**PROJECT DESIGN DOCUMENT FORM
FOR CDM PROJECT ACTIVITIES (F-CDM-PDD)
Version 04.1**

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Vaayu India Wind Power Project in Gujarat.
Version number of the PDD	4
Completion date of the PDD	17/04/2013
Project participant(s)	Vaayu (India) Power Corporation Private Limited
Host Party(ies)	India (Host)
Sectoral scope and selected methodology(ies)	Scope Number 1, Sectoral Scope - Energy industries (renewable/ non-renewable sources)
Estimated amount of annual average GHG emission reductions	106,378

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Vaayu (India) Power Corporation Private Limited (VIPCPL) is developing 51.2 MW wind farm in the state of Gujarat in India. The project activity involves supply, erection, commissioning and operation of 64 machines of rated capacity 800 KW each. The machines are Enercon E-53 make. The project will generate 115.312 GWh of electricity per year which shall be supplied to the state electricity utility thereby contributing to reducing the energy demand supply gap in the state of Gujarat. The project activity will assist the sustainable growth of the region by providing clean and green electricity to the state electricity grid.

The purpose of the project activity is to utilize renewable wind energy for generation of electricity. The project activity replaces anthropogenic emissions of greenhouse gases (GHG's) into the atmosphere, which is estimated to be approximately 106,378 tCO_2e per year, by displacing the equivalent amount of electricity generation through the operation of existing fuel mix in the grid comprising mainly fossil fuel based power plants and future capacity expansions connected to the grid.

In the absence of the project activity the equivalent amount of electricity would have been generated from the connected/ new power plants in the 'Northern Eastern Western North-Eastern' NEWNE grid, which are/ will be predominantly based on fossil fuels[1]. Whereas the electricity generation from operation of Wind Energy Convertors (WEG's) is emission free. As per the applicable methodology the baseline scenario for the project activity is the grid based electricity system, which is also the pre-project scenario.

A.2. Location of project activity

A.2.1. Host Party(ies)

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India

A.2.2. Region/State/Province etc.

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Western Region/ Gujarat State

A.2.3. City/Town/Community etc.

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The Project is spread across villages Chattar, Narmana, Seth Wadala, Jam Ambardi, Mevasa, Dhun Dhoraji, Sadodar, Bodi, Padavala and Machharda in Jamnagar and Rajkot Districts of Gujarat state in India.

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

A.2.4. Physical/Geographical location

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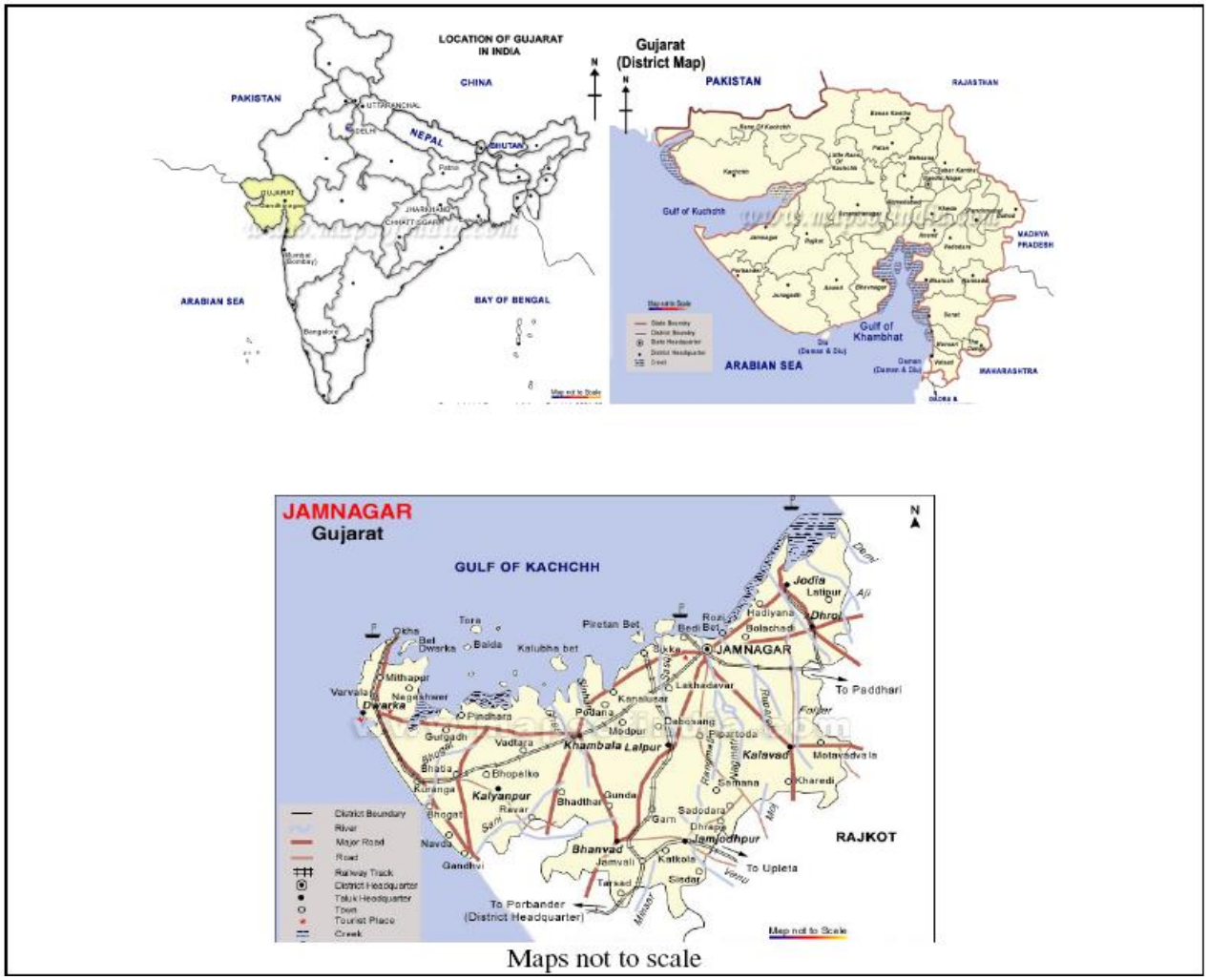
The project area extends between latitude 21º 55' and 22° 08' North and longitude 70° 05' and 70° 19' East.

Nearest airport and railway station are at Jamnagar city which is located at a distance of approximately 60 kms from the project activity site.



WEGs Commissioned

Serial No.	Location No	WTG-ID No.	Latitude	Longitude	Village	Commissioning Date
1	3020	EIL/800/10-	N22 O 06'	E70 O 18'	Machharda	12-Jul-10

		11/1826	19.0”	45.7”		
2	3021	EIL/800/10-11/1827	N22 O 06’ 23.5”	E70 O 18’ 43.7”	Machharda	12-Jul-10
3	3022	EIL/800/10-11/1828	N22 O 06’ 29.7”	E70 O 18’ 44.6”	Machharda	12-Jul-10
4	3072	EIL/800/09-10/1738	N21 O 57’ 19.6”	E70 O 15’ 05.0”	Padavala	25-Jun-10
5	3073	EIL/800/09-10/1739	N21 O 57’ 14.9”	E70 O 15’ 11.7”	Padavala	25-Jun-10
6	3075	EIL/800/09-10/1740	N21 O 56’43.1”	E70 O 15’ 20.6”	Padavala	25-Jun-10
7	3076	EIL/800/09-10/1741	N21 O 55’ 59.2”	E70 O 15’ 33.7”	Padavala	25-Jun-10
8	3088	EIL/800/09-10/1742	N21 O 56’ 19.3”	E70 O 14’ 38.0”	Padavala	25-Jun-10

WEGs yet to be commissioned

Serial No.	**Location No**	**WTG-ID No.**	**Latitude**	**Longitude**	**Village**	**Expected Commissioning Date**
1	62	EIL/800/09-10/1766	N22 O 07’ 40.2”	E70 O 15’ 10.7”	Chattar	20-Apr-11
2	63	EIL/800/09-10/1767	N22 O 07’ 46.6”	E70 O 15’00.6”	Chattar	20-Apr-11
3	64	EIL/800/09-10/1768	N22 O 07’ 53.3”	E70 O 14’ 57.1”	Chattar	20-Apr-11
4	539	EIL/800/09-10/1789	N22 O 04’ 46.7”	E70 O 05’ 34.3”	Seth Wadala	20-Apr-11
5	540	EIL/800/09-10/1790	N22 O 04’ 33.3”	E70 O 05’ 43.1”	Seth Wadala	20-Apr-11
6	541	EIL/800/09-10/1791	N22 O 04’ 27.4”	E70 O 05’ 47.6”	Seth Wadala	20-Apr-11
7	543	EIL/800/09-10/1792	N22 O 04’ 17.3”	E70 O 05’ 53.7”	Seth Wadala	20-Apr-11
8	544	EIL/800/09-10/1793	N22 O 04’ 13.5”	E70 O 06’ 00.7”	Seth Wadala	20-Apr-11
9	545	EIL/800/09-10/1794	N22 O 03’ 31.5”	E70 O 05’ 32.6”	Seth Wadala	20-Apr-11
10	546	EIL/800/09-10/1795	N22 O 03’ 40.2”	E70 O 05’ 31.0”	Jam Ambardi	20-Apr-11
11	547	EIL/800/09-10/1796	N22 O 03’ 45.3”	E70 O 05’ 31.9”	Jam Ambardi	20-Apr-11

