No funding from any party is available for the project.

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**Annex 3****BASELINE INFORMATION****Western Grid Emission Factors****CENTRAL ELECTRICITY AUTHORITY: CO2 BASELINE  
DATABASE<sup>15</sup>**

**VERSION** 2.0  
**DATE** 21 June 2007  
**BASELINE METHODOLOGY** ACM0002 /  
 Ver 06

**EMISSION FACTORS****Weighted Average Emission Rate (tCO<sub>2</sub>/MWh) (excl. Imports)**

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

**Simple Operating Margin (tCO<sub>2</sub>/MWh) (excl. Imports)**

|       | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
|-------|---------|---------|---------|---------|---------|---------|
| North | 0.98    | 0.98    | 1.00    | 0.99    | 0.97    | 0.99    |
| East  | 1.22    | 1.22    | 1.20    | 1.23    | 1.20    | 1.16    |
| South | 1.02    | 1.00    | 1.01    | 1.00    | 1.00    | 1.01    |

**Weighted Average Emission Rate (tCO<sub>2</sub>/MWh) (incl. Imports)**

|            | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
|------------|---------|---------|---------|---------|---------|---------|
| North      | 0.72    | 0.73    | 0.74    | 0.71    | 0.72    | 0.72    |
| East       | 1.09    | 1.03    | 1.09    | 1.08    | 1.05    | 1.05    |
| South      | 0.74    | 0.75    | 0.82    | 0.84    | 0.78    | 0.74    |
| West       | 0.90    | 0.92    | 0.90    | 0.90    | 0.92    | 0.88    |
| North-East | 0.42    | 0.41    | 0.40    | 0.43    | 0.48    | 0.33    |
| India      | 0.82    | 0.83    | 0.85    | 0.85    | 0.84    | 0.81    |

**Simple Operating Margin (tCO<sub>2</sub>/MWh) (incl. Imports)**

|       | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
|-------|---------|---------|---------|---------|---------|---------|
| North | 0.98    | 0.98    | 1.00    | 0.99    | 0.98    | 0.99    |
| East  | 1.22    | 1.19    | 1.17    | 1.20    | 1.17    | 1.13    |
| South | 1.03    | 1.00    | 1.01    | 1.00    | 1.00    | 1.01    |

<sup>15</sup> <http://www.cea.nic.in/>

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|            |      |      |      |      |      |      |
|------------|------|------|------|------|------|------|
| West       | 0.98 | 1.01 | 0.98 | 0.99 | 1.01 | 0.99 |
| North-East | 0.73 | 0.71 | 0.74 | 0.74 | 0.71 | 0.70 |
| India      | 1.02 | 1.02 | 1.02 | 1.03 | 1.03 | 1.02 |

|            |      |      |      |      |      |      |
|------------|------|------|------|------|------|------|
| West       | 0.98 | 1.01 | 0.98 | 0.99 | 1.01 | 0.99 |
| North-East | 0.73 | 0.71 | 0.74 | 0.74 | 0.84 | 0.70 |
| India      | 1.01 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 |

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

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

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

|            | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
|------------|---------|---------|---------|---------|---------|---------|
| North      | 0.76    | 0.76    | 0.77    | 0.76    | 0.75    | 0.80    |
| East       | 1.06    | 1.06    | 1.05    | 1.07    | 1.05    | 1.06    |
| South      | 0.87    | 0.85    | 0.86    | 0.86    | 0.85    | 0.86    |
| West       | 0.87    | 0.89    | 0.88    | 0.88    | 0.89    | 0.81    |
| North-East | 0.44    | 0.43    | 0.44    | 0.44    | 0.43    | 0.42    |
| India      | 0.86    | 0.86    | 0.86    | 0.86    | 0.86    | 0.85    |

### GENERATION DATA

#### Gross Generation Total (GWh)

|            | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
|------------|---------|---------|---------|---------|---------|---------|
| North      | 144,292 | 151,185 | 155,385 | 165,735 | 168,438 | 179,751 |
| East       | 58,936  | 64,048  | 66,257  | 75,374  | 85,776  | 93,902  |
| South      | 129,035 | 131,902 | 136,916 | 138,517 | 144,086 | 147,355 |
| West       | 162,329 | 165,805 | 177,399 | 172,682 | 183,955 | 188,606 |
| North-East | 5,319   | 5,332   | 5,808   | 5,867   | 7,883   | 7,778   |

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

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

### Combined Margin in tCO2/MWh (incl. Imports)

|            | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
|------------|---------|---------|---------|---------|---------|---------|
| North      | 0.76    | 0.76    | 0.77    | 0.76    | 0.75    | 0.80    |
| East       | 1.06    | 1.05    | 1.04    | 1.05    | 1.04    | 1.05    |
| South      | 0.87    | 0.85    | 0.86    | 0.86    | 0.85    | 0.86    |
| West       | 0.87    | 0.89    | 0.88    | 0.88    | 0.89    | 0.81    |
| North-East | 0.44    | 0.43    | 0.44    | 0.44    | 0.49    | 0.42    |
| India      | 0.85    | 0.86    | 0.86    | 0.86    | 0.86    | 0.85    |

