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

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	•The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. •As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	•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.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

8.75 MW Bundle Wind Power Project in Maharashtra
Version: 1
Date : 16/01/2007

A.2 Description of the small-scale project activity:

The proposed project is a bundled project activity which involves the establishment of a Wind Power Project of 8.75 MW installed capacity enabling generation of electricity by state-of-art 1.25 MW Wind Electricity Generators (WEGs) (One of the latest available technologies in the country developed by M/s Suzlon Energy Limited) in the State of Maharashtra by M/s Shahi Exports Pvt. Ltd (hereafter SEPL or project proponent).

The bundled project activity consists of 2 sub-bundles:

- Sub-bundle I : At Dhulia (3 x 1.25 MW).
- Sub-bundle II : At Nandurbar (4 x 1.25 MW)

The electricity generation from this project will contribute to annual GHG reductions estimated at 161920 tCO2e (tonnes of carbon dioxide equivalent) over period of 10 years. Although the project life is envisaged as 20 years, it is proposed that the project activity needs to mitigate the risks involved in Renewable Energy Technology for the first 10 years. The project activity will evacuate approximately 176.00 lakh KWh of renewable power annually to the power deficit Western Region Grid.

Purpose of the project activity:

The main purpose of the project activity is to generate electrical energy through sustainable means using wind power resources, to utilize the generated output for either meeting the captive energy demand and/or selling it to the state electricity utility and/or a third party and to contribute to climate change mitigation efforts.

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

- To enhance the propagation of commercialisation of wind turbines in the region.
- To contribute to the sustainable development of the region, socially, environmentally and economically.
- To reduce the prevalent regulatory risks for this project through revenues from the CDM.

Contribution of project activity to sustainable development:

Indian economy is highly dependent on "Coal" as fuel to generate energy and for production processes. Thermal power plants are the major consumers of coal in India and yet the basic electricity needs of a large section of population are not being met.

This results in excessive demands for electricity and places immense stress on the environment. Changing coal consumption patterns will require a multi-pronged strategy focusing on demand, reducing wastage of energy and the optimum use of Renewable Energy (RE) sources.

Government of India has stipulated the following indicators for sustainable development in the interim approval guidelines[1] for CDM projects.

1. Social well-being

The proposed project activity leads to alleviation of poverty by establishing direct and indirect employment benefits accruing out of ancillary units for manufacturing towers for erecting the WEGs and for maintenance during operation of the project activity. The infrastructure in and around the project area will also improve due to project activities. This includes development of road network and improvement of the quality of electricity in terms of its availability and frequency as the generated electricity is fed into a deficit grid.

2. Economic well-being

The project activity leads to an investment of about INR 437.3 million to a developing region which otherwise would not have happened in the absence of the project activity. The generated electricity is fed into the Western Regional Grid through local grid, thereby improving the grid frequency and availability of electricity to the local consumers (villagers and sub-urban habitants) which will provide new opportunities for industries and economic activities to be setup in the area thereby resulting in greater local employment, ultimately leading to overall development. The project activity also leads to diversification of the national energy supply, which is dominated by conventional fuel based generating units.

3. Environmental well-being

The project utilizes wind energy for generating electricity which otherwise would have been generated through alternate fuels (most likely - fossil fuel) based power plants, thereby contributing to the reduction in specific emissions (emissions of pollutant/unit of energy generated) including GHG emissions. As wind power projects produce no end products in the form of solid waste (ash etc.), they address the problem of solid waste disposal encountered by most other sources of power. Being a renewable resource, using wind energy to generate electricity contributes to resource conservation. Thus the project causes no negative impact on the surrounding environment contributing to environmental well-being.

[1] Ministry of Environment and Forests web site: http://envfor.nic.in:80/divisions/ccd/cdm_iac.html

4. Technological well-being

The project activity leads to the promotion of 1.25 MW WEGs into the region, demonstrating the success of wind turbines, which feed the generated power into the nearest sub-station, thus increasing energy availability and improving quality of power under the service area of the substation. Hence, the project leads to technological well-being.

A.3 Project participants:

Name of Party involved ((host) indicates a host Party)	Private and/or public entity (ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India.	M/s Shahi Exports Pvt. Ltd.	No.

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

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

Wind has considerable amount of kinetic energy when blowing at high speeds. This kinetic energy when it passes through the blades of the wind turbines it is converted into mechanical energy and rotates the wind blades. When the wind blades rotate, the connected generator also rotates, thereby producing electricity.

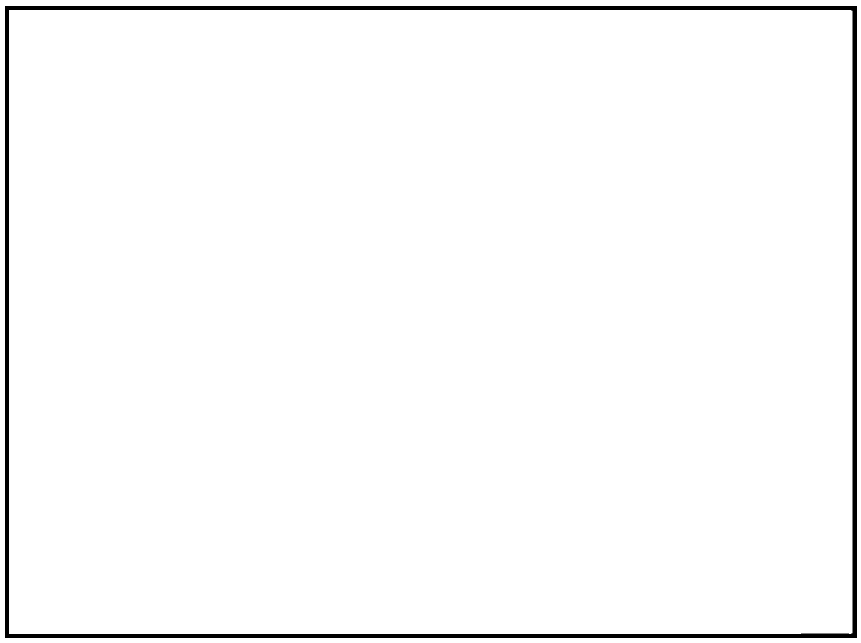


Figure 01, Major Mechanical Parts of a Wind Turbine.