12	548	EIL/800/09-10/1797	N22 O 03' 50.7"	E70 O 05' 34.2"	Jam Ambardi	20-Apr-11
13	903	EIL/800/09-10/1747	N22 O 01' 23.0"	E70 O 15' 35.2"	Mevasa/Haripar	20-Apr-11
14	904	EIL/800/09-10/1748	N22 O 01' 30.2"	E70 O 15' 41.0"	Mevasa/Haripar	20-Apr-11
15	905	EIL/800/09-10/1749	N22 O 01' 36.6"	E70 O 15' 27.2"	Mevasa/Haripar	20-Apr-11
16	906	EIL/800/09-10/1750	N22 O 01' 30.7"	E70 O 14' 55.0"	Mevasa/Haripar	20-Apr-11
17	907	EIL/800/09-10/1751	N22 O 01' 37.9"	E70 O 14' 56.8"	Mevasa/Haripar	20-Apr-11
18	908	EIL/800/09-10/1752	N22 O 01' 44.8"	E70 O 14' 54.1"	Mevasa/Haripar	20-Apr-11
19	909	EIL/800/09-10/1753	N22 O 01' 51.2"	E70 O 14' 51.2"	Mevasa/Haripar	20-Apr-11
20	910	EIL/800/09-10/1754	N22 O 01' 57.7"	E70 O 14' 55.7"	Mevasa/Haripar	20-Apr-11
21	912	EIL/800/09-10/1746	N22 O 02' 09.1"	E70 O 15' 04.4"	Dhun Dhoraji	20-Apr-11
22	926	EIL/800/09-10/1769	N22 O 06' 57.6"	E70 O 16' 33.0"	Chattar	20-Apr-11
23	927	EIL/800/09-10/1770	N22 O 06' 59.3"	E70 O 16' 23.3"	Chattar	20-Apr-11
24	928	EIL/800/09-10/1771	N22 O 07' 10.0"	E70 O 16' 16.5"	Chattar	20-Apr-11
25	929	EIL/800/09-10/1772	N22 O 07' 15.9"	E70 O 16' 11.3"	Chattar	20-Apr-11
26	931	EIL/800/10-11/1870	N22 O 07' 12.7"	E70 O15' 23.5"	Chattar	20-Apr-11
27	932	EIL/800/09-10/1773	N22 O 07' 05.5"	E70 O 15' 27.2"	Chattar	20-Apr-11
28	933	EIL/800/09-10/1774	N22 O 06' 59.3"	E70 O 15' 31.5"	Chattar	20-Apr-11
29	934	EIL/800/09-10/1775	N22 O 06' 53.9"	E70 O 15' 27.9"	Chattar	20-Apr-11
30	935	EIL/800/09-10/1776	N22 O 06' 46.0"	E70 O 15' 22.7"	Chattar	20-Apr-11
31	936	EIL/800/09-10/1777	N22 O 06' 40.3"	E70 O 15' 25.7"	Chattar	20-Apr-11
32	937	EIL/800/09-10/1778	N22 O 06' 32.0"	E70 O 15' 23.4"	Chattar	20-Apr-11
33	938	EIL/800/09-10/1779	N22 O 06' 25.7"	E70 O 15' 22.1"	Chattar	20-Apr-11
34	939	EIL/800/09-10/1760	N22 O 08' 19.5"	E70 O 19' 02.3"	Jamvadi	20-Apr-11
35	941	EIL/800/09-	N22 O 08'	E70 O 18'	Jamvadi	20-Apr-11

		10/1761	07.2”	57.8”		
36	942	EIL/800/09-10/1762	N22 O 08’ 08.6”	E70 O 19’ 30.2”	Jamvadi	20-Apr-11
37	943	EIL/800/09-10/1763	N22 O 08’ 00.9”	E70 O 19’ 25.4”	Jamvadi	20-Apr-11
38	944	EIL/800/09-10/1764	N22 O 07’ 53.9”	E70 O 19’ 26.0”	Jamvadi	20-Apr-11
39	945	EIL/800/09-10/1765	N22 O 07’49.5”	E70 O 19’ 31.4”	Jamvadi	20-Apr-11
40	947	EIL/800/09-10/1755	N22 O 06’ 04.0”	E70 O 18’ 16.9”	Moti Vavdi	20-Apr-11
41	948	EIL/800/09-10/1756	N22 O 05’ 57.0”	E70 O 18’ 17.8”	Moti Vavdi	20-Apr-11
42	950	EIL/800/09-10/1757	N22 O 05’ 45.7”	E70 O 18’ 21.5”	Moti Vavdi	20-Apr-11
43	951	EIL/800/09-10/1758	N22 O 05’ 38.3”	E70 O 18’ 18.4”	Moti Vavdi	20-Apr-11
44	952	EIL/800/09-10/1759	N22 O 05’ 31.6”	E70 O 18’ 16.9”	Moti Vavdi	20-Apr-11
45	958	EIL/800/09-10/1743	N22 O 02’ 32.4”	E70 O 16’ 42.8”	Dhun Dhoraji	20-Apr-11
46	959	EIL/800/09-10/1744	N22 O 02’ 26.2”	E70 O 16’ 44.6”	Dhun Dhoraji	20-Apr-11
47	960	EIL/800/09-10/1745	N22 O 02’ 19.0”	E70 O 16’ 44.4”	Dhun Dhoraji	20-Apr-11
48	992	EIL/800/09-10/1782	N22 O 03’ 13.6”	E70 O 10’ 37.3”	Sadodar	20-Apr-11
49	993	EIL/800/09-10/1783	N22 O 03’ 09.5”	E70 O 10’ 40.0”	Sadodar	20-Apr-11
50	994	EIL/800/09-10/1784	N22 O 02’ 59.6”	E70 O 10’ 36.4”	Sadodar	20-Apr-11
51	995	EIL/800/09-10/1785	N22 O 02’ 54.2”	E70 O 10’ 33.5”	Sadodar	20-Apr-11
52	996	EIL/800/09-10/1786	N22 O 02’ 47.4”	E70 O 10’ 22.2”	Sadodar	20-Apr-11
53	997	EIL/800/09-10/1787	N22 O 02’ 41.3”	E70 O 10’ 32.4”	Sadodar	20-Apr-11
54	1028	EIL/800/09-10/1788	N22 O 03’ 06.0”	E70 O 08’ 36.9”	Seth Wadala	20-Apr-11
55	1045	EIL/800/09-10/1780	N22 O 08’ 43.4”	E70 O 15’ 11.4”	Bodi	20-Apr-11
56	1046	EIL/800/09-10/1781	N22 O 08’ 48.8”	E70 O 15’ 08.5”	Bodi	20-Apr-11

A.3. Technologies and/or measures

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The project activity involves 64-wind energy converters (WEGs) of Enercon make (800 kW E-53) with internal electrical lines connecting the project activity with local evacuation facility. The WEGs generates 3-phase power at 400V, which is stepped up to 33 KV. The project activity can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V ± 12.5%. The average life time of the WEG is around 20 years as per the industry standards; however the project activity is yet to be commissioned. The other salient features of the state-of-art-technology are:

E 53 Specifications

Turbine model	Enercon E- 53
Rated power	800 kW
Rotor diameter	53 m
Hub height	75 m
Turbine Type	Gearless horizontal axis wind turbine with variable rotor speed
Power regulation	Independent electromechanical pitch system for each blade.
Cut in wind speed	2.5 m/s
Rated wind speed	12 m/s
Cut out Wind speed	28-34 m/s

Extreme Wind Speed	59.5 m/s
Rated rotational speed	32 rpm
Operating range rot. speed	12-29 rpm
Orientation	Upwind
No of Blades	3
Blade Material	Fibre Glass Epoxy reinforced with integral lightning protection
Gear box type	Gear less
Generator type	Synchronous generator
Braking	Aerodynamic
Output Voltage	400 V
Yaw System	Active yawing with 4 electric yaw drives with brake motor and friction bearing
Tower	74 m concrete

Enercon has secured and facilitated the technology transfer for wind based renewable energy generation from Enercon GmbH, has established a manufacturing plant at Daman in India, where along with other components the "Synchronous Generators" using "Vacuum Impregnation" technology are manufactured.

In the absence of the project activity the equivalent amount of electricity would have been generated from the connected/ new power plants in the NEWNE grid, which are/ will be predominantly based on fossil fuels[2], hence baseline scenario of the project activity is the grid based electricity system, which is also the pre-project scenario. Since the project activity involves power generation from wind, it does not involve any GHG emissions for generating electricity.

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A (host) : India	Private entity A : Vaayu (India) Power Corporation Private Limited Public entity A	No
Party B	Private entity B Public entity B	
…	…	

A.5. Public funding of project activity

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

There is no public funding from Annex 1 countries and no diversion of Official Development Assistance (ODA) involved in the project activity

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

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Title: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Reference: Approved consolidated baseline methodology ACM0002 (Version 11, EB 52)

ACM0002 draws upon the following tools which have been used in the PDD:

- Tool to calculate the emission factor for an electricity system – Version 02
- Tool for the demonstration and assessment of additionality – Version 5.2

Further information with regards to the methodology / tools can be obtained at http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

B.2. Applicability of methodology

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The project activity is wind based renewable energy source, zero GHG emission power project connected to the Gujarat state grid which in turn forms part of the NEWNE grid. The project activity will displace fossil fuel based electricity generation that would have otherwise been provided by the operation and expansion of the fossil fuel based power plants in NEWNE grid.

The approved consolidated baseline and monitoring methodology ACM0002 Version 11 is the relevant baseline and monitoring methodology and it is applicable because:

Para No.	Applicability Conditions as per ACM 0002	Applicability to this Project Activity
1.	The project activity is the installation capacity addition, retrofit or replacement of a power plant/unit of one of the following types: • Hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir) • Wind power plant/unit, • Geothermal power plant/unit, • Solar power plant/unit, • Wave power plant/unit • Tidal power plant/unit.	The project activity is grid connected renewable power generation from wind.
2.	In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition project which	This condition is not relevant, as the project activity does not involve capacity additions, retrofits or replacements.

	use option 2: on the page 10 to calculate the parameter $EG_{PJ, y}$) : the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	
3.	In case of hydro power plants: • The project activity is implemented in an existing reservoir, with no change in the volume of reservoir. • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2. • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	This condition is not relevant, as the project activity is not the installation of a hydro power plant.
4.	The methodology is not applicable to the following: • Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants; • Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2.	The project activity does not involve any of the given criteria hence methodology is applicable for the project activity.
5.	In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual	The project activity is a new wind power plant. Also no replacement, modification and retrofit measures are implemented here. Hence, this criterion is also not relevant to the project activity.

	maintenance".	