### EMISSION DATA

#### Absolute Emissions Total (tCO2)

|            | 2000-01     | 2001-02     | 2002-03     | 2003-04     | 2004-05     | 2005-06     |
|------------|-------------|-------------|-------------|-------------|-------------|-------------|
| North      | 97,866,565  | 102,743,113 | 106,808,582 | 109,996,544 | 112,212,597 | 120,056,079 |
| East       | 58,026,488  | 61,427,499  | 66,593,200  | 75,512,010  | 83,956,860  | 92,517,515  |
| South      | 89,019,263  | 92,112,060  | 105,187,726 | 108,049,156 | 105,539,862 | 101,712,149 |
| West       | 135,192,153 | 141,597,621 | 148,557,341 | 144,127,175 | 157,781,065 | 153,933,199 |
| North-East | 2,202,108   | 2,158,348   | 2,280,049   | 2,462,796   | 2,468,463   | 2,532,819   |

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|                                   |         |         |         |         |         |         |
|-----------------------------------|---------|---------|---------|---------|---------|---------|
| India                             | 499,911 | 518,272 | 541,764 | 558,175 | 590,138 | 617,392 |
| <b>Net Generation Total (GWh)</b> |         |         |         |         |         |         |
|                                   | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
| North                             | 135,230 | 141,415 | 144,743 | 155,043 | 157,291 | 168,206 |
| East                              | 53,350  | 58,097  | 59,841  | 68,428  | 77,968  | 86,014  |
| South                             | 121,158 | 123,630 | 127,789 | 128,373 | 134,676 | 138,329 |
| West                              | 150,412 | 153,125 | 164,448 | 159,780 | 170,726 | 176,003 |
| North-East                        | 5,195   | 5,213   | 5,671   | 5,752   | 7,762   | 7,655   |
| India                             | 465,345 | 481,479 | 502,492 | 517,376 | 548,423 | 576,206 |

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

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

### Net Generation in Operating Margin (GWh)

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

### 20% of Net Generation (GWh)

|       |         |         |         |         |         |         |
|-------|---------|---------|---------|---------|---------|---------|
|       | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
| North | 27,046  | 28,283  | 28,949  | 31,009  | 31,458  | 33,641  |

|                                     |             |             |             |             |             |             |
|-------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| India                               | 382,306,576 | 400,038,640 | 429,426,898 | 440,147,681 | 461,958,846 | 470,751,761 |
| <b>Absolute Emissions OM (tCO2)</b> |             |             |             |             |             |             |
|                                     | 2000-01     | 2001-02     | 2002-03     | 2003-04     | 2004-05     | 2005-06     |
| North                               | 97,866,565  | 102,743,113 | 106,808,582 | 109,996,544 | 112,212,597 | 120,056,079 |
| East                                | 58,026,488  | 61,427,499  | 66,593,200  | 75,512,010  | 83,956,860  | 92,517,515  |
| South                               | 89,019,263  | 92,112,060  | 105,187,726 | 108,049,156 | 105,539,862 | 101,712,149 |
| West                                | 135,192,153 | 141,597,621 | 148,557,346 | 144,127,175 | 157,781,065 | 153,933,199 |
| North-East                          | 2,202,108   | 2,158,348   | 2,280,049   | 2,462,796   | 2,468,463   | 2,532,819   |
| India                               | 382,306,576 | 400,038,640 | 429,426,898 | 440,147,681 | 461,958,846 | 470,751,761 |

### Absolute Emissions BM (tCO2)

|            |         |         |         |         |            |            |
|------------|---------|---------|---------|---------|------------|------------|
|            | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05    | 2005-06    |
| North      |         |         |         |         | 17,108,583 | 20,622,114 |
| East       |         |         |         |         | 14,303,611 | 16,990,438 |
| South      |         |         |         |         | 19,839,024 | 20,029,713 |
| West       |         |         |         |         | 27,148,870 | 22,318,133 |
| North-East |         |         |         |         | 299,121    | 266,981    |
| India      |         |         |         |         | 78,699,210 | 80,227,378 |

## IMPORT DATA

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

|       |         |         |         |         |         |         |
|-------|---------|---------|---------|---------|---------|---------|
|       | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
| North | 0       | 0       | 0       | 0       | 3,616   | 5,748   |