The technology is a clean technology since there are no GHG emissions associated with the electricity generation. The project installs Suzlon make WEGs of individual capacity 1.25 MW (7 WEGs).

Salient Features of 1.25 MW (S 70) WEG

Sr. No.	Particulars	Specifications
1.	Rotor diameter	69.1 m
2.	Hub height	74 m
3.	Installed electrical output	1250 kW
4.	Cut-in wind speed	3 m/s
5.	Rated wind speed	12 m/s
6.	Cut-out wind speed	20 m/s
7.	Rotor swept area	3750 m^2
8.	Rotational speed	13.2/19.8
9.	Rotor material	GRP
10.	Regulation	Pitch
11.	Generator	Asynchronous Generator, 4/6 poles
12.	Rated output	250/1250 kW
13.	Rotational speed	1010/1515 rpm
14.	Operating voltage	690 V
15.	Frequency	50 Hz
16.	Protection	IP 56
17.	Insulation class	H
18.	Cooling system	Air cooled
19.	Gear box	3-stage gearbox, 1 planetary & 2 helical.
20.	Manufacturer	Winergy
21.	Gear ratio	77.848
22.	Nominal load	1390 kW
23.	Type of cooling	Oil cooling system
24.	Yaw drive system	4 active electrical yaw motors
25.	Yaw bearing	Polyamide slide bearing
26.	Safety system	--
27.	Aerodynamic brake	3 times independent pitch regulation
28.	Mechanical brake	Spring power disc brake, hydraulically released, fail safe. Microprocessor controlled, indicating.
29.	Control unit	Actual operating conditions, UPS back-up system
30.	Tower	Tubular
31.	Design standards	GL/IEC

Salient Features of 1.25 MW (S 66) WEG

Sr. No.	Particulars	Specifications
1.	Rotor diameter	66 m
2.	Hub height	74 m
3.	Installed electrical output	1250 kW
4.	Cut-in wind speed	3 m/s
5.	Rated wind speed	14 m/s
6.	Cut-out wind speed	22 m/s
7.	Rotor swept area	3421 m^2
8.	Rotational speed	1006 / 1506 rpm (50 Hz) 1208 / 1810 rpm (60 Hz)
9.	Rotor material	GRP
10.	Regulation	Pitch
11.	Generator	Asynchronous Generator, 4/6 pole
12.	Rated output	250/1250 kW
13.	Rotational speed	1010/1515 rpm
14.	Operating voltage	690 V
15.	Frequency	50 / 60Hz
16.	Protection	IP 56
17.	Insulation class	H
18.	Cooling system	Air cooled
19.	Gear box	3-stage gearbox, 1 planetary & 2 helical.
20.	Manufacturer	Winergy
21.	Gear ratio	74.917:1
22.	Nominal load	1390 kW
23.	Type of cooling	Oil cooling system
24.	Yaw drive system	4 active electrical yaw motors
25.	Yaw bearing	Polyamide slide bearing
26.	Safety system	--
27.	Aerodynamic brake	3 times independent pitch regulation
28.	Mechanical brake	Spring power disc brake, hydraulically released, fail safe. Microprocessor controlled, indicating.
29.	Control unit	Actual operating conditions, UPS back-up system
30.	Tower	Tubular
31.	Design standards	GL/IEC

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

A.4.1.1 Host Party(ies):

India.

A.4.1.2 Region/State/Province etc.:

Maharashtra.

A.4.1.3 City/Town/Community etc:

Dhule

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

Site	Amkhel (3 x 1.25 MW)	**Latitude**	20.98 N
Taluka	Sakri		(DMS)-20°58' 0 N
District	Dhulia	**Longitude**	74.31 E
R.S. No. – 100, 119, 164			(DMS)- 74°19' 0 E
		Altitude	1325**(feet)**
			403**(meters)**

Site	Gangapur (4 x 1.25 MW)	**Latitude**	20.03N
Taluka	Nandurbar		(DMS)- 20° 01' 60N
District	Nandurbar	**Longitude**	73.71E
R.S. No. – 125, 8, 64, 8			(DMS)- 73° 43' 0E
		Altitude	1896**feet)**
			577**(meters)**