The description provided in the table above shows that the project activity satisfies the applicable conditions of the methodology, ACM0002

B.3. Project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Grid-connected electricity generation	CO_2	Yes	In the baseline scenario the electricity would have been sourced from the NEWNE grid which in turn would be connected to fossil fuel fired power plants which emit CO_2.
		CH_4	No	No methane generation is expected to be emitted.
		N_2O	No	No nitrous oxide generation is expected to be emitted.
Project Activity	Greenfield wind energy conversion system	CO_2	No	The project activity does not emit any emissions.
		CH_4	No	No methane generation is expected to be emitted.
		N_2O	No	No nitrous oxide generation is expected to be emitted.

B.4. Establishment and description of baseline scenario

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According to ACM0002, for project activities that do not modify or retrofit an existing electricity generation facility, the baseline scenario is the following:

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

As the Project does not modify or retrofit an existing generation facility, the baseline scenario is the emissions generated by the operation of grid-connected power plants and by the addition of new generation sources. This is estimated by multiplying the Combined Margin with electricity delivered to the grid.

The details of India grid system is described in the table below:

S.No.	Electricity Grid (Present)	Electricity Grid (Earlier)	Geographical Areas Covered
		Northern	Chandigarh, Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand
		Western	Chhattisgarh, Gujarat, Daman & Diu, Dadar & Nagar Haveli, Madhya Pradesh, Maharashtra,

1.	NEWNE Grid		Goa
		Eastern	Bihar, Jharkhand, Orissa, West Bengal, Sikkim, Andaman-Nicobar
		North-Eastern	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura
2.	Southern Grid	Southern	Andhra Pradesh, Karnataka, Kerala, Tamilnadu, Pondicherry, Lakshadweep

Gujarat state falls under NEWNE grid. The power sector in India including the NEWNE region largely comprises thermal power stations[3]; as can be seen from the table below[4]:

Sector	Hydro	Thermal				Nuclear	Renewable	Total
		Coal	Gas	Diesel	Total			
State	27055.76	42537.5	3672.12	602.61	46812.23	0.00	2247.68	76115.67
Central	8592.00	29620.00	6638.99	0.00	36258.99	4120.00	0.00	48970.99
Private	1230.00	5491.38	4565.50	597.14	10654.02	0.00	10994.73	22878.75
All India	36877.76	77648.88	14876.61	1199.75	93725.24	4120.00	13242.41	147965.41

It is evident from the above table that the installed capacity in India is predominantly thermal power plants; thermal power generation is GHG intensive and is a major source of CO_2 emissions. In the absence of the project activity equivalent amount of electricity would have been generated from the existing grid connected power plants and planned capacity additions which are also largely fossil fuel based. Thus generation from the project displaces the electricity generated from existing and planned power plant capacities in the NEWNE grid whose emission intensities are represented by the Combined Margin Emission Factor of the NEWNE Grid.

The baseline emissions and emission reductions from the project activity are estimated by multiplying the amount of net electricity exported by the project activity to the NEWNE grid and the baseline emission factor of the NEWNE grid calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors in the ratio of 75:25.

Variable	Data Source
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)	Records maintained by project proponents
Parameter	**Data Source**
$EF_{OM,\ y}$ = Operating Margin Emission Factor (tCO_2/MWh)	CEA Database for CO_2 emission factor, version 5
$EF_{BM,\ y}$ = Build Margin Emission Factor	CEA Database for CO_2 emission factor, version

[3] http://www.cea.nic.in/

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

(tCO_2/MWh)	5
EFy – Grid Emission Factor	Calculated as the weighted average of the operating margin and build margin in ratio of 75:25.

B.5. Demonstration of additionality

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CDM Consideration:

The project activity has been conceived as a CDM project since its inception. The project start date is 05 December 2009 and the PP has intimated UNFCCC and DNA about the project activity initiative within six months of the start date. The acknowledgement from Indian DNA received on 15 March 2010 & from UNFCCC received on 12 May 2010.

As per EB 49, Annex 22, the chronology of events leading up to web-hosting of the PDD for global stakeholder consultation and the actions taken by the project proponent to secure CDM status of the project are presented below:

Event	Date
Offer letter for WEGs	20th November 2009
Board resolution on project activity	28th November 2009
Purchase order for WEGs	5th December 2009
Stakeholder consultation meeting	9th February 2010
Intimation to DNA of India	11th March 2010
Acknowledgement received from DNA of India	15th March 2010
Intimation to UNFCCC Secretariat	07th April 2010
Acknowledgement received from UNFCCC Secretariat	12th May 2010

Loan Application	16th March 2010
Loan sanction	30th April 2010
Appointment of validator	22nd July 2010
PDD Webhosted for global stakeholder consultation	12th August 2010

Demonstration of Additionality for the project activity:

The latest Additionality tool i.e. Tool for the demonstration and assessment of Additionality version 5.2 approved by CDM Executive Board is used to demonstrate project Additionality.

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

As per ACM0002, the baseline alternative for the project activity is generation of equivalent amount of electricity by operation of grid-connected power plants and by addition of new generation sources. Accordingly, the realistic and credible alternatives to the project activity are:

(a) The Project is undertaken without registering it as a CDM activity.

(b) Equivalent amount of electricity being generated through operation of grid-connected power plants and addition of new generation sources

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

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

There are no legal and regulatory requirements that prevent Alternatives (a) and (b) from occurring.

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

Proceed to Step 2 (Investment analysis) or Step 3 (Barrier analysis). (Project participants may also select to complete both steps 2 and 3.)

Step 2: Investment Analysis

Simple cost analysis is not applicable as the project activity sells electricity to the Utility and obtains economic benefits in the form of electricity tariffs.

The alternative to the project activity is continuation of current situation i.e. no project activity, in that case equivalent amount of electricity would have been produced by the grid electricity system. The project activity is the development of wind power project which could potentially be invested by more

than one potential developer. Therefore benchmark analysis is more appropriate than investment comparison analysis (option II). Therefore PP has selected for option III benchmark analysis for substantiating additonality.

The Project Proponent proposes to use **Option III – Benchmark Analysis** and the financial indicator that are identified as the *post-tax* equity IRR.

The guidance to investment analysis issued in EB 51, Annex 58 (paragraph 12) states that in cases where a benchmark approach is used, the applied benchmark shall be appropriate to the type of IRR calculated. Weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity (Cost of Equity) are appropriate benchmarks for equity IRR.

The tool for demonstration and assessment of additionality [para-5, sub step 2(b)] states that in cases where the project has more than one potential developer, the benchmark shall be based on parameters that are standard in the market, considering the specific characteristics of the project type. Accordingly, the cost of Equity applicable to the project type has been considered as the benchmark to be compared against equity IRR.

The benchmark Cost of equity for the project is calculated as **16.84%**. The detailed working has been attached as Appendix 1.

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

Key assumptions used for calculating post-tax Equity IRR are set out below:

Assumptions for Financial Model

Capacity of Machines in kW	800		Enercon Offer dated 20 Nov 2009
Number of Machines	64		Enercon Offer dated 20 Nov 2009
Project Capacity in MW	51.20		Enercon Offer dated 20 Nov 2009
Expected project commissioning date	01-Apr-11		Enercon Offer dated 20 Nov 2009
Project Cost per MW (INR In Millions)	59.34		Calculated from offer letter dated 20 Nov 2009
Operations			
Plant Load Factor Base Case	25.71%		C-WET Report
Insurance Charges @ % of capital cost	0.12%		Normative
Operation & Maintanance Cost base year @ % of capital cost	1.30%		Enercon's offer dated 20 Nov 2009
% of escalation per annum on O & M Charges	6.0%		Enercon's offer dated 20 Nov 2009
Tariff			
Base year Tariff for 20 years - INR/kWh	3.55		GERC Tariff Order/Draft Order no. 2 of 2009
Generation Based Tariff- INR/kWh	0.50		Generation based incentive

			are applicable to wind power projects at the rate of INR/KWh 0.50 with cap of INR 6.2 Million per MW[5]
Project Cost	**INR Million**		
Land and Infrastructure, Generator & Electrical Equipments, Mechanical Equipments, Civil Works, Instrumentation & Control, Other Project Cost, Pre operative Expenses, etc.			
Total Project Cost	**3,038.08**		Enercon Offer dated 20 Nov 2009
Means of Finance		**INR Million**	
Own Source	30%	911.42	Debt Equity Ratio for the power generation projects in India.
Term Loan	70%	2,126.66	Debt Equity Ratio for the power generation projects in India
Total Source		3,038.08	
Terms of Loan			
Interest Rate	11.50%		PLR rate published by RBI dated 30 October 2009.
Tenure	10	Years	Normative for power generation Sector India
Depreciation Rate (Written Down Value basis) as per IT Act			
on Wind Energy Generators	15%		Income Tax Act The Depreciation rates are defined in New Appendix - I (applicable from Assessment year 2006-07 onwards) As per Block III clause 1, the rate for general Plant & Machinery is 15% whereas as per Block III , clause 8(xiii) Renewable Energy Devices being :- (l) Windmills are eligible for 80% depreciation.