## CDM – Executive Board

|            |        |        |         |         |         |         |
|------------|--------|--------|---------|---------|---------|---------|
| East       | 10,670 | 11,619 | 11,968  | 13,686  | 15,594  | 17,203  |
| South      | 24,232 | 24,726 | 25,558  | 25,675  | 26,935  | 27,666  |
| West       | 30,082 | 30,625 | 32,890  | 31,956  | 34,145  | 35,201  |
| North-East | 1,039  | 1,043  | 1,134   | 1,150   | 1,552   | 1,531   |
| India      | 93,069 | 96,296 | 100,498 | 103,475 | 109,685 | 115,241 |

**Net Generation in Build Margin (GWh)**

|            | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
|------------|---------|---------|---------|---------|---------|---------|
| North      |         |         |         |         | 32,064  | 34,340  |
| East       |         |         |         |         | 15,818  | 17,567  |
| South      |         |         |         |         | 27,987  | 28,158  |
| West       |         |         |         |         | 35,257  | 35,425  |
| North-East |         |         |         |         | 2,055   | 1,793   |
| India      |         |         |         |         | 113,181 | 117,283 |

|            |       |       |     |       |       |        |
|------------|-------|-------|-----|-------|-------|--------|
| East       | 489   | 555   | 357 | 1,689 | 0     | 0      |
| South      | 1,162 | 1,357 | 518 | 0     | 0     | 0      |
| West       | 321   | 0     | 797 | 962   | 285   | 11,982 |
| North-East | 0     | 0     | 0   | 0     | 2,099 | 0      |

**Share of Net Imports (% of Net Generation)**

|            | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
|------------|---------|---------|---------|---------|---------|---------|
| North      | 0.0%    | 0.0%    | 0.0%    | 0.0%    | 2.3%    | 3.4%    |
| East       | 0.9%    | 1.0%    | 0.6%    | 2.5%    | 0.0%    | 0.0%    |
| South      | 1.0%    | 1.1%    | 0.4%    | 0.0%    | 0.0%    | 0.0%    |
| West       | 0.2%    | 0.0%    | 0.5%    | 0.6%    | 0.2%    | 6.8%    |
| North-East | 0.0%    | 0.0%    | 0.0%    | 0.0%    | 27.0%   | 0%      |

CDM – Executive Board

**Annex 4****MONITORING INFORMATION**

| <b>Sr. no.</b> | <b>Data description</b>  | <b>Procedure for monitoring the parameter</b> | <b>Traceability of calibration method/ standard</b>        | <b>Tag no OR equipment serial no of instrument</b> | <b>Service &amp; Tech def. Of instru and measuring</b>                                | <b>Make of instrument</b> | <b>Location of instrument</b>            | <b>Calibration Method</b>  | <b>Least Count and range of instrument</b> |
|----------------|--|---|--|--|---|---------------------------|--|----------------------------|--|
| 1              | Net Electricity Exported   | Secure Metre of Alembic Ltd. at (33kv)        | ERDA DOC. FOR CALLIBRATION AT regular interval of 6 Months | <b>GJU03992</b>                                    | <i>Service:</i><br><i>Electrical energy measurement</i><br>Tech. Def:<br>Energy Meter | <b>Secure Meter Ltd.</b>  | At 33 kv line for Alermbic WTG 4,5,6 & 7 | As per the standard by OEM | 0.5  |
| 2              | Net units of electricity substituted in the grid during the year y (in MWh) (EG <sub>y</sub> ) | Secure Metre of M/S GETCO at (66kv)           | Monthly Genertaion Certificate issued by GEDA              | GJB 00265  | <i>Service:</i><br><i>Electrical energy measurement</i><br>Tech. Def:<br>Energy Meter | <b>Secure Meter Ltd.</b>  | Control Room of 66 Kv Sub Station        | As per the standard by OEM | 0.5  |

CDM – Executive Board

## Annex 5

## Supportives

2nd August, 2003

To,  
The Assistant Director,  
Gujarat Energy Development Agency,  
Suraj Plaza II, 2<sup>nd</sup> Floor,  
Sayajigunj,  
Vadodara 390005

**Kind Attn.: Shri S. B. Patil**

**Sub: Permission for setting up of Wind farm in Bhavnagar District.**

**Ref: Your letter GEDA/PWF/SDPL/BVN/5468 dated 30/7/2003.**

Dear Sir,

Thank you very much for granting us permission for setting up 12.5 MW Wind farm in Bhavnagar District vide your letter No.GEDA/PWF/SDPL/BVN/5468 dated 30/7/2003 with the approved micro siting drawing to install 10 Nos. of WTG W1 to W10.

We are enclosing herewith the application as received from M/s Alembic Ltd. alongwith the Demand Draft No. 722158 dated 28.7.03 for Rs.2.00 lakhs payable to Gujarat Energy Development Agency and drawn on Bank of Baroda. We are also enclosing with this application the following, to transfer 8 Nos. of WTG in favour of our client M/s Alembic Ltd., Baroda out of 10 WTG approved by reference letter. Micro siting drawing for M/s Alembic Ltd. is being submitted separately.