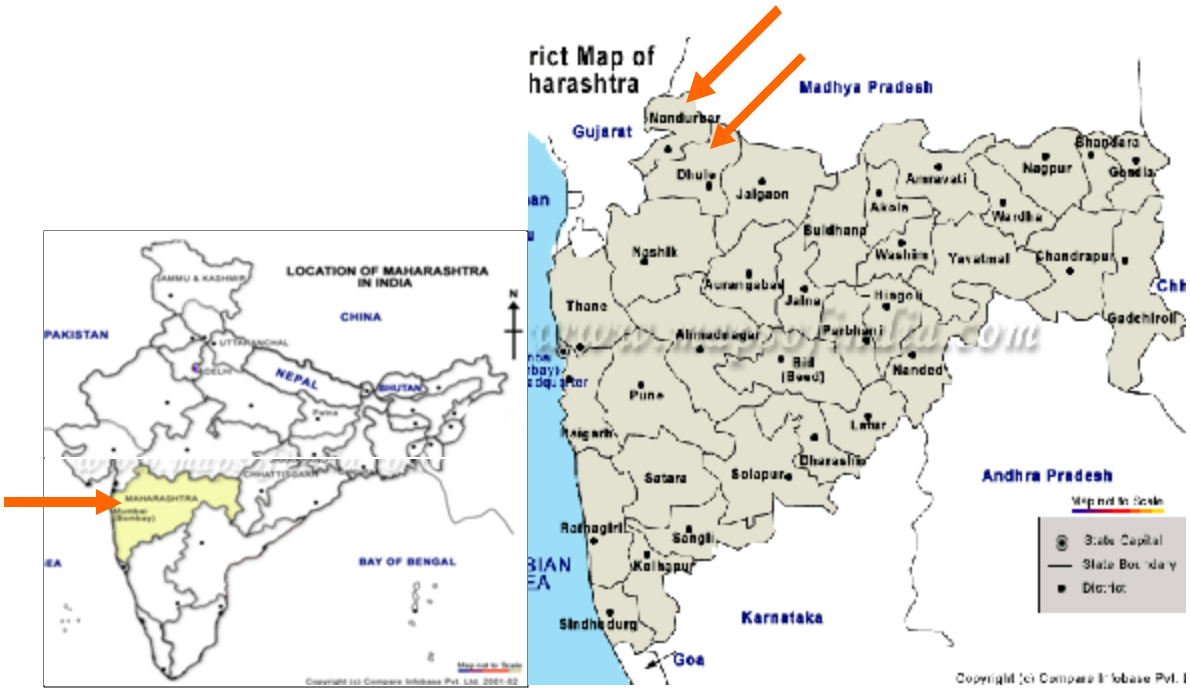


Figure 02, Location Map

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

As defined under Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the project activity proposes to apply following project types and categories:

- **Type : I – Renewable Energy Projects**
- **Project Category : I.D. – Grid connected renewable electricity generation (Version 10: 23 December 2006)**

Requirements with respect to technology/measure under AMS I.D. – Grid connected renewable electricity generation (Version 10: 23 December 2006)

– 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 distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass 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 non-renewable biomass or fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.

– Biomass combined heat and power (co-generation) systems that supply electricity to and/or displace electricity from a grid are included in this category. To qualify under this category, the sum of all forms of energy output shall not exceed 45 $MW_{thermal}$. e.g., for a biomass based co-generating system the rating for all the boilers combined shall not exceed 45 $MW_{thermal}$.

– Project activities adding renewable energy capacity should consider the following cases:

1) Adding new units;
2) Replacing old units for more efficient units.

To qualify as a small scale CDM project activity, the aggregate installed capacity after adding the new units (case 1) or of the more efficient units (case 2) should be lower than 15 MW.

– 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

Justification:

– This project activity is a 8.75 MW (< 15 MW) bundled wind power (renewable energy) project that supply electricity to a grid that is or would have been supplied by at least one fossil fuel or non-renewable biomass fired generating unit.

– So, in light of the above the applicability of this type & category of methodology to this project is justified.

This category comprises renewable energy, including wind power, which supplies electricity to an electricity distribution system (grid). The proposed project will generate 189.25 lakh kWh per annum of electricity from a renewable source (Wind Energy); this electricity will be supplied to the Western Region Electricity Grid, where the major part of electricity comes from non-renewable electricity generation. As the proposed project will supply electricity from a renewable source to the regional grid, the application of Type ID is justified.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2006	16192.00
2007	16192.00
2008	16192.00
2009	16192.00
2010	16192.00
2011	16192.00
2012	16192.00
2013	16192.00
2014	16192.00
2015	16192.00
Total estimated reductions	**161920.00**
Total number of crediting years	**10**
Annual average over the crediting period of estimated reductions (t of CO_2 eqiv.)	**16192.00**

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

The project has not received any public funding from Annex I countries and Official Development Assistance (ODA). The project is a unilateral project.

Kindly refer to Annex 2 for details on funding and investment plan for the implementation of 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 paragraph 2 of Appendix C to the Simplified Modalities and Procedures for Small-Scale CDM project activities (FCCC/CP/2002/7/Add.3), a small-scale project is considered a debundled component of a large project activity if there is a registered small-scale activity or an application to register another small-scale activity:

- With the same project participants

- In the same project category and technology
- Registered within the previous two years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small scale activity

None of the above applies to the above project and SEPL has not registered or applied for registration of another wind project. Therefore, the proposed project is not a debundled component of a larger 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:

Project Type : I – Renewable Energy Projects
Project Category: D – Grid connected renewable electricity generation
(Version 10: 23 December 2006)

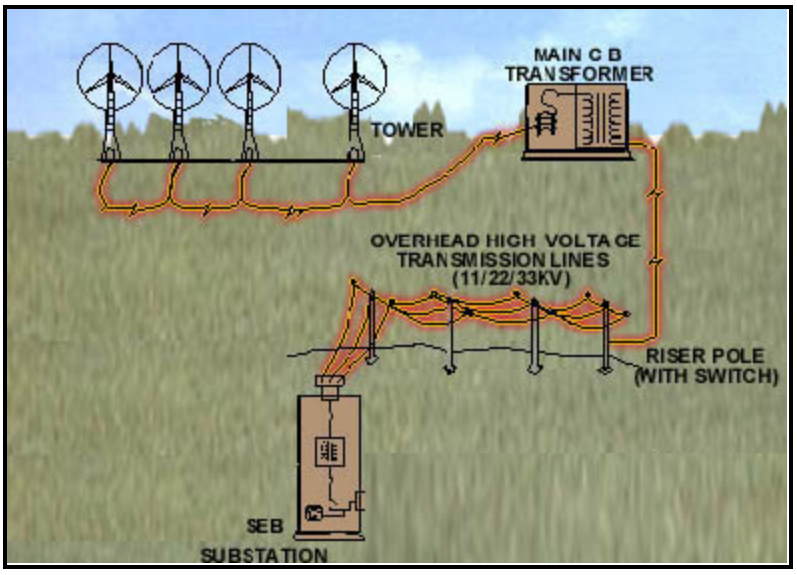
Reference: Appendix B of the simplified M&P for small-scale CDM project activities (UNFCCC, 2003b)

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

The project is a renewable energy project generating electricity (Type ID) – the monitoring methodology and baseline are selected here as suggested in the document ' SimplifiedModalities and Procedures for Small-Scale CDM project activities'

B.3 Description of the project boundary:

Project boundary specified in the Appendix B of simplified modalities and procedures is that encompasses the physical and geographical site of the renewable generation source. This includes the wind turbine installation, pooling and MSEDCL sub-stations. The proposed project activity evacuates the power to the Western Region Grid. Therefore all the power plants contributing electricity to the Western Grid are taken in the connected (project) electricity system for the purpose of baseline estimation.



B.4 Description of baseline and its development:

Baseline Estimation:

According to Point 10, Methodology AMS I D, Version10 -

"For all other systems, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/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 the Simple OM and the Average OM calculations must be considered.