[5] *(source:http://www.cwet.tn.nic.in/Docu/Grid%20Interactive%20Wind%20Power%20Projects.pdf)

Book Depreciation Rate (Straight Line Method basis)			
On all assets	4.50%		Straight line Method Adopted
Book Depreciation up to (% of asset value)	90%		
Salvage (% of asset value)	10%		
Income Tax			
Income Tax rate	33.99%		Income Tax Act
Minimum Alternate Tax	17.00%		Income Tax Act
Working capital			
Receivables (no of days)	30		Billing Cycle
O & m expenses (no of days)	90		Enercon's Offer

Project Cost Break up:

Cost Breakup	Cost/Machine	Project Cost
WEGs	32.90	2,105.60
Concrete Tower	5.93	379.52
Distribution Transformer	2.48	158.72
Civil works, foundation and electrical lines	1.62	103.68
Erection, commissioning, insurance and other works	1.62	103.68
Land and Transportation charges	1.19	76.16
Transfer of Development right charges	1.73	110.72
Total	**47.47**	**3,038.08**

Generation Based Incentive: Generation Based Incentive are applicable to wind power projects at the rate of INR 0.50 per kWh with cap of INR 6.2 Million per MW. The wind power project that claims GBI cannot claim apply accelerated depreciation of 80% as per applicability[6] criteria of generation based incentive. As the project proponent has opted for GBI; the normative depreciation rate of 15% is applied.

Debt Equity Ratio: This is the first investment by Vaayu (India) Power Corporation Private Limited and there are no existing debts in the company. Hence the debt equity ratio of 70:30 envisaged for the project activity as per the detailed project report has been considered. In addition a sensitivity analysis on the debt equity ratio has been carried out to strengthen the investment analysis.

Interest rate: This is the first investment by Vaayu (India) Power Corporation Private Limited and there are no existing debts in the company. Therefore we have taken the Prime lending Rate as interest rate for investment analysis form the data published by Reserve bank of India that is publically available.

[6] http://www.cwet.tn.nic.in/Docu/Grid%20Interactive%20Wind%20Power%20Projects.pdf

Plant Load Factor: As per EB 48, annex 11, Plant load factor validated by independent third party source can be used for investment analysis. Plant load factor for the project activity is taken from Center for Wind Energy Testing (a Government of India Agency). The plant load factor for the project site as determined by CWET is 25.71%.

Salvage Value: The project is depreciated up to 90% of the project cost (except for land that is non depreciable item); therefore we have considered land cost and 10% of the remaining value as salvage in the cash flow for computing equity IRR.

The post tax equity IRR for the Project without CDM revenues is 8.07% i.e. less than the benchmark.

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

Sensitivity Analysis

The investment in wind power project shall be tested based on the following parameters:

- Capital Cost
- Tariff
- Plant Load Factor
- Debt Equity Ratio
- O&M cost

Capital Cost

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

	10% decrease in Capital Cost	Base Capital Cost	10% Increase In Capital Cost
Post tax Equity IRR	10.85%	8.07%	5.81%

The equity IRR crosses the benchmark at capital cost variation of 25.90%. The actual project cost is 2816 Million INR as per purchase order. Therefore, the variation of 25.90% is not realistic.

Tariff

Gujarat Electricity Regulatory Commission (GERC) has fixed the tariff for the period of 20 years (Lifetime) for the wind power projects. The tariff for the entire life of the project activity is fixed at 3.55 INR/kWh. Therefore it is not appropriate to conduct sensitivity on tariff.

However the actual tariff rate as per the tariff order No. 1-2010 of Gujarat Electricity Regulatory Commission is 3.56 INR/kWh, which is fixed for 20 years. The equity IRR at the tariff is 8.14% less than the benchmark.

The equity IRR crosses the benchmark at tariff of INR/KWh 4.90 which is not realistic as the PP has already executed long term power purchase agreement for the period of 20 years (full technical life of the project activity) at INR/KWh 3.56.

Plant Load Factor

Plant Load Factor is the key variable encompassing variation in wind profile, variation in off-take (including grid availability) including machine downtime.

CWET Data: The PLF estimated by CWET (Center for Wind Energy Testing-Third party independent source for PLF) is 25.71%. We have conducted sensitivity at a variation of 10% over the base case.

	PLF @ 23.14% (10% Decrease over PLF estimated by CWET)	PLF 25.71% (PLF by CWET)	PLF @ 28.28% (10% Increase over PLF estimated by CWET)
Post tax Equity IRR	5.72%	8.07%	10.44%

The sensitivity analysis clearly shows even with a higher PLF, the project is not able to generate sufficient returns. It can therefore be concluded that the project is financially not viable without CDM benefits.

The equity IRR crosses the benchmark at PLF of 35.25% which is not a reasonable assumption. The PLF provided by third party is 25.71% and therefore the variation of 35.25% is not realistic.

Debt Equity Ratio

The debt equity ratio envisaged for the project is 70:30, evident from the Detailed Project Report; the same has been considered for Investment Analysis. A sensitivity analysis of IRR to 10% variations in the debt-equity ratio is carried out in the table below:

	10% decrease over base case [68:32]	Base Debt Equity ratio [70:30]	10% Increase over base case [72:28]
Post tax Equity IRR	8.06%	8.07%	8.09%

It may also be noted that at 100% equity, the Equity IRR is 7.85%.

O&M Cost

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

	10% decrease in	Base O&M Cost	10% Increase In

	O&M cost		O&M cost
Post tax Equity IRR	8.43%	8.07%	7.71%

The project does not cross the benchmark even at 100% variation in O&M cost.

Loan Tenure
At the time of investment decision the loan repayment period was assumed as 10 years for the project activity. The loan repayment period of 10 years is accepted norm for power sector projects and is envisaged by Central Electricity Regulatory Commission and State Electricity Regulatory Commission. However, in actual the PP was able to secure loan from IDFC for period of 12 years. To capture the deviation, the sensitivity analysis at loan tenure of 12 years has been done; the equity IRR for 12 years loan tenure is 7.92% which is less than the benchmark.

Outcome of Step 2: As can be seen, the equity IRR of the project activity remains well below the benchmark even under the sensitivity analysis. Therefore it can be concluded that the proposed CDM project activity is unlikely to be the most financially/economically attractive.

Step 3: Barrier analysis:

Not Opted for.

Step 4: Common practice analysis:

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

The additionality tool version 5.2 describes similar project activities are those that rely on a broadly similar technology, are of similar scale, and take place in a comparable environment with respect to regular framework, investment climate, access to technology, access to finance etc.

In light of the above definition, all large scale wind projects (greater than 15 MW) set up by a single project proponent (investor) in the state of Gujarat has been analyzed. In India there are 114 individual investors who have wind installations greater than 15 MW. Out of these, those which have installation greater than 15 MW in the state of Gujarat have been produced below:

Name of Owner	Installed Capacity in Gujarat (MW)	CDM	Web links and Explanations
DLF Limited	150 MW	Yes	The project activity has been registered on 18-Jun-2009. http://cdm.unfccc.int/Projects/DB/BVQI1229917560.71/view
GACL	23.75 MW + 39 MW	Yes	The project is under CDM validation. 23.75 MW: http://cdm.unfccc.int/Projects/Validation/DB/PLJVAOHCZK3WX6GN4QGVAH8C3MGAYP/view.html 39 MW: http://cdm.unfccc.int/Projects/Validation/DB/CBEZRP9HZI993GZEUKGZF6JOGZJB45/view.html
GSEC (Electrical)	20 MW	Yes	References' stating that CDM development for these projects is underway. http://www.gudcltd.com/public/CDM-Bulletin.pdf http://www.docstoc.com/docs/2825129/Section-1-Letter-of-Invitation
Gujarat Gardian	23.2 MW	Yes	Installations under PDD titled "Gujarat Guardian wind power project in the State of Gujarat managed by Enercon India Limited" spread across villages in Satapar, Kuranga and Bamnasa of Jamnagar District of Gujarat state in India http://cdmindia.nic.in/cdmindia/projects/PCN_696_07.pdf
Gujarat NRE Coal Group	22.3 MW, 26.25 MW	Yes	Installations are under the CDM PDDs 1) 22.3 MW Bundled grid connected Wind Power based electricity generation project in Gujarat http://cdm.unfccc.int/Projects/Validation/DB/OW17ZTWQUDGVXQGEO59WCBOC9C6LIR/view.html 2. 26.25 MW wind electricity generation project of Gujarat NRE Coke Limited at Jamnagar and Katch http://cdm.unfccc.int/Projects/Validation/DB/2WHFROEPK85ARNQ1TVKJV4WC8ATMAB/view.html 3) GHG abatement project through wind based energy generation, in Kutch, Gujarat http://cdm.unfccc.int/Projects/Validation/DB/3XJDEJWIXD7AE8K5O7RYT5HU1CV2HB/view.html

Gujarat Paguthan Energy Corporation Ltd.	50.4 MW	Yes	The project activity has been registered on 13-feb-2010. http://cdm.unfccc.int/Projects/DB/RWTUV1250689673.15/view
HZL Limited	88.8 MW	Yes	The project activity has been registered on 15-Jan-2009. http://cdm.unfccc.int/Projects/DB/BVQI1211956663.14/view
IOCL	21MW	Yes	The project is under CDM validation: http://cdm.unfccc.int/Projects/Validation/DB/6F92LAJ7ZAGAUDLEMPLC5CKL8KKDS5/view.html
MSPL Group	30MW	Yes	The Project is under CDM validation as part of the project activity - "30 MW wind power project at Surajbari, Gujarat in India" http://cdm.unfccc.int/Projects/Validation/DB/L59OGCJY0XLZUC0W8MMB84A2T4NKNX/view.html
ONGC	51 MW	Yes	The project activity has been registered on 01 March 2010: http://cdm.unfccc.int/Projects/DB/DNV-CUK1249377814.84/view
Patnaik Minerals Pvt Ltd	30.4 MW	Yes	The project is under CDM and part of Wind Power project by PMPL in Gujarat, District Jamnagar and Rajkot by M/s Patnaik Minerals Private Limited http://cdm.unfccc.int/Projects/Validation/DB/GQ56N39MLSZ9QDRL6RUF5YJSFDPD1U/view.html
Ratnamani Metals and Tubes Ltd	17.5 MW	Yes	The project activity has been implemented in phases. The first phase of around 5 MW has been included under two bundled CDM project activities - 1. 22.3 MW Bundled grid connected Wind Power based electricity generation project in Gujarat and 2. 13.7 MW Bundled Grid-connected wind electricity generation in Jamnagar & Kachchh, Gujarat. 1.http://cdm.unfccc.int/UserManagement/FileStorage/X6RZB5RJQDTY6C6PF4A38DSNXH2FL4 2. http://www.sgsqualitynetwork.com/tradeassurance/ccp/projects/452/PDD%20-%2013.7%20MW%20Bundled%20Wind%20Gujarat_Feb2008.pdf Post these bundled projects the second phase consisting of 13.25 MW has been proposed as a separate CDM project activity implemented post January 2007 - 13.25 MW Wind Power Generation by RMTL, in Kutch, Gujarat. http://cdm.unfccc.int/Projects/Validation/DB/FQOM561A0WJL6VAG2NT568TNPCLZCG/view.html