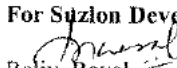
- I. Registration of the Company.
- II. Last Three years' Annual Report.
- III. Last three months Electricity Bills.
- IV. MNES Approval of WTG Model.
- V. Resolution of Board of Directors.
- VI. IT Clearance Certificate of Last three years.
- VII. Memorandum and Articles of Association.
- VIII. Purchase order for land & 8 Nos. WTG along with work order for erection and installation of 8 Nos. WTG of 1250 KW S-64 model.

You are requested to kindly permit transfer of WTGs and also issue No Objection Certificate for IREDA loan application.

Thanking you ,

Yours sincerely,

**For Suzlon Developers Pvt. Ltd.**

  
Rajiv Raval  
Authorised Signatory

Encl: as above



CDM – Executive Board

SUZLON<sup>®</sup>

SDPL:GEDA:2003-2004

September 15, 2003

To  
**The Asst. Director**  
**Gujarat Energy Development Agency**  
 Suraj Plaza – II, 2<sup>nd</sup> Floor  
 Sayajigunj,  
 Vadodara – 395 005

**Kind Attn: Mr. S. B. Patil****Subject : Request for Permission for Setting up of Windfarm.**

Dear Sir

This has a reference to your permission to M/s. Suzlon Developers Pvt. Ltd., for setting up 12.50MW windfarm in Bhavnagar District vide your letter GEDA/PWF/SDPL/BVN/5468 dated 30<sup>th</sup> July 2003 as a developer of said windfarm.


We are forwarding, demand draft no. 512641 dated 11.09.2003 for Rs. 25,000.00 payable to Gujarat Energy Development Agency drawn on Indusind Bank Ltd., Vadodara alongwith duly filled and signed application form by our customer M/s. Samay Electronics Pvt. Ltd. (SEPL), for installation of 1 no. of 1250kW Suzlon make Wind Turbine Generators under developer scheme, at village : Ukharla , Taluka : Ghogha, District : Bhavnagar with following annexures:

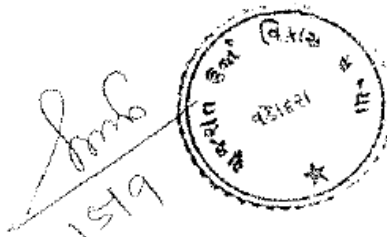
- I. Registration of the Company.
- II. Last Three years' Annual Report.
- III. Installed Capacity of the Production.
- IV. Last three years' Actual Production Details.
- V. Approval from GL & MNES for 1250kW WTG Model.
- VI. Last three months Electricity Bills
- VII. Memorandum and Articles of Association
- VIII. Resolution of Board of Directors
- IX. Micrositting Drawing duly signed and Stamped by M/s. SEPL.
- X. Details of Present Captive Consumption.

We would request you to kindly issue permission for setting up windfarm and oblige.

Thanking you  
 Yours Sincerely

For Suzlon Developers Pvt. Ltd.

  
**Authorized Signatory**  
 Encl : as above

**SUZLON DEVELOPERS PVT. LTD.**

Suzlon, 5, Shrimati Society, Near Shree Krishna Centre, Navrangpura, Ahmedabad – 380 009, India  
 Ph.: (+91) 79-6466315, 6467141, 6445731 Fax: (+91) 79-6565540  
 Head. Office : Godrej Millennium, 5th Floor, A, Baramulla Park Road, Pune – 411 001, India

CDM – Executive Board

②

**SUZLON INFRASTRUCTURE LTD.**41/2/413, Centre Point, R.C. Dutt Road, Alkapuri  
Vadodara - 390 005, India

☎ : +91-265-2334123  
 ☎ : +91-265-2337995  
 ✉ : baroda@suzlon.com  
 🌐 : www.suzlon.com

**TO WHOMSOEVER IT MAY CONCERN**

This is to certify that M/s. Suzlon Infrastructure Ltd. (formerly M/s. Suzlon Developers Pvt. Ltd.) had planned to develop the Wind farm at around Vill. Ukharla (Sanodar site), Dist. Bhavnagar, under the developer scheme on the basis of initiative shown by M/s. Alembic Ltd., Vadodara.

M/s. Alembic Ltd., Vadodara, was the first applicant to file the application for the transfer of the turbine from the developer i.e. M/s. Suzlon Developers Pvt. Ltd. and where the first to get the permission letter for the transfer of the turbine from GEDA for transfer of their 4 WTGs each of 1.25MW.