OR

(b) The weighted average emissions (in kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used. Calculations must be based on data from an official source (where available) and made publicly available."

The project opted to choose for the option (b) i.e. weighted average emission factor and the value has been used from the latest version of **Baseline Carbon Dioxide Emissions from Power Sector** provided by the Central Electricity Authority, Govt. of India.[1]

[1] http://cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

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 small-scale CDM project activity:

The installed capacity of the project is 8.75 MW, is less than the limiting capacity of 15 MW and is thus eligible to use small-scale simplified methodologies. Further, the project activity is generation of electricity for a grid system using wind energy. Hence, the type and category of the project activity matches with I.D. as specified in Appendix B of the indicative simplified baseline and monitoring methodologies for small-scale CDM project activities.

✓ **Justification for additionality of the project**

UNFCCC simplified modalities seek to establish additionality of the project activity as per Attachment A to Appendix B, which listed various barriers, out of which, at least one barrier shall be identified due to which the project would not have occurred any way. Project participants identified the following barriers for the proposed project activity.

✓ **Barriers due to prevailing Practices:**

This source of energy has not been exploited widely in India. It is only during the last couple of years that a commercial exploitation of wind energy started in a big way. Wind energy has been the most unpredictable of all the other common sources of generating energy i.e. coal, diesel etc. Further wind turbines generation plant has the lowest load factor of all other sources. In the concerned cases it is in between 25.57% to 27.82%.

The total installed electricity-generating capacity in India, as on January 2005 was about 115,545 MW. This includes 69.4% thermal (80201 MW), 26.08% hydro (30135 MW), 2.35% nuclear (2720 MW) and 2.15% wind based generation (2488 MW)[2]. Coal based thermal power generation has been the mainstay of electricity generation.

To bridge India' s peak power shortage of 13-15% and average shortage of 8-10%, in the business as usual scenario, nearly 100,000 MW of fresh capacity addition would be required by 2012 of which more than 75% is likely to be coal based [3].

The installed capacity of Western Region at the end of financial year 2004-05 as per CEA was 33242.76 MW The total installed capacity comprises of Hydro – 5876.33 MW, Gas – 5035.72 MW, Coal- 20816.50 MW, Nuclear- 760 MW, Wind–658.70 MW and Diesel – 17.48 MW. The hydro, gas, thermal and nuclear energy generation in the region during 2004-05 was 10577.22 MUs, 25807.25 MUs, 141961.97 MUs & 5099.68 MUs respectively (WREB Annual Report 2004-05). As per the 2006 CEA General Review gross electrical energy generation by wind in Western Region at the end of year 2004-2005 is only 884.12 MUs which clearly shows that the share of electricity generation from wind is very low in the region and the current practice being followed in the region is preferential generation of electricity from fossil fuel based power plants.

[2] http://cea.nic.in/exe_summ/jan/6.pdf.

[3] Power on Demand by 2012: Perspective Plan Studies, CEA, GOI.

The technical wind power potential of the State of Maharashtra, which is in the western part of the country, is approximately 3040 MW. The current practice followed by investors (investing in WEGs) is to execute wind electricity projects in southern states[2] of India because of higher generation potential (these states observe two monsoon seasons, leading to a higher PLF). Owing to this fact, the total capacity exploited in the state of Maharashtra (as on March 31, 2005) was just about 15% of the technical potential, which is far behind the potential harnessed in southern states. Hence, a wind power project in Maharashtra needs to be encouraged.

✓ **Other Barrier:**

➢ **In terms of Investment:**

The entire project was planned based on the arrangement of supplying the electricity produced to the western regional grid of India. At the time of making the decision to invest in these windmills, the payment mechanisms were not stabilized and delays were very common, the grid availability and other structural readiness were not in a very dependable state. This adversity played its role. During the first 4 months of operations, Dhule site suffered a reduction in the sale of units to the extent of 80%. This was because the equipments & necessary grid related arrangements were not in place.

This source of energy has not been exploited widely in India. It is only during the last couple of years that a commercial exploitation of wind energy started in a big way. Wind energy has been the most unpredictable of all the other common sources of generating energy i.e. coal, water or sun. Further windmill generation plant has the lowest load factor of all other sources. In the concerned cases it is between 25.57% to 27.82%.

Project proponent has chosen the activity for their urge of sustainable development, despite being not so financially rewarding as compared to the usual business returns. In India, investment in Govt. Securities generate a tax free return of 5 to 5.5%, long term Bank Deposits earn about 9%, Rated Companies Debentures earn about 9 to 10%. The investors in other infrastructure projects such as roads & urban services expect minimum annual return of 14 to 15%.

Wind power projects are comparatively more risky than these because wind, the main source for generating the energy is not very predictable and totally beyond anybody' s control. In India annually inflation rate moves around 5%. Hence a minimum return between 14.40% to 15% (i.e. rate of interest @ 9.40% plus inflation of 5%) from the concerned project activity is reasonably justifiable.

The term loan for the project was sanctioned by the Bank @ 8.40% i.e. 2.35% less BPLR. But due to changes in the policy of RBI (i.e. increase in SLR and CRR) has forced all banks to change its BPLR (Benchmark Prime lending rate), which is resulted in to increase in rate of interest in the project

[2] The total technical potential of Southern region is 5585 MW and that of Western region is 5665 MW. But as per CEA General Reviev 2006 only 11.6 % (i.e. 658 MW) of the total potential has actually been harnessed in Western region and in Southern region it goes well above 35% (i.e. 2056 MW)

Source : http://mnes.nic.in/frame.htm?majorprog.htm

proponent from 8.40% to 9.40% (BPLR is revised to 11.75%), which has adversely affected the project.

Initially the project was sanctioned by the Bank @ 8.40% rate of interest. If we compare the effect of change in RBI policy over the DSCR of the project without benefits from CER sale, the results are as under:

Particular	**Rate of Interest @ 8.40%**	**Rate of Interest @ 9.40%**
DSCR	1.06	1.01

So the DSCR of the project reduced from 1.06 to 1.01, the DSCR of 1.06 was also not so attractive for the proposal without CER sale, but after increase in the rate of interest the DSCR of proposal almost equivalent to 1, which is not acceptable for any proposal, CER fund is required to increase the DSCR of the proposal.