SREI	24.8 MW	Yes	Installations under the PDD titled "Green House Gas Abatement through installation of a wind power project for export to the Grid." The PP name in the PDD is given as India Power Corporation Limited (IPCL), SREI is Finance providers, and have the major stakes of the projects. http://cdm.unfccc.int/Projects/Validation/DB/K0ZTRSQUQH8WZN76AA11ZAZW16BPNH/view.html
Surajbari Wind farm Development Pvt. Ltd	16.5MW	Yes	The project activity is under CDM validation. http://cdm.unfccc.int/Projects/Validation/DB/51AZ1NLK643Y7W70DT6EH6HSR6HV54/view.html
TPCL	12MW September 2008 17.6MW March 2009	Yes	The project is under CDM validation: http://cdm.unfccc.int/Projects/Validation/DB/V3VLCQGE9AP9TX41VS9FJI8UKLMBOA/view.html
Aarvee Denims & Exports Ltd	18 MW	Yes	The project is under CDM validation http://cdm.unfccc.int/Projects/Validation/DB/FLUB2VU6RT4P2MU7QAE0L176AYBVLX/view.html
Indian Petrochemicals Co. Ltd	15.315 MW	No	The project was commissioned phase-wise in March 1997, the regulatory environment prevailing at that time and the policies applicable for wind energy were different from those existing at the time of the start of the proposed project activity. Thus this project cannot be compared to the proposed project activity.

It can be seen that, without exception, all private investors in the state of Gujarat with installations greater than 15 MW have developed these projects as CDM projects. In addition, all similar activities over 15 MW in size in the state of Gujarat are CDM projects

Sub-steps 4a is satisfied.

Sub-step 4b Discuss any similar options that are occurring:
From sub-step 4a it is clear that similar activities are not widely observed or commonly carried out and that all similar projects have been undertaken only as CDM projects. Therefore Sub-step 4b is not applicable. Based on the above considerations, the project activity is considered to be additional.

B.6. Emission reductions
B.6.1. Explanation of methodological choices
>>

According to the approved methodology ACM0002 (Version 11) Emission Reductions are calculated as:-

$ER_y = BE_y – PE_y$ …….. (1)

Where:

BE_y Baseline Emissions in year *y* (t CO_2e/yr)

PE_y Project Emissions in year *y* (t CO_2e/yr)

Estimation of Baseline Emissions:

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_{y} = EG_{PJ,y} * EF_{grid,CM,y} \quad \ldots\ldots (2)$$

Where:

BE_y = Baseline emissions in year *y* (tCO_2/yr)

$EG_{PJ,y}$ = Quantity of net electricity exported to the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO_2/MWh)

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

$$EG_{PJ,y} = EG_{facility,y} \quad \ldots\ldots (3)$$

Where:

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

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

The proposed project activity is in the state of Gujarat which falls under NEWNE grid, baseline emission factor is calculated as combined margin, consisting of a combination of operating margin and build margin factors according to the procedures prescribed in the latest tool for calculating the emission factor for an electricity system. The steps of calculation are as follows:

STEP 1: Identifying the relevant electricity systems:

The Indian electricity system is divided into two regional grids, viz. (1) Northern, Eastern, Western, North-Eastern and (2) Southern grid. Each grid covers several states. As the regional grids are interconnected, there is inter-state and inter-regional exchange. A small power exchange also takes place with neighboring countries like Bhutan and Nepal.

Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Each state in a regional grid meets its demand with its own generation facilities and also with allocation from power plants owned by the Central Sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the Central Sector power plants.

Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. The regional grid thus represents the largest electricity grid where power plants can be dispatched without significant constraints and thus, represents the "project electricity system" for the project activity. As the project activity is connected to the western regional electricity grid, the NEWNE grid is the "project electricity system".

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

Option I is opted for the project activity i.e. only grid power plants are included in the calculation.

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

According to the tool, the calculation of the operating margin emission factor is based on one of the following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

Any of the four methods can be used for calculating OM, The simple adjusted OM and dispatch data analysis OM cannot be currently applied in India due to lack of necessary data however, the simple OM method (option a) can only be used if low cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

The Share of Low Cost / Must-Run (% of Net Generation) in the generation profile of the different grids in India in the last five years is as follows:

	2004-05	**2005-06**	**2006-07**	**2007-08**	**2008-09**
NEWNE	16.84%	18.0%	18.5%	19.0%	17.3%
South	21.61%	27.0%	28.3%	27.1%	22.8%
India	18.01%	20.1%	20.9%	21.0%	18.6%

Source: CO_2 Baseline Database for the Indian Power Sector – Central Electricity Authority

The above data clearly shows that the percentage of total grid generation by low cost/must run plants (on the basis of average of five most recent years) for the NEWNE grid is less than 50 % of the total generation. Hence the Simple OM method can be used to calculate the Operating Margin Emission factor. The average operating margin method cannot be applied, as low cost/ must run resources in NEWNE grid constitute less than 50% of total grid generation.

The project proponents choose an ex ante option for calculation of the OM with a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.

STEP 4: Calculate the operating margin emission factor according to the selected method:

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

- Based on the net electricity generation, and a CO_2 emission factor of each power unit. (Option A), or
- Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option B)

The Central Electricity Authority, Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database i.e. The CO_2 Baseline Database provides information about the Combined Margin Emission Factors of all the regional electricity grids in India. The Combined Margin in the CEA database is calculated ex ante using the guidelines provided by the UNFCCC in the "Tool to calculate the emission factor for an electricity system". We have, therefore, used the Combined Margin data published in the CEA database, for calculating the Baseline Emission Factor.

The CEA database uses the option A i.e. data on net electricity generation and CO_2 emission factor for each power unit, the average efficiency of each power unit and the fuel type(s) used in each power unit, to calculate the OM of the different regional grids.

The simple OM emission factor is calculated based on the net electricity generation of each power unit and an emission factor for each power unit, as follows:

$$\mathbf{EF_{grid,OMsimple,y} = \Sigma\ (EG_{m,y} \times EF_{EL,m,y}) / \Sigma EG_{m,y}} \quad \text{..... (a)}$$

Where:

$EF_{grid,OMsimple,y}$	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	CO_2 emission factor of power unit m in year y (tCO2/MWh)
m	All power units serving the grid in year y except low-cost / must-run power units
y	The relevant year as per the data vintage chosen in step 3

The emission factor of each power unit m has been determined as follows:

$$\mathbf{EF_{EL,m,y} = (\Sigma\ FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,I,y}) / EG_{m,y}} \quad \text{..... (b)}$$

Where:

$EF_{EL,m,y}$	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,m,y}$	Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,I,y}$	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
m	All power units serving the grid in year y except low-cost / must-run power units
i	All fossil fuel types combusted in power unit m in year y
y	The relevant year as per the data vintage chosen in step 3

STEP 5: Identify the group of power units to be included in the build margin:

The sample group of power units m used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use the set of power units that comprises the larger annual generation.
Accordingly, the CEA database calculates the build margin as the average emissions intensity of the 20% most recent capacity additions in the grid based on net generation.
The build margin emission factor has been calculated ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. This option does not require monitoring the emission factor during the crediting period.

STEP 6: Calculate the build margin emission factor:

The build margin emissions factor is the generation-weighted average emission factor of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$\mathbf{EF_{grid,BM,y} = (\Sigma\, EG_{m,y} \times EF_{EL,m,}) / \Sigma\, EG_{m,y}} \quad \text{..... (c)}$$

Where:

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

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) is determined as per the procedures given in step 4 (a) for the simple OM, using option A1 for *y* most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

STEP 7: Calculate the combined margin emissions factor:

The emission factor $EF_{\mathbf{grid,CM,}y}$ of the grid is represented as a combination of the Operating Margin (OM) and the Build Margin (BM). Considering the emission factors for these two margins as $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$, then the $EF_{\mathbf{grid,CM,}y}$ is given by:

$$\mathbf{EF_{grid,CM,}y = w_{OM} * EF_{grid,OM,}y + w_{BM} * EF_{grid,BM,}y} \quad \text{..... (d)}$$

Where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM}	Weight in operating margin emissions factor (%)
w_{BM}	Weight in build margin emissions factor (%)

(where $w_{OM} + w_{BM} = 1$).

According to ACM0002 the weights for OM and BM are 0.75 and 0.25 respectively.

Using the values for operating and build margin emission factor provided in the CEA database and their respective weights for calculation of combined margin emission factor, the baseline carbon emission factor (CM) is 0. 92252 tCO_2e/MWh.

Details of Baseline data:

Data of operating for the three financial years from 2006-07, 2007-08 and 2008-09 and Build Margin for 2008-09 has been obtained from -

The CO_2 Baseline Database for the Indian Power Sector
Ministry of Power: Central Electricity Authority (CEA)
Version 5
Key baseline information is reproduced in Annex 3.
The detailed excel sheet is available at:
http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Estimation of Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 11, there will be no project emissions in the project activity

$PE_y = 0$ …… (4)

Estimation of Leakage Emissions

As per ACM0002 Version 11, no leakage has been considered for the calculation of emission factor

$LE_y = 0$ …….. (5)

The details on OM, BM and CM estimates as provided by the CEA are shown in Annex-3.