**For Suzlon Infrastructure Ltd.**

**Rajiv Raval**  
**Authorized Signatory**

Place : Vadodara  
 Date : May 10, 2006



CDM – Executive Board

*Alembic*  
Date : 11<sup>th</sup> November 2006

To,

Director ,  
Gujarat Energy Development Agency  
2<sup>nd</sup> Floor  
Suraj Plaza – II  
Sayaji Gunj  
Vadodara – 390007  
India

Kind Attn : Sri B.J.Bhatt

Dear Sir,

This refers to installation of Wind Mill at Location : UKHRALA , TRAMBAK ,  
TALUKA – GHOGHA , DIST ; BHAVNAGAR ; STATE ; GUJARAT , where

M/S Alembic Ltd , Vadodara  
M/S Samay Electronics Pvt. Ltd. , Morbi  
M/S Umedica Laboratories Pvt. Ltd. , Mumbai  
M/S Real Strips Ltd., , Ahmedabad  
M/S Raaj Ratna Ind. Ltd. , Ahmedabad  
M/S Intas Pharamaceutical Ltd. , Ahmedabad  
M/S Jay Bharat Dyeing & Printing Pvt. Ltd. , Surat  
M/S Ratnamani Metal & Tubes Ltd. , Ahmedabad

Wind mills are in operations as on date.

We request you to provide the information about the date of application ,  
mentioning the that who had applied first for wind mill at above mentioned site  
among all above mentioned company for information to our Board of Directors &  
share holders of company.

Meanwhile, thanking you & looking forward for your reply.

Reg.

*[Signature]*  
**S.S.SINGH**  
Sr. Manager  
Cogen, Power Dist. & Water Plant  
Alembic Ltd.  
Ph. No. – 0265 – 2307735  
Fax : 0265 - 2282931

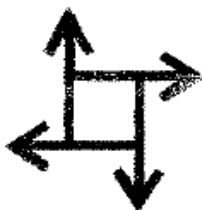
*[Signature]*  
13/11

*[Faint text, likely a stamp or footer]*

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CDM – Executive Board

CDM – Executive Board



## Gujarat Energy Development Agency

Surajplaza II - 2nd Floor, Sayajigunj, Vadodara - 390 005 Gujarat India.

Ph.: (0265) 2363123, 2362058, 2361409 Fax : 0265-2363120

E-mail : info@geda.org.in

Website : www.geda.org.in

Ref No: GEDA/WIND/2006/ 6666

13 December 2006 Date :

To,

Alembic Limited,  
Alembic Road, Vadodara – 390 003

Kind Attn : Mr. S.S. Singh, Sr. Manager

Ref : - Your letter dtd. 13/10/2006

Sir,

With reference to your above letter please note that all the windfarms installed at Ukharia site is under the developers approach. The information required by you, for the application of other companies may be obtained from your developer.

Thanking you.

Your faithfully,

(S. B. Patil)

Dy. Director

CC to : Suzlon Developers Pvt. Ltd.  
412/ 413, Center Point, R. C. Dutt Road,  
Alkapuri, Baroda – 39 00 05

IRR calculation

## CDM – Executive Board

| Alembic Ltd                                      |            | IRR calculation without CDM |  |
|--|------------|-----------------------------|--|
| Wind Mills Financials                            |            |                             |  |
|  |            |                             |  |
| Basic Data/ Assumptions                          |            |                             |  |
| Investment cost                                  | Rs Mill/MW | 42.40                       | Purchase order, suzlon                                   |
| Capacity   | MW         | 5                           | Purchase order, suzlon                                   |
| No of WEG  |            | 4                           |  |
| Average PLF                                      | %          | 26.48%                      | As guranteed by Suzlon-26.48%                            |
| Grid unavailability                              | %          | 4.0%                        | Suzlon proposal  |
| Wheeling Charges                                 | %          | 4.0%                        | Suzlon proposal and PPA                                  |
| Transmission Losses (between substation and WEG) | %          | 4.0%                        | Suzlon proposal  |
| O&M for first 4 years                            | %          | 2.0%                        | Purchase order, suzlon                                   |
| O&M from 4th year                                | %          | 2.0%                        | Purchase order, suzlon                                   |
| Annual escalation in O&M after 4 years           | %          | 5.0%                        | Purchase order, suzlon                                   |
| Derating of equipment post 5th years             | %          | 5.0%                        | Purchase order, suzlon                                   |
| Working Capital (Days sale)                      | Days       | 100                         |  |
|  |            |                             |  |
| Depreciation rate                                |            | 5.28%                       | Depreciation   |
| Tariff for power                                 |            | 3.67                        | Weighted average cost of power; Given in suzlon proposal |
| Esclation  |            | 2.50%                       | Per year   |
| Minimum Alternative Tax rate                     |            | 8.00%                       | Balance sheet  |