The wind turbines set up by the project proponent generate an overall annual return of 13.69 % (after change in RBI policy). This return is arrived at estimated generation of units, operation & maintenance expenses and all other variables materialize as expected. The adverse scenarios in any combinations have a significant negative impact on the project profitability. Few scenarios with main variables are given below.

Scenarios >>	**1**	**2**	**3**	**4**
Saleable units: reduction by	10.0%	7.5%	5.0%	2.5%
IRR	11.59%	12.13%	12.66%	13.18%
O&M expenses increased by	10.0%	7.5%	5.0%	2.5%
IRR	13.49%	13.54%	13.59%	13.64%

We can say that the increase in the cost of O& M does not effect too much to the returns of the project while decrease in the generation of unit affect the proposal adversely and the IRR comes down to 11.59% if the electricity generation is reduced by 10%, which is much lesser than the minimum return expected from the project.

The company has invested in proposed project activity. If the same amount is invested in to the existing activity of the company (Manufacturing & Export of Textile) then the returns would have been different. We have considered the performance figures of the company for the financial year 2004-05 and 2005-06 to asses cash returns, the results are as under:

Rs. In Lacs

Particular	**2004-05**	**2005-06**
Net Profit after Tax	1867.36 Lacs	2429.28 Lacs

Depreciation	1032.96 Lacs	1397.97 Lacs
Cash Profit (A)	2900.32 Lacs	3827.25 Lacs
Ordinary Share Capital	11079.09 Lacs	499.97 Lacs
General Reserve	0.00	450.18 Lacs
Unsecured Loan	0.00	13200 Lacs
Other Reserves	0.00	1621.63 Lacs
Surplus in Profit & Loss Account	1867.36 Lacs	1739.78 Lacs
Term loan O/S	0.00	1102.35 Lacs
Total Investment in the Business (B)	12946.45 Lacs	18613.91 Lacs
Return against Investment (A/B)	22.40%	20.56%

On the basis of above table, we can say that the company is getting a return of around 20 to 22% on the investment. So, if the amount would have been invested in to the existing business the company may have get the return of 20 to 22% easily.

But, despite of lower returns (i.e. 13.90%) in wind energy, the Company has decided to invest in to the same just to promote the renewable energy keeping in mind that the CDM benefit will improve the returns marginally (i.e. 15.21%).

The CDM benefits of Rs. 83.06 lacs (16,192 tCO_2e x approx Euro 9 per tCO_2e x Rs 57 per euro) per year are expected. This amount takes the return to the investors to a reasonably acceptable level of 15.21 %, provided the CDM benefits are available to the project participant by himself and not to be shared with any Govt. body. The DSCR of the project also increased up to 1.13, which also reasonably well for any green field proposals.

✓ **Regulatory Risks:**

Maharashtra Electricity Regulatory Commission (MERC) in exercising its power under Sec 22(i) c and 29 of the erstwhile ERC Act 1998, and also under Sections 62 & 86 (i) e of the EA 2003, fixed the tariff rates of electricity when sold to the state owned utility for wind energy projects that are commissioned after 1st April, 2003. This was a regulatory barrier as the rate at which electricity is to be sold to State utility was fixed by MERC and binding on the project promoter who had no say in the matter.

Further, a negative impact was created in the whole set-up owing to defaults in payment of revenue by the State owned utility, to earlier investors in wind energy projects. While the former statement is a direct regulatory risk, the latter statement is an indirect regulatory risk to the project promoter.

The project promoter has entered into an agreement with Maharashtra State Electricity Distribution Company Ltd. (MSEDCL) (a sub-division of Maharashtra State Electricity Board) for the sale of electricity to them. This Agreement (Article 18 Section 18.02 CDM Benefit) stipulates " MERC shall be approached to review the tariff structure (contained in the Agreement) once the project becomes eligible for CDM benefit or similar credits and any mechanism for sharing of CDM or similar credit between the seller (in this case SEPL) and MSEDCL. The decision of the MERC will be binding on both parties." Hence, though an Agreement has been signed, the rate at which electricity is sold to MSEDCL may change if SEPL obtain any benefit under CDM or they may have to share the benefit with MSEDCL. The extent of sharing of the CDM benefit has not been specified by MERC. Hence,

this is a big risk undertaken by the project promoter as revenue, either from the sale of electricity or from the CDM benefit may be affected depending upon the decision of MERC.

A Green Energy Fund has been created by the Government of Maharashtra for funding power evacuation arrangements by MSEB and development of infrastructure such as roads by the Public Works Department of the State Government. Though the fund is theoretically available but it is actually dependant on its "Availability" as stated in Maharashtra Government Resolution No. Pawan 2004/P No. 1274/Urja-7 dated February 26, 2004 and issued by the Industries, Energy and Labour Department. Therefore, non-availability of the fund may delay the commercial operation of the project and result in a financial loss to the project promoter. This also forms a risk to this project. A total of 131.25 Lakh INR has been deposited under this scheme by the SEPL.

Despite of an agreement of payment of bills within 45 days of Billing from MSEDCL, the bills are generally paid in about 90 days after billing. This also creates some problem in getting cash at stipulated time.

- **Due to Lack of Experience in this Field:**

The project promoter is in the business of manufacturing and export of various products. Entering into the field of wind electricity generation was an entirely new activity for them, as they did not possess any knowledge or experience in this field. Hence, entering into this totally new field itself was a major barrier or a risky business for the project promoters.

In order to enter into this business, the project promoter had to upgrade the knowledge and skill not only at the Management level but also for the subordinates in the Company who would look after this project. This was a definite barrier for the project promoters.

- **Due to Uncertainty in Power Generation:**

The major additional risk faced by the promoters was the uncertainty in the amount of electricity that can be generated and sold. Generation of electricity in a wind electric project is mainly dependant on the available wind. As the electricity generation from the WEG is a function of the cube of the wind speed, even small variations in the wind speed contribute to relatively large variations in the electricity generated.