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$EF_{grid,OM,y}$
Unit	tCO_2e/MWh
Description	Operating Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data	"CO_2 Baseline Database for Indian Power Sector", version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value(s) applied	1.00498
Choice of data or Measurement methods and procedures	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002
Purpose of data	This data is used for baseline emission calculation
Additional comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter	$EF_{grid,BM,y}$
Unit	tCO_2e/MWh
Description	Build Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data	"CO_2 Baseline Database for Indian Power Sector", version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value(s) applied	0.67518
Choice of data or Measurement methods and procedures	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002.
Purpose of data	This data is used for baseline emission calculation
Additional comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter	$EF_{grid,,CM,y}$
Unit	tCO_2e/MWh
Description	Combined Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data	"CO_2 Baseline Database for Indian Power Sector", version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value(s) applied	In case of wind power projects default weights of 0.75 for EF_{OM} and 0.25 for EF_{BM} are applicable as per ACM0002. Combined Margin Emission Factor (EFy or $EF_{CM,y}$) : 0.92252 Refer Annex – 3 for comprehensive calculation of Combined Margin Emission Factor.
Choice of data or Measurement methods and procedures	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002, and Tool to Calculate the emission Factor for an Electricity System.
Purpose of data	This data is used for baseline emission calculation
Additional comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

B.6.3. Ex ante calculation of emission reductions

>>

Emission reductions from the project activity are equal to the baseline emissions as project emissions and leakage are nil.

Baseline emission factor (Combined Margin) (EFy)
= 0.92252 tCO_2e/MWh

Annual electricity supplied to the grid by the Project (EGy) is calculated as:
= 51.2 MW (Capacity) x 25.71% (PLF) x 8,760 (hours) MWh
= 1,15,312.44 MWh

Annual Baseline Emissions Reduction: $ERy = EF_{grid,CM,}y * EG_{PJ,}y$
= 0.92252 tCO_2e/MWh x 115312.44 MWh
= 1,06,378 tCO_2e

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
1st year*	106,378	0	0	106,378
2nd year	106,378	0	0	106,378
3rd year	106,378	0	0	106,378
4th year	106,378	0	0	106,378
5th year	106,378	0	0	106,378
6th year	106,378	0	0	106,378
7th year	106,378	0	0	106,378
8th year	106,378	0	0	106,378
9th year	106,378	0	0	106,378
10th year	106,378	0	0	106,378
Total	106,3780	0	0	106,3780
Total number of crediting years	10			
Annual average over the crediting period	106,378	0	0	106,378

B.7. Monitoring plan
B.7.1. Data and parameters to be monitored

Data / Parameter	$EG_{PJ,y}$
Unit	MWh
Description	Net Quantity of Electricity exported to the grid
Source of data	Share certificate issued by GETCO
Value(s) applied	1,15,312.44 MWh/year
Measurement methods and procedures	The procedures for metering will be as per the provisions of the power purchase agreement. The WEGs of a single customer (VIPCPL in this case) are divided into clusters and each cluster has dedicated metering system. Different clusters are connected to different Vacuum Circuit Breaker metering yards (VCB) which ultimately lead to the shared main GETCO meter (also known as revenue meter) at the Sadodar substation maintained by Enercon (India) Limited. Data monitoring takes place at the cluster metering points and GETCO main meter at the EIL substation. The net electricity supplied to the grid by the wind farm is calculated by GEDA on the basis of GETCO main meter reading and the meter readings taken at individual cluster meters after adjusting transmission loss. For adjustment of transmission loss, the electricity metered at the GETCO meter is proportionally divided by GEDA among the customers connected to the revenue meter on the basis of the pro rata readings taken at the cluster meters metering point . The net electricity generated by the project activity is taken directly from the share certificate issued by GETCO on monthly basis.
Monitoring frequency	Monthly
QA/QC procedures	Calibration of all the meters will be undertaken once in three years and faulty meters will be duly replaced immediately.
Purpose of data	This data is not directly used for baseline estimation
Additional comment	The data will be archived for the entire crediting period plus two years.

Data / Parameter	$EG_{GETCO,\ Export}$
Unit	kWh
Description	Net Electricity export recorded at Enercon Substation
Source of data	Joint Meter Reading (JMR)
Value(s) applied	This reading is used for calculation of transmission loss by GEDA and is not directly used for calculation of emission reductions
Measurement methods and procedures	The meter reading is taken jointly by the representatives of Enercon and GEDA/GETCO in the form of JMR
Monitoring frequency	Monthly
QA/QC procedures	Calibration of all the meters will be undertaken once in three years and faulty meters will be duly replaced immediately.
Purpose of data	This data is directly used for baseline estimation
Additional comment	The data will be archived for the entire crediting period plus two years.

Data / Parameter	$EG_{GETCO, Import}$
Unit	kWh
Description	Net Electricity import recorded at Enercon Substation
Source of data	Joint Meter Reading (JMR)
Value(s) applied	This reading is used for calculation of transmission loss by GEDA and is not directly used for calculation of emission reductions.
Measurement methods and procedures	The meter reading is taken jointly by the representatives of Enercon and GEDA/GETCO in the form of JMR
Monitoring frequency	Monthly
QA/QC procedures	Calibration of all the meters will be undertaken once in three years and faulty meters will be duly replaced immediately.
Purpose of data	This data is not directly used for baseline estimation
Additional comment	The data will be archived for the entire crediting period plus two years.

B.7.2. Sampling plan

>>

Not applicable

B.7.3. Other elements of monitoring plan

>>

Approved monitoring methodology ACM0002 Version 11 Sectoral Scope: 1, "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources", by CDM - Meth Panel is proposed to be used to monitor the emission reductions.

Enercon (India) Limited is the O&M contractor for the project activity. Enercon (India) Limited will be responsible for maintaining all the monitoring data on behalf of VIPCPL in respect of the project activity. Enercon (India) Limited has implemented the management structure for managing the monitored data.

The approved monitoring methodology requires monitoring of the following:

- Electricity generation from the project activity; and
- Operating margin emission factor and build margin emission factor of the grid, where *ex post* determination of grid emission factor has been chosen

Since the baseline methodology is based on ex ante determination of the baseline, the monitoring of operating margin emission factor and build margin emission factor is not required. Further, wind based electricity generation is not associated with any kind of leakages.

The project activity will have various clusters and each cluster has exclusive metering arrangement and the meter readings taken at these metering points will be provided by the representatives of Enercon to GEDA. These meters will be sealed by GEDA and will also be calibrated once in three years.

Enercon substation at Sadodar has main meter(s) also known as revenue meter which is connected to wind turbines installed by the project proponent and wind turbines installed by other project owners. Gujarat Electricity Development Authority (GEDA) apportions the net electricity supplied to the grid at the Enercon substation to all the project owners after adjusting transmission loss to the meter readings taken at dedicated cluster meters of different project owners. The meter reading is taken jointly by the representatives of Enercon and GEDA/GETCO in the form of JMR The electricity from Enercon's substation is finally supplied to the utility's substation at Moti Paneli. The net electricity generated by the project owners is provided by GETCO in the share certificate of electricity generated. The value of the net electricity generated by the project activity will be taken directly by the project proponent from the share certificate provided by GETCO for calculation of emission reductions.

If during meter testing the main meter at the Enercon substation is found beyond the permissible limit of error, the meter reading will be taken from the main meter located at the utility (GETCO) substation at Moti Panelli after addition of average historical transmission losses.

If during meter testing the cluster meters are found beyond the permissible limit of error, the sum of panel meter (LCS meter) readings located at each wind turbine of the project activity will be provided to GEDA for purpose of apportioning net electricity supplied to the grid. The LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WEGs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report.

The allocation plan for the project activity is given below:-

$EG_{GETCO, Export}$ = Electricity exported, as recorded by the main meter at Enercon substation
$EG_{GETCO, Import}$ = Electricity imported, as recorded by the main meter at Enercon substation
$EG_{Cluster, Export}$ = Electricity exported by the project activity, as measured at Cluster Meter
$EG_{Cluster, Import}$ = Electricity imported by the project activity, as measured at Cluster Meter
$EG_{Cluster, WF, Export}$ = Electricity exported by all the project owners connected to Enercon substation, as measured at Cluster Meter
$EG_{Cluster, WF, Import}$ = Electricity imported by all the project owners connected to Enercon substation, as measured at Cluster Meter
$EG_{PJ,export,y}$ = Electricity exported by the project activity to the grid, calculated
$EG_{PJ,import,y}$ = Electricity imported from the project activity to the grid, calculated
$EG_{PJ,y}$ = Net Electricity exported by the project activity to the grid, calculated

Electricity Exported to the Grid by the project activity

$$EG_{PJ,export,y} = EGGETCO_{, Export} \text{ X } EG_{Cluster, Export} / EG_{Cluster, WF, Export}$$

Electricity Imported from the Grid by the project activity

$$EG_{PJ,Import,y} = EG_{GETCO, Import} \text{ X } EG_{Cluster, Import} / EG_{Cluster, WF, Import}$$

Net Electricity Exported to the grid by the project activity

$$EG_{PJ,y} = EG_{PJ,export,y} - EG_{PJ,Import,y}$$

The apportioning procedure for the project activity is done by GEDA (Gujarat Energy Development Agency) based on the meters that are connected to the cluster meter of various project owners connected

to substation of Enercon based on meter reading noted at Enercon substation connecting all the machines of the project activity and other project developers. The meter reading at cluster meter and the Enercon substation are directly monitored and hence the apportioning of the electricity is based on the meter reading that are directly measured.