| Profit Statement               |            |   |       |       |       |       |       |       |       |       |
|--------------------------------|------------|---|-------|-------|-------|-------|-------|-------|-------|-------|
| Year                           |            | 0 | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     |
| Power tariff                   |            |   | 3.67  | 3.76  | 3.85  | 3.95  | 4.05  | 4.15  | 4.25  | 4.36  |
| Power Generation               | Mill Units |   | 10.21 | 10.21 | 10.21 | 10.21 | 9.70  | 9.70  | 9.70  | 9.70  |
| Free cash flow forecast        | Rs Mill    |   |       |       |       |       |       |       |       |       |
| Sales realizations             | Rs Mill    |   | 37.42 | 38.36 | 39.32 | 40.30 | 39.24 | 40.22 | 41.23 | 42.26 |
| Less:                          |            |   |       |       |       |       |       |       |       |       |
| O&M, Insurance & others        | Rs Mill    |   | 4.20  | 4.20  | 4.20  | 4.20  | 4.41  | 4.63  | 4.86  | 5.10  |
| Depreciation (Avalied for MAT) | Rs Mill    |   | 10.98 | 10.98 | 10.98 | 10.98 | 10.98 | 10.98 | 10.98 | 10.98 |
| EBIT                           |            |   | 22.24 | 23.18 | 24.14 | 25.12 | 23.85 | 24.61 | 25.39 | 26.18 |

## CDM – Executive Board

|                             |         |           |       |       |       |       |        |       |        |        |
|-----------------------------|---------|-----------|-------|-------|-------|-------|--------|-------|--------|--------|
| Interest                    |         |           | 17.81 | 16.14 | 11.69 | 7.23  | 2.78   | 0.00  | 0.00   | 0.00   |
| PBT                         |         |           | 4.44  | 7.04  | 12.45 | 17.89 | 21.07  | 24.61 | 25.39  | 26.18  |
| Tax (MAT)                   |         |           | 0.35  | 0.56  | 1.00  | 1.43  | 1.69   | 1.97  | 2.03   | 2.09   |
| PAT                         |         |           | 4.08  | 6.48  | 11.46 | 16.46 | 19.39  | 22.64 | 23.36  | 24.08  |
| Cummulative P/L             |         |           | 4.08  | 10.56 | 22.01 | 38.47 | 57.85  | 80.50 | 103.86 | 127.94 |
|                             |         |           |       |       |       |       |        |       |        |        |
| Cash Flow                   |         |           |       |       |       |       |        |       |        |        |
| Year                        |         | 0         | 1     | 2     | 3     | 4     | 5      | 6     | 7      | 8      |
| Operating Cashflow          | Rs Mill |           | 32.87 | 33.60 | 34.12 | 34.67 | 33.15  | 33.63 | 34.34  | 35.06  |
| Less:                       |         |           |       |       |       |       |        |       |        |        |
| Increase in Working Capital | Rs Mill |           | 10.25 | 0.26  | 0.26  | 0.27  | (0.29) | 0.27  | 0.28   | 0.28   |
| Capital Expenditure         |         | 212.00    | -     | -     | -     | -     | -      | -     | -      | -      |
|                             |         |           |       |       |       |       |        |       |        |        |
| Free Cash Flows to Project  | Rs Mill | (212.00 ) | 22.62 | 33.34 | 33.86 | 34.40 | 33.44  | 33.36 | 34.06  | 34.78  |
|                             |         |           |       |       |       |       |        |       |        |        |
| IRR of Project              | 14.80%  |           |       |       |       |       |        |       |        |        |
|                             |         |           |       |       |       |       |        |       |        |        |
| Interest Calculations       |         |           |       |       |       |       |        |       |        |        |
| Debt Opening                |         | 148.4     | 148.4 | 111.3 | 74.2  | 37.1  | 0.0    |       |        |        |
| Debt Repayment              |         |           |       | 37.1  | 37.1  | 37.1  | 37.1   |       |        |        |
| Interest                    |         |           | 17.8  | 16.1  | 11.7  | 7.2   | 2.8    |       |        |        |
|                             |         |           |       |       |       |       |        |       |        |        |
| Working Capital             |         |           |       |       |       |       |        |       |        |        |
| Working Capital             |         |           | 10.3  | 10.5  | 10.8  | 11.0  | 10.8   | 11.0  | 11.3   | 11.6   |