For example at the site chosen for setting up a sub-bundle of the project at Dhulia in Maharashtra state, the Plant Load Factor (PLF) varies from 21.82 % to 25.80 % for different turbines set-up at the same site by other parties in the past and commissioned on March 31, 2004. All these turbines are of the same make and rating, i.e. 1.25 MW and are of the same design and supplied by the same manufacturer, M/s Suzlon Energy Ltd. The PLFs mentioned above are the averages for the year April 2004 to March 2005, and this fluctuation can be seen in the following table.

Turbine No.	**PLF at 100 % Grid Availability**
K 003	24.21 %
K 004	25.80 %
K 005	23.91 %
K 006	23.57 %

K 009	21.82 %

Apart from the above variations in PLF, at the same site there is a constant variation in the PLF from year to year owing to variations in the wind speed. A comparison in the generation of electricity in a particular month for 2 consecutive years for the above wind generators is given the table below.

Turbine No.	kWh Generation in May 2004 at Controller	kWh Generation in May 2005 at Controller
K 003	369641	318745
K 004	379651	348251
K 005	370186	331142
K 006	378965	332950
K 009	345938	294117

The maximum variation in the above table is for Turbine No. K 009. However, there was a substantial variation in the machine availability for this turbine in the month of May for the 2 years considered above. But even where the machine availability was nearly the same as for Turbine No. K 004, the difference in generation was 31,400 kWh, which is a variation of 8.27 %. This variation in generation can be attributed only to variation in the wind speed at that Turbine location. This forms a major risk to the project promoter.

The next major risk to the project promoter is the variation in the grid availability. The grid is under the control of MSEB and the project promoter has no control over this grid and its availability. To cite an extreme example, the grid availability for Turbine No. K 003 was 41.76 % in April 2004 and the same was 94.81 % in April 2005. This implies that the project promoter lost 58.24 % of the generated electricity and so lost the same percentage in revenue in April 2004. Though the above is an extreme example, the variation in grid availability between 95 % to 99 % is quite common. This variation in the grid availability also forms a major risk to the project promoter.

The setting up of the grid to evacuate the electricity generated is the sole responsibility of MSEB and the project promoter has no control over this activity. Hence, any delay in setting up the grid by the State utility forms a major risk to the project promoter as, though the turbines have been commissioned and are in a position to generate electricity, they cannot do so as the grid is not in place. In this case SEPL, had commissioned the machine on March, 2006 at Dhule site but could only supply electricity and get proper revenue from August, 2006 when the grid became operational. Hence, there was a loss of revenue for about 3 months, which again forms a risk to the project promoter.

The PLF achieved at both side differ considerably in month as well as site specific. The table given below explain the PLF achieved at both site over a period of time.

Month	% PLF Realized	
	Dhulia (1.25 × 3)	Nandurbar (1.25 × 4)
Mar-06	0.0646	2.6515
Apr-06	10.8780	24.3422
May-06	10.7309	40.0133
Jun-06	5.9310	42.4814
Jul-06	21.8502	50.5016

Aug-06	49.9979	48.4322
Sep-06	9.5226	15.0569
Oct-06	2.0102	4.9280
Nov-06	1.8791	2.1746
Dec-06	3.4624	5.5067
Average	**11.6327**	**23.6088**

It quite evident from above table that though the machine is of same capacity and site is also not so far, the trend of realized PLF is quite different so the generation is never stable. Over and above, there is vast difference in PLF realized, almost of 12 %. So it is one of the most important barrier to the project promoter in achieving the normal financial benefit out of the project.

- **Due to Natural Calamities:**

The generation of electricity from wind is, of necessity, an entirely an outdoor activity which is usually located in a remote location, beyond the control of project promoter. The wind generators and the grid are constantly subject to natural elements such as high winds and rain and a calamity such as a severe thunderstorm and lightning can damage the generators and/or the grid. Whereas the cost of repairing the generators or grid can be recovered by insuring them, the loss in revenue due to the turbine not generating electricity when it is damaged or the grid not functioning cannot be recovered as insurance companies normally do not provide liquidated damages in their insurance cover. Even if, the insurance company agrees for liquidated damages cover, the insurance premium will be prohibitively very high.

To mitigate the risks mentioned in the above paragraphs and encourage the setting up of a wind power project in Maharashtra, CDM support to the project promoters is required.

The proposed activity thus satisfies the additionality conditions as required under Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities, and thus qualifies as a CDM project.

B.6 Emission reductions:

B.6.1 Explanation of methodological choices:

Baseline methodology for projects under Type I.D has been detailed in paragraphs 7-11 (Type I.D) of the above-mentioned document. Paragraph 9 (Type I.D) 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_2equ/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_2equ/kWh) of the current generation mix.

Baseline emission reductions have been estimated using the weighted average emission (in kgCO_2 equ/kWh) of the current generation mix, using the most recent statistics available at the time of PDD submission. (Paragraph 9, sub point (b))

In the proposed baseline, Western Region grid is used as the reference region for estimating the current generation mix. Using the methodology available for small-scale project activities, the weighted average emissions (in tCO_2e/GWh) of current generation mix of Western Region grid of India is used for the calculation of baseline. The weighted average emission factor data calculated and provided by Central Electricity Authority (CEA)[3] is used for the proposed project activity.