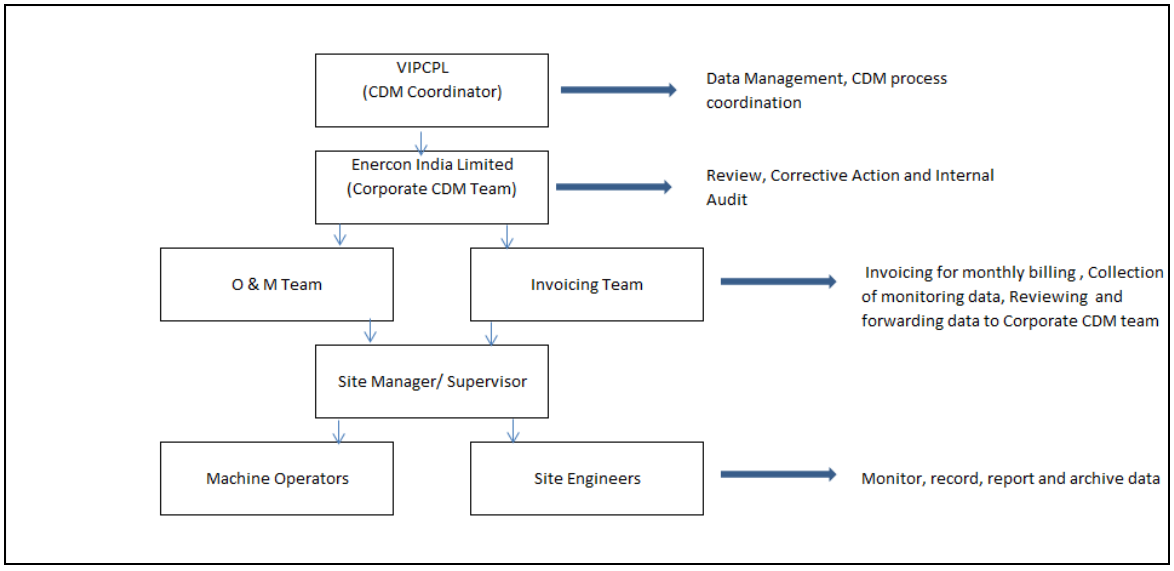
The Project is operated by Enercon (O&M contractor for the project activity) and managed by the PP. The operational and maintenance contract for the project is with Enercon. Enercon is an ISO 9001:2000 certified Quality Management system from Germanischer Lloyd. Enercon follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, finance, construction, commissioning and operation of the wind power project.

The accuracy of monitoring parameter is ensured by adhering to the calibration and testing of the metering equipment once in three years. Enercon is Operation and Maintenance contractor for the project activity and provides the daily generation report to the Project proponent. The project proponent also maintains the records of daily generation report and joint meter report.

Training and maintenance requirements:

Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the Wind Energy Generators (WEGs), it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that Enercon's service staffs is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. The Enercon Training Academy provides need-based training to meet the training requirements of Enercon projects. The training is contemporary, which results in imparting focused knowledge leading to value addition to the attitude and skills of all trainees. This ultimately leads to creativity in problem solving.

The operational and management structure implemented for data monitoring is as follows:



Action plan for monitoring of 2% CER revenue contributed towards sustainable development

Vaayu (India) Wind Power Corporation Private Limited (VIPCPL) is committed to contribute a minimum of 2% of the CER revenue accrued every year for sustainable development activities for the local population. The table below provides an estimation of the revenue that would be committed every year for sustainable development activities.

Year	Estimation of total emission reduction (tCO_{2e})	Estimated CER Price* (Euro)	Exchange rate (Euro to INR)	Estimation of CER Revenue generated by the project (INR)	Estimation of minimum revenue commitment for sustainable development (INR)
1	106,378	33.00	69.08	242,503,544	4,850,070
2	106,378	33.00	69.08	242,503,544	4,850,070
3	106,378	33.00	69.08	242,503,544	4,850,070
4	106,378	33.00	69.08	242,503,544	4,850,070
5	106,378	33.00	69.08	242,503,544	4,850,070
6	106,378	33.00	69.08	242,503,544	4,850,070
7	106,378	33.00	69.08	242,503,544	4,850,070
8	106,378	33.00	69.08	242,503,544	4,850,070
9	106,378	33.00	69.08	242,503,544	4,850,070
10	106,378	33.00	69.08	242,503,544	4,850,070

Please note that:-

(i) Estimation of CER revenue has been done based on the envisaged price of CER (33 Euro) at the time of revenue realization and the present conversion rate from Euro to INR (1 Euro=69.08 INR.)

(ii) The revenue committed will vary every year as per the actual CERs generated, the CER price that is actually transacted and the prevailing exchange rate at the time of transaction.

VIPCPL will undertake an annual review process of the actual CERs accrued and the price transacted. On the basis of the actual price and exchange rate, VIPCPL will commit 2% of the revenue for sustainable development activities in the local areas.

As part of the annual review, VIPCPL will undertake informal discussions with the locals at the project site and commit the revenue towards society / community developmental activities in areas that are of most concern to the local population. These areas could include health, education, sanitation, skill development, infrastructure development, etc. The annual review process will detail the exact activities that would be undertaken using the 2% revenue and the detailed mode of implementation of the proposed activity.

VIPCPL commits that a CSR team will be appointed to oversee the activities towards sustainable development and also that the activities are undertaken and concluded in a timely manner each year.

SECTION C. Duration and crediting period
C.1. Duration of project activity
C.1.1. Start date of project activity
>>
05/12/2009, being the date of placement of purchase order for the wind energy generators.

C.1.2. Expected operational lifetime of project activity
>> 20 years

C.2. Crediting period of project activity
C.2.1. Type of crediting period
>>
The project proponent has selected the fixed crediting period for the project activity.

C.2.2. Start date of crediting period
>>

01/06/2011, being the expected date of Commissioning of the Project or the date of Project registration with UNFCCC whichever occurs later.

C.2.3. Length of crediting period

10 years and 0 months

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts
>>
As per the Schedule 1 of Ministry of Environment and Forests (Government of India) notification dated January 27, 1994 and EIA Notification (S.O 1533) dated 14th September 2006, a list of activities that require undertaking environmental impact assessment studies[7] has been provided. EIA is not a regulatory requirement in India for wind energy projects and PP does not expect any adverse impacts of the proposed CDM project activity on the environment.

D.2. Environmental impact assessment
>>
The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. Hence, EIA is not required by the host party.

SECTION E. Local stakeholder consultation
E.1. Solicitation of comments from local stakeholders
>>
The comments from local stakeholders were invited through a local stakeholder meeting conducted at Jamnagar District in Gujarat on 9 February 2010. A local newspaper advertisement was placed in Naubat

[7] http://envfor.nic.in/legis/eia/so1533.pdf

on 23 January 2010 inviting the local stakeholders for the meeting. The personal invitations were also sent to the local villagers. The meeting was presided over by Mr. Mayur Dave (EIL-Baroda), Mr. Puneet Katyal (EIL-CDM), Mr. Rohit Joshi (EIL-CDM), Ms Anushree Mishra (EIL-CDM) and Mr. Alpesh Patel (EIL- Jamnagar).

E.2. Summary of comments received

>>

Mr. Mayur Dave welcomed the gathering and introduced the company. Mr. Rohit Joshi briefed the agenda initiative to the stakeholders. Mr. Kanti Bhai village Sarpanch (Chief) of Chattar village was selected as the chairperson of the meeting.

Ms Anushree Mishra briefed about project activity of Vaayu (India) Power Corporation Private Limited (VIPCPL), reasons for setting up the project, costs and benefits of setting up the project and role of project in mitigating the emissions of green house gases in the atmosphere.

Mr Rohit Joshi gave a presentation on global warming and its impacts, Kyoto Protocol, CDM and role of wind power in mitigating the global warming. He invited Mr. Puneet Katyal who explained about the project activity and discussed the benefits of wind power project in the mitigation of global warming.

The Chairperson, Mr. Kanti Bhai appreciated the management of VIPCPL for proposing pollution free technology for power generation. Mr. Mayur Dave then delivered the vote of thanks and appreciated the villagers for their active participation.

The meeting was very cordial and ended on a positive note. No adverse comments were received. Villagers gave suggestion that the panchayat would be taken into loop while implementing the project activity.

The following queries were raised by the stakeholders:

1. Whether VIPCPL shall provide any compensation for Gauchar Land (Land used for grazing)?
2. How **Wind farms would help in mitigating climate change?**
3. Whether the wind projects harm local property values?
4. Whether the electricity generated from this project will be directly fed to the local community?
5. The direct and indirect benefits to them from the proposed project activity?
6. Whether wind turbines move away rain clouds?

E.3. Report on consideration of comments received

>>

The clarifications that were addressed by the representatives of Enercon (Enercon is authorized by the PP to execute all the activities in relation to CDM i.e. project registration and verification including local stakeholder consultation) are listed in the table below:

S.No.	Villager Name	Question	Reply by Enercon representatives
1	Mr. Wali Bhai	Enquired whether VIPCPL shall provide any compensation for Gauchar Land (Land used for grazing)?	There is a provision by Enercon (India) Limited to provide adequate compensation package to the panchayat for the acquisition of Gauchar land.

2	Mr. Nanji Mauji Bhai	Asked how **Wind farms would help in mitigating climate change?**	Wind power is a clean, renewable source of energy, which produces no greenhouse gas emissions or waste products. Fossil fuel based power stations are the largest emitters of carbon dioxide. Hence, shifting from fossil fuel based power generation to renewable sources of power will help in mitigating carbon dioxide emissions and global warming.
3	Mr. Sharad Bipin	Asked whether the wind projects harm local property values?	There would not be any negative impact on the property values due to the presence of wind farms. In fact the development of wind farms will subsequently increase the property value owing to the overall development in the region.
4	Mr. Sardharakantilal	Enquired whether the electricity generated from this project will be directly fed to the local community?	The electricity generated will be supplied to the state electricity grid which further distributes the electricity as per the state policy.
5	Mr. Ramesh Gordhan	Enquired about the direct and indirect benefits to them from the proposed project activity?	The project would generate local job opportunities, which would help in the overall socio-economic development of the region. Additionally, a number of Corporate Social Responsibility initiatives would be undertaken, which would be identified based on the specific needs of the local populace.
6	Mr. Jairamkokul	Enquired whether wind turbines move away rain clouds?	The clouds are much higher than the height of the wind turbines and it is absolutely unlikely that it would cause the problem. This has already been established by various studies undertaken in this aspect.