| 9             | 10            | 11            | 12            | 13            | 14            | 15            | 16            | 17            | 18            | 19            | 20            |
|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 4.47          | 4.58          | 4.69          | 4.81          | 4.93          | 5.05          | 5.18          | 5.31          | 5.44          | 5.58          | 5.72          | 5.86          |
| 9.70          | 9.70          | 9.70          | 9.70          | 9.70          | 9.70          | 9.70          | 9.70          | 9.70          | 9.70          | 9.70          | 9.70          |
| <b>43.32</b>  | <b>44.40</b>  | <b>45.51</b>  | <b>46.65</b>  | <b>47.81</b>  | <b>49.01</b>  | <b>50.23</b>  | <b>51.49</b>  | <b>52.78</b>  | <b>54.10</b>  | <b>55.45</b>  | <b>56.84</b>  |
| 5.36          | 5.63          | 5.91          | 6.20          | 6.51          | 6.84          | 7.18          | 7.54          | 7.92          | 8.31          | 8.73          | 9.16          |
| 10.98         | 10.98         | 10.98         | 10.98         | 10.98         | 10.98         | 10.98         | 10.98         | 10.98         | 10.98         | 10.32         | 0.00          |
| <b>26.98</b>  | <b>27.79</b>  | <b>28.62</b>  | <b>29.46</b>  | <b>30.32</b>  | <b>31.19</b>  | <b>32.07</b>  | <b>32.97</b>  | <b>33.88</b>  | <b>34.80</b>  | <b>36.40</b>  | <b>47.67</b>  |
| 0.00          | 0.00          | 0.00          | 0.00          | 0.00          | 0.00          | 0.00          | 0.00          | 0.00          | 0.00          | 0.00          | 0.00          |
| <b>26.98</b>  | <b>27.79</b>  | <b>28.62</b>  | <b>29.46</b>  | <b>30.32</b>  | <b>31.19</b>  | <b>32.07</b>  | <b>32.97</b>  | <b>33.88</b>  | <b>34.80</b>  | <b>36.40</b>  | <b>47.67</b>  |
| 2.16          | 2.22          | 2.29          | 2.36          | 2.43          | 2.50          | 2.57          | 2.64          | 2.71          | 2.78          | 2.91          | 3.81          |
| <b>24.82</b>  | <b>25.57</b>  | <b>26.33</b>  | <b>27.11</b>  | <b>27.89</b>  | <b>28.69</b>  | <b>29.51</b>  | <b>30.33</b>  | <b>31.17</b>  | <b>32.02</b>  | <b>33.49</b>  | <b>43.86</b>  |
| <b>152.76</b> | <b>178.33</b> | <b>204.66</b> | <b>231.77</b> | <b>259.66</b> | <b>288.35</b> | <b>317.86</b> | <b>348.19</b> | <b>379.36</b> | <b>411.38</b> | <b>444.87</b> | <b>488.73</b> |
|               |               |               |               |               |               |               |               |               |               |               |               |
|               |               |               |               |               |               |               |               |               |               |               |               |

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CDM – Executive Board[illegible]

| Sensitivity Analysis based on PLF |        |        |        |        |        |        |        |        |        |        |        |
|-----------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Variation                         | 5%     | 4%     | 3%     | 2%     | 1%     | 0      | -1%    | -2%    | -3%    | -4%    | -5%    |
| PLF                               | 27.80% | 27.54% | 27.27% | 27.01% | 26.74% | 26.48% | 26.22% | 25.95% | 25.69% | 25.43% | 25.17% |
| IRR                               | 15.70% | 15.52% | 15.34% | 15.16% | 14.98% | 14.80% | 14.61% | 14.43% | 14.25% | 14.07% | 13.89% |

|                              |               |                   |                              |                     |
|------------------------------|---------------|-------------------|------------------------------|---------------------|
| <b>Project cost details</b>  | Rs mn         |                   |                              |                     |
| <b>Project (MW capacity)</b> | <b>Towers</b> | <b>Comm. Date</b> | <b>Loan amount Disbursed</b> | <b>Project Cost</b> |
| 5,00                         | 1.25 x 4      | 22/12/00          | 148,40                       | 212,00              |
|                              |               |                   |                              |                     |
|                              |               |                   | <b>Per MW Cost Mn</b>        | 42,40               |
|                              |               |                   | <b>Project Cost Mn</b>       | 212,00              |
|                              |               |                   | <b>Debt Mn</b>               | 148,40              |
|                              |               |                   |                              |                     |
|                              |               |                   | <b>INTEREST RATE</b>         | 12.00%              |

### Weighted Average Cost of capital

## CDM – Executive Board

|  |                    |         |            |         |         |
|--|--------------------|---------|------------|---------|---------|
| Alembic Ltd.<br>(Rs. in Lacs)                |                    |         |            |         |         |
|  | Year               | 1999    | 2000       | 2001-02 | 2002-03 |
|  | Period<br>(Months) | 12      | 12         | 15      | 12      |
|  |                    |         |            |         |         |
| Return on<br>Shareholders Fund:              |                    |         |            |         |         |
|  |                    |         |            |         |         |
| Equity Share<br>Capital                      |                    | 721     | 721        | 721     | 736     |
| Reserves & Surplus                           |                    | 11,805  | 14,473     | 16,509  | 14,809  |
| Less Revaluation<br>Reserves                 |                    | (2,175) | (2,159)    | (1,199) | (995)   |
|  | Total              | 10,351  | 13,035     | 16,031  | 14,550  |
|  |                    |         |            |         |         |
| Average<br>Shareholders Fund<br>(Op+Cl)/2    |                    |         | 11,693     | 14,533  | 15,291  |
|  |                    |         |            |         |         |
| Profit for<br>Shareholders:                  |                    |         |            |         |         |
|  |                    |         |            |         |         |
| PAT  |                    |         | 3,010      | 2,350   | 3,152   |
| Less: Preference<br>Dividend+Corp<br>Div.Tax |                    |         | -          | -       | -       |
| Profit for<br>Shareholders                   |                    |         | 3,010      | 2,350   | 3,152   |
|  |                    |         |            |         |         |
| Annualised Profit<br>p.a.                    |                    |         | 3,010      | 1,880   | 3,152   |
|  |                    |         |            |         |         |
| Return on<br>Shareholders Fund<br>% p.a.     |                    |         | 25.74<br>% | 12.94%  | 20.61%  |
|  |                    |         |            |         |         |
| Net of Tax Cost of<br>Borrowings:            |                    |         |            |         |         |