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

(Copy this table for each data and parameter)

Data / Parameter:	Energy
Data unit:	KWh
Description:	Electricity Generation
Source of data used:	Machine Provider
Value applied:	16192
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is provided by Suzlon Energy Ltd..
Any comment:	

Data / Parameter:	CO_2Emission Factor
Data unit:	t CO_2/MWh
Description:	Carbon Enission Factor
Source of data used:	Central Electricity Authority
Value applied:	0.92
Justification of the choice of data or description of measurement methods and procedures actually applied :	The used data is from an official source.
Any comment:	

[3] http://cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

B.6.3 Ex-ante calculation of emission reductions:

Baseline Emission = Units of electricity generated X Weighted Av. Emission Factor

= 17600 × 0.92 t CO_2
= 16192 t CO_2 / annum

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

Year	Project Emission (tonnes CO_2e /yr.)	Baseline Emissions (tonnes CO_2e /yr.)	Leakage (tonnes CO_2e / yr.)	Emission Reductions (tonnes CO_2e /yr.)
2006	0	16192.00	0	16192.00
2007	0	16192.00	0	16192.00
2008	0	16192.00	0	16192.00
2009	0	16192.00	0	16192.00
2010	0	16192.00	0	16192.00
2011	0	16192.00	0	16192.00
2012	0	16192.00	0	16192.00
2013	0	16192.00	0	16192.00
2014	0	16192.00	0	16192.00
2015	0	16192.00	0	16192.00
Total (tonnes CO_2e)	**0**	**161920.00**	**0**	**161920.00**

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

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	Energy
Data unit:	MWh
Description:	Electricity Generation
Source of data to be used:	MSEDCL
Value of data	17600
Description of measurement methods and procedures to be applied:	The data can be very accurately measured. The meters installed measure mentioned variables on a continuous basis. Every month these meter readings will be recorded by plant personnel, these records will be archived for crosschecking yearly figures.
QA/QC procedures to be applied:	The meter maintained by MSEDCL
Any comment:	

Data / Parameter:	CO_2Emission Factor
Data unit:	t CO_2/MWh
Description:	Carbon Enission Factor
Source of data to be used:	Central Electricity Authority
Value of data	0.92
Description of measurement methods and procedures to be applied:	The used data is from an official source.
QA/QC procedures to be applied:	The data source is regularly updated by the responsible authority.
Any comment:	

B.7.2 Description of the monitoring plan:

The project proponents have undertaken an operation and maintenance agreement with the supplier of the wind turbines i.e. Suzlon. The agreement is for a period of 10 years. The performance of the mills, safety in operation and scheduled /breakdown maintenances are organized and monitored by the contractor. So the authority and responsibility of project management lies with the contractor.

The monitoring personnel receive intensive training at the Suzlon Manufacturing facility in Daman before being appointed at the site to look after the operations.

The O& M management structure is as follows:

Routine Maintenance Services:

Routine Maintenance Labour Work involves making available suitable manpower for operation and maintenance of the Equipment and covers periodic preventive maintenance, cleaning and upkeep of the Equipment including –

a) Tower Torquing
b) Blade Cleaning
c) Nacelle Torquing and Cleaning
d) Transformer Oil Filtration
e) Control Panel & LT Panel Maintenance
f) Site and Transformer Yard Maintenance

Security Services: This service includes watch and ward and security of the wind farm and the equipment.

Management Services:

a) Data logging in for power generation, grid availability, machine availability.
b) Preparation and submission of monthly performance report in agreed format.
c) Taking monthly meter reading jointly with utility, of power generated at Wind Farm and supplied to grid from the meter/s maintained by utility for the purpose and co-ordinate to obtain necessary power credit report/ certificate.

Technical Services:

a) Visual inspection of the WTG and all parts thereof.
b) Technical assistance including checking of various technical, safety and operational parameters of the equipment, trouble shooting and relevant technical services.

The project activity essentially involves generation of electricity from wind, the employed WEG can only convert wind energy into electrical energy and cannot use any other input fuel for electricity generation. As the operation of WEGs is emission free and no emissions are produced during the lifetime of the WEG.

Although it is being anticipated that there would be no unintended emissions/leakages from this project, however, if any such condition arises, and leakage effect is found due to the project, such leakage will be accounted accordingly as mentioned in the chosen applied baseline methodology.

- The proposed project activity requires evacuation facilities for sale to grid and the evacuation facility is essentially maintained by the state power utility (MSEDCL).
- The electricity generation measurements are required by the utility and the investors to assess electricity sales revenue and / or wheeling charges.
- The project activity has therefore envisaged two independent measurements of generated electricity from the wind turbines.
- The primary recording of the electricity fed to the state utility grid will be carried out jointly at the incoming feeder of the state power utility (MSEDCL). Machines for sale to utility will be connected to the feeder.
- The joint measurement will be carried out once in a month in presence of both parties (the developer' s representative and officials of the state power utility). Both parties will sign the recorded reading.
- Metering equipment- Metering is carried out through electronic trivector meters of accuracy class 0.2% required for the project. The main meter shall be installed and owned by MSEDCL, whereas the project proponent owns the check meters. The metering equipments are maintained in accordance with electricity standards.
- Meter Readings- The monthly meter readings (both main and check meters) at the project site and the receiving station shall be taken simultaneously and jointly by the parties on the first day of the following month. At the conclusion of each meter reading an appointed representative of the MSEDCL and the company signs a document indicating the number of kWh exported to the grid
- The secondary monitoring, which will provide a backup (fail-safe measure) in case the primary monitoring is not carried out, would be done at the individual WEGs. Each WEG is equipped with an integrated electronic meter. These meters are connected to the Central Monitoring Station (CMS) of the entire wind farm through a wireless Radio Frequency (RF) network (SCADA). The generation data of individual machine can be monitored as a real-time entity at CMS. The snapshot of generation

on the last day of every calendar month will be kept as a record both in electronic as well as printed (paper) form.

All the relevant data & reports for maintaining accuracy in future monitoring and reporting of GHGs emission reduction is with SEPL, which follows Quality Management System (QMS) procedure as per ISO 9001 and is ISO certified organization.

SEPL has appointed a full time project in-charge to manage the overall project activities after commissioning. The project in-charge supervises the functioning of the Wind farm in close coordination with the officials 7 technical personnel of Suzlon Energy Limited (SEL).

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

Date of completion of Baseline and Monitoring methodology – 15th January 2007.

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:

27/10/2005

C.1.2 Expected operational lifetime of the project activity:

20 Years

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

C.2.1 Renewable crediting period

Not opted for.

C.2.1.1 Starting date of the first crediting period:

Not applicable

C.2.1.2 Length of the first crediting period:

Not applicable

C.2.2. Fixed crediting period:

C.2.2.1 Starting date:

1st April 2007

C.2.2.2 Length:

10 years.

SECTION D. Environmental impacts

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

The project activity does not fall under the purview of Environmental Impact Assessment notification of the Ministry of Environment and Forests (MoEF), Government of India (GOI) and the project activity is exempted from environmental clearances. The project activity has no significant impact on the environment. However, certain foreseen impacts due to the project activity are discussed below:

Impact on air
Wind energy plants are known to contribute to zero atmospheric pollution as no fuel combustion is involved during any stage of the operation.

Impact on water
There is absolutely no effluent discharge during operation of wind turbine generators.

Impact on ecology
There are no known migratory birds/endangered species in the region of project activity. Therefore no harm on the ecological environment is envisaged.

Impact due to noise
Noise is generated due to the movement of rotor blades. Noise is very much below the regulatory norms. It has no direct effect on the population, as the area is less populated and noise generated will be attenuated by ambient conditions. The considering the overall impact of the project in reducing GHG' s, creation of employment etc., makes this effect negligible.

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

Conclusion

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

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

Not Applicable.

SECTION E. Stakeholders' comments

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

SEPL identified local communities, farmers, and villagers, as the stakeholders with an interest in the CDM activities. The meeting was conducted separately for both the sites i.e., Dhule & Nandurbar. Accordingly, SEPL issued a letters to all the respective stakeholders requesting all to attend meeting or depute representatives at respective venues:

S.No.	Site	Venue	Date
1.	Dhule	Amkhel Village, Taluka – Sakri, Dist. Dhule.	19/06/2006
2.	Nandurbar	Gangapur village, Taluka – Nandurbar, Dist.. Nandurbar	19/06/2006

The agenda of the meeting was fixed as follows:

- Welcome
- Description of the project details.
- Queries and responses from the proponent and the stakeholders.
- Vote of Thanks.

The stake holder' s view is SEPL in its own small way is contributing positively to local economy & development.

E.2 Summary of the comments received:

Stakeholders had no objections from installations of WEGs instead they have openly said that wind power projects helped to us by…

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

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

The stakeholders have given very positive feedback and thus no measures were required to be taken.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	M/s Shahi Exports Pvt. Ltd.
Street/P.O.Box:	Industrial Plot No. -1, Sector-28
Building:	--
City:	Faridabad
State/Region:	Haryana
Postfix/ZIP:	121 008
Country:	India
Telephone:	+91 129 2273980, 504444
FAX:	+91 129 2273485, 2273491
E-Mail:	delhi@shahi.co.in
URL:	
Represented by:	
Title:	
Salutation:	Mr
Last Name:	Gupta
Middle Name:	--
First Name:	Vijay
Department:	Management
Mobile:	09868845049
Direct FAX:	--
Direct tel:	--
Personal E-Mail:	vijay.gupta@shahi.co.in

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

- The project has not received any public funding and Official Development Assistance (ODA).
- The project is a unilateral project.

Annex 3

BASELINE INFORMATION

Baseline emissions are calculated as the kWh produced by the project activity multiplied by an emission coefficient for the Western Regional grid, calculated as the weighted average emissions (in kg CO_2equ/kWh) of the current generation mix.

$BE = EGy * CEF_{grid}$

Where EGy is the net quantity of electricity generated by the project in year y, and CEF_{grid} is the carbon emissions factor of the Western grid.

CEF_{grid} is taken from CDM database provided by CEA and it is approved by DNA i.e Ministry of Environment and Forest, India.

Baseline Emmision	**0.92 tCO2/MWh**
Project Emmision	**0 tCO2/GWh**

Baseline Emission Reductions

Year	Units (MWh)	Baseline Emission	Project Emmision	Leakage	Emission Reduction tCO2
2007-08	17600.00	16192.0000	0	0	16192.00
2008-09	17600.00	16192.0000	0	0	16192.00
2009-10	17600.00	16192.0000	0	0	16192.00
2010-11	17600.00	16192.0000	0	0	16192.00
2011-12	17600.00	16192.0000	0	0	16192.00
2012-13	17600.00	16192.0000	0	0	16192.00
2013-14	17600.00	16192.0000	0	0	16192.00
2014-15	17600.00	16192.0000	0	0	16192.00
2015-16	17600.00	16192.0000	0	0	16192.00
2016-17	17600.00	16192.0000	0	0	16192.00
Total	**176000.00**	**161920**	**0.00**	**0**	**161920.00**
Annual Average	17600	16192	0	0	16192

Annex 4

MONITORING INFORMATION

The points given below detail the monitoring plan:

- The Electronic Meter that is used for monitoring is the Export-Import Energy Meter and is, installed before the grid.
- Its is a three phase, Four wire, 50Hz, 110 Volts, 6Amp,Time of Day (ToD), 0.2 class Export-Import tri- vector Energy meter.
- The calibration procedure followed, requires calibrating the meter once in a 12 month, by the MSEDCL. MSEDCL is State Electricity Utility Company which functions under Government of Maharashtra (GoM) as per Central Electricity Act & it is responsible for Energy Meter calibration check with their calibrated Refrence Standard Meter having tracability with International Standards through Institute for Design of Electric Measuring Instruments, Sion, Mumbai (IDEMI, Govt. of India Institution). The Purchaser/ wheeling agent of power, performs calibration check in presence of representative of owner.
- The import and export of electricity is continuously monitored by the export/ import meter and the data is recorded on a monthly basis jointly by the proponent and the electricity board
- This meter is located at the delivery point of wind power in MSEDCL grid. This accounts for the import of electricity that is used by the Project proponent. Hence the net electricity generated is calculated from the joint meter reading and recorded /archived in paper/electronic.

The complete monitoring responsibility is carried out as follows:

- Monitoring is joint responsibility of both owner as well as MSEDCL hence, daily monitoring is in the scope of owner
- Monthly monitoring is a joint responsibility. All services are provided by MSEDCL to the owner of wind farm.
- Though the ownership of the meter is with owner, but it is in possession of SEB' s sealed meter box under lock & Key as per statutory requirements. Owner can only see readings through glass window of sealed meter box

Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored		
Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1	Low	This Data will be directly used for calculating emission reduction. Sales record to grid to be used with other record to check for consistency
2	Low	Default data (for emission factors) and CEA statistics (for energy data) are used to check the local data.

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