## CDM – Executive Board

|                                |  |                                       |         |        |        |
|--------------------------------|--|---------------------------------------|---------|--------|--------|
| Total Borrowings               |  |                                       |         |        |        |
| Sch C + D                      |  | 13,556                                | 19,998  | 19,476 | 22,493 |
|                                |  |                                       |         |        |        |
| Total                          |  | 13,556                                | 19,998  | 19,476 | 22,493 |
|                                |  |                                       |         |        |        |
| Average Borrowings (Op+Cl)/2   |  |                                       | 16,777  | 19,737 | 20,985 |
|                                |  |                                       |         |        |        |
| Total Interest Paid            |  |                                       | 2,603   | 3,325  | 2,457  |
| Bank Charges & Brokerages Paid |  |                                       | 125     | 177    | 173    |
| Total for period               |  |                                       | 2,728   | 3,502  | 2,630  |
|                                |  |                                       |         |        |        |
| Annualised Interest Paid p.a.  |  |                                       | 2,728   | 2,802  | 2,630  |
|                                |  |                                       |         |        |        |
| Rate of Avg. Interest p.a. %   |  |                                       | 16.26 % | 14.20% | 12.53% |
|                                |  |                                       |         |        |        |
| Less:Applicable Tax Rates %    |  |                                       | 8.475   | 7.650  | 7.875  |
|                                |  |                                       |         |        |        |
| Net of Tax Interest Rate p.a.  |  |                                       | 14.88 % | 13.11% | 11.55% |
|                                |  |                                       |         |        |        |
|                                |  |                                       |         |        |        |
| Assessment Yr.                 |  | 2000-01                               | 01-02   | 02-03  | 03-04  |
|                                |  | Taxable Income 30 % of Book Profit,   |         |        |        |
|                                |  | Tax Rate 35 % on Above Book Profit +, |         |        |        |

## CDM – Executive Board

|         |  |   |            |       |       |
|---------|--|---|------------|-------|-------|
|         |  | +<br>Surcharge<br>of 10 % &<br>Nil<br>Education<br>Tax. |            |       |       |
|         |  | Note as<br>Above  | 7.500      | 7.500 | 7.500 |
|         |  | 10.00%  | 13.00<br>% | 2.00% | 5.00% |
|         |  |   | 0.975      | 0.150 | 0.375 |
|         |  |   | 8.475      | 7.650 | 7.875 |
|         |  | 0.00%   | 0.00%      | 0.00% | 0.00% |
|         |  | -   | -          | -     | -     |
| Total % |  | -   | 8.475      | 7.650 | 7.875 |

|                                  |         |        | Net of<br>Tax | Weight      |
|----------------------------------|---------|--------|---------------|-------------|
| Year                             | 2000    | Weight | Int. Rate     | X Int. Rate |
|                                  |         |        |               |             |
| Equity+ Free Reserves (Average ) | 11,693  | 0.41   | 25.74%        | 10.57%      |
| Borrowings (Average )            | 16,777  | 0.59   | 14.88%        | 8.77%       |
|                                  | 28,470  | 1.00   |               | 19.34%      |
|                                  |         |        |               |             |
| Year                             | 2001-02 |        |               |             |
| Equity+ Free Reserves (Average ) | 14,533  | 0.42   | 12.94%        | 5.49%       |
| Borrowings (Average )            | 19,737  | 0.58   | 13.11%        | 7.55%       |
|                                  | 34,270  | 1.00   |               | 13.04%      |
|                                  |         |        |               |             |
| Year                             | 2002-03 |        |               |             |
| Equity+ Free Reserves (Average ) | 15,291  | 0.42   | 20.61%        | 8.69%       |
| Borrowings (Average )            |         |        | 11.55%        | 6.68%       |

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 CDM – Executive Board

|             |        |      |  |               |
|-------------|--------|------|--|---------------|
|             | 20,985 | 0.58 |  |               |
|             | 36,275 | 1.00 |  | 15.37%        |
|             |        |      |  |               |
| <b>WACC</b> |        |      |  | <b>15.92%</b> |

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