The meeting was very cordial and ended on a positive note. No adverse comments were received.

SECTION F. Approval and authorization

>>

The letter of approval (Host Country Approval letter) has been submitted to the validating DOE.

- - - - -

Appendix 1: Contact information of project participants

Organization name	Vaayu (India) Power Corporation Private Limited
Street/P.O. Box	Plot No. 33, Daman Patalia Road
Building	
City	Bhimpore
State/Region	Daman (UT)
Postcode	396210
Country	India
Telephone	+91-260-2220624, 2220628
Fax	+91-260-2221508
E-mail	yogesh.mehra@enerconindia.net
Website	
Contact person	
Title	Managing Director
Salutation	Mr.
Last name	Mehra
Middle name	
First name	Yogesh
Department	Corporate
Mobile	+91-98200 40301
Direct fax	+91-260-2221508
Direct tel.	+91-22-22-6702 2832 extn. 7111
Personal e-mail	yogesh.mehra@enerconindia.net

Appendix 2: Affirmation regarding public funding

The project activity does not involve any public funding from parties included in Annex 1.

Appendix 3: Applicability of selected methodology

Please refer section B.2.

Appendix 4: Further background information on ex ante calculation of emission reductions

BASELINE INFORMATION

The Operating Margin data for the most recent three years and the Build Margin data for the NEWNE Grid as published in the CEA database version 5 are as follows:

Simple Operating Margin

	NEWNE Grid (tCO_2e/MWh)
Simple Operating Margin – 2006-07	1.00848
Simple Operating Margin – 2007-08	0.9999
Simple Operating Margin – 2008-09	1.00655
Average Operating Margin of last three years	1.00498

Build Margin

	NEWNE Grid (tCO_2e/MWh)
Build Margin- 2008-09	0.67518

Combined Margin Calculations

	Weights	**NEWNE Grid (tCO_2e/MWh)**
Operating Margin	0.75	1.00498
Build Margin	0.25	0.67518
Combined Margin		0.9225

Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at www.cea.nic.in.

Appendix 5: Further background information on monitoring plan

MONITORING INFORMATION

Meter Reading

- The net electricity supplied to the grid will be taken directly from the share certificate for net electricity generated provided by GETCO.
    - The meter reading is taken jointly at GETCO meters by representatives of Enercon and GEDA/GETCO located at Enercon substation. The GETCO meters are connected to the wind turbines of the project activity and the wind turbines of the other project owners. Therefore GETCO provides the share certificate that apportions the net electricity generated by the project owners.
    - The Cluster meters are provided exclusively to all the project owners having installed wind turbines at the wind farm. The meter readings from these meters are used by GEDA for purpose of apportioning.

Meter Testing

- The main meter at Enercon Substation will be jointly tested & calibrated once in three years.
- If during meter testing the main meter at the Enercon substation is found beyond the permissible limit of error, the meter reading will be taken from the main meter located at the utility (GETCO) substation at Moti Panelli after addition of average historical transmission losses.
- The main meter at utility substation will also be calibrated once in three years.
- All cluster meters which are connected to the Enercon substation will be sealed by GEDA and will also be calibrated once in three years.
- If during meter testing any cluster meter is found beyond the permissible limit of error, the sum of LCS meter reading located at each wind turbine of that cluster will be provided to GEDA for purpose of apportioning net electricity supplied to the grid.
- The LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WEGs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report.
- Billing for the failure Period will be adjusted from the month of preceding test.

Data recording

- The meter recording at the main meter at Enercon substation and the cluster meters of the project activity will be done each month.
- The panel meter (LCS meter) reading is recorded continuously by the online monitoring system.

All the monitored data will be recorded and filed electronically and in hard format for 2 years beyond the crediting period i.e. 10+2 years.

Appendix 6: Summary of post registration changes

There are three post registration changes applied in the project which are as follows:

1. The calibration frequency of the meters has been changed from annually to once in three years for meters at substation (GETCO meter) and cluster meters.
2. The monitoring and organizational structure has been revised.
3. The coordinates of three WECs have been corrected.

Annexure 1:
Calculation on Cost of Equity

Selection of Appropriate Benchmark:

In choosing an appropriate benchmark we have based our approach on the principles of financing and investment decision making that are well found in theory and practice of corporate financing worldwide. We have derived from text book on "Corporate Finance Theory and Practice" by Dr. Aswath Damodaran of Stern School of Business, New York University. Dr. Damodaran is one of the foremost authorities in the world in the field of Investment Analysis.

The guidance to investment analysis issued in EB 51states that in cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR and cost of Equity is appropriate benchmark for equity IRR.

It is also worthwhile to note that the captioned project is a Greenfield wind power generation project that generates and supplies electricity to the state grid, therefore the project cannot have only one possible project developer. The tool for demonstration and assessment of additionality [para-5, sub step 2(b)] states that in such cases (where the project has more than one potential developer) the benchmark cannot be based on internal cost of equity or WACC and shall be based on parameters that are standard in the market, considering the specific characteristics of the project type. Hence, we have not used company or project specific parameters for the calculation of the benchmark.

Risk free rate:

The risk free rate is understood as the rate of return on an asset that is theoretically free of any risks, therefore the yeild rates are considered as risk free rates. Page 188 of text book on "Corporate Finance Theory and Practice" by Dr. Aswath Damodaran[8], Stern School of Business, New York University, describes that the yield rates are suitable indicators of risk free rates when the time horizon for the investment is long term.

Accordingly the risk free rate has been taken from yield rates available at the decision making date. This has been considered as it was in the year of investment (i.e in that year, the company had the alternative of this long term risk free investment). The data on yield rates is published by Reserve Bank of India. (RBI Web-link:

http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/27CT_BUNOV09.pdf

The applicable risk free rate is 7.98%.

Risk Premium:

The most common approach for estimating the risk premium is to base it on historical data, in the CAPM, the premium is estimated by looking at the difference between average return on stocks and risk free return. It is preferred to use long term premimums, i.e over a period of 25 years, since considering shorter time periods can lead to large standard errors because volatility in stock returns [page 191, Corporate Finance Theory and Practice, Dr. Aswath Damodaran]. It is also preferred to calculate the risk premium based on geometric mean of the returns since arithmetic mean overstates the risk premium. Geometric

[8] Dr. Damodaran, one of the foremost authorities in the world in the field of Investment Analysis

mean is defined as the compounded annual return over the same period [page 191, Corporate Finance Theory and Practice, Dr. Aswath Damodaran].

The market return can be calculated from the following available indices: (1) BSE-Sensex, (2) BSE-200 and (3) BSE-500 (4) BSE 100. Minimum market return of the available indices is for BSE 200 and hence conservatively we have used BSE 200 market return for computation of the benchmark.

Therefore the risk premium has been calculated as the difference in compounded annual return bewteen the BSE-200 and the yield rate since the year of inception of BSE 200. The detailed calculations are presented in the attached excel sheet.

The applicable risk premium is 7.58%.

Beta:

Beta (B) indicates the sensitivity of the company to market risk factors. Beta represents the market risk for an asset and is calculated as the statistical measure of volatility of a specific asset/investment relative to the movement of a market group. The conventional approach for estimating beta of an investment is a regression of returns on investment against returns on a market index. For companies that are not publicly listed, the beta is determined by referring beta values of publicly listed companies that are engaged in similar types of business. The project activity type is wind power generation; the approach therefore should be to base the beta for the project on the beta values of listed wind power generation companies in India. Therefore, in the absence of adequate data on companies which are exclusively into the exactly same type of business (i.e wind power projects), the next best option for assessing the risk of these projects is to consider the data available on companies which are involved in similar businesses.

Therefore, we have considered beta values of all major electricity generating companies in India. The group of companies considered includes renewable as well as conventional power generating companies. It is understood that risky businesses are likely to have higher cost of equity than safer businesses; projects in riskier businesses will have to cover these higher costs. Hence, investors demand a higher return from renewable energy projects than from conventional energy ones, given the higher risks in renewable, including risks of technology, risks from significantly varying and unpredictable resource availability (e.g. Wind) and a lower established support base for such projects relative to that for conventional power (e.g. grid connections, bank finance, suppliers, etc.). The use of this Beta value is therefore considered conservative, as it does not add for the higher risk of non conventional energy. The applicable Beta value has been determined on the basis of the Beta values of major power generating companies in India which were listed on the stock exchange at the time of this investment. Beta values of individual companies have been sourced from Bloomberg.

The table below summarises the beta values:

Company Name	Beta
Cese Ltd.	1.11
Gujarat Industries	0.96
Tata Power	1.03
RELI	1.57
Energy Dev	1.19
Average	1.17
Period: Five years upto October 2009 fro Bloomberg	

Beta values are representative of volatility of the stock over the market index. We have considered major players that are active in power sector in India. The values are directly derived from the third party data source (Bloomberg). The average of the beta returns of the power stocks is considered in order to

determine the beta applicable for the project activity. The beta for the various power stocks ranges from 0.96 to 1.57 for Gujarat Industries and Reliance respectively. Therefore we have considered the average beta that will be reflective of the volatility of the power stocks vis-à-vis market index.**Calculation of Benchmark Cost of Equity:**

Cost of Equity:

The expected return on equity has been determined using the Capital Asset Pricing Model (CAPM)[9]. The CAPM economic model is used worldwide to determine the required/expected return on equity based on potential risk of an investment. The CAPM framework is the Nobel award winning work of financial economist Dr. William Sharpe.

Ke = Rf + B x (Rm - Rf)
where:
Ke = Rate of return on equity capital;
Rf = Risk-free rate of return;
B = Beta;
Rm – Rf = Market risk premium;

Cost of Equity = Risk Free Rate + Beta x Market risk premium
= 7.98% + 1.17 x 7.58%
= 16.84%

[9] The Capital Asset Pricing Model (CAPM) was published in 1964 by William Sharpe, for his work on CAPM Sharpe received the Nobel Prize in 1990. http://www.investopedia.com/articles/06/CAPM.asp

Annexure 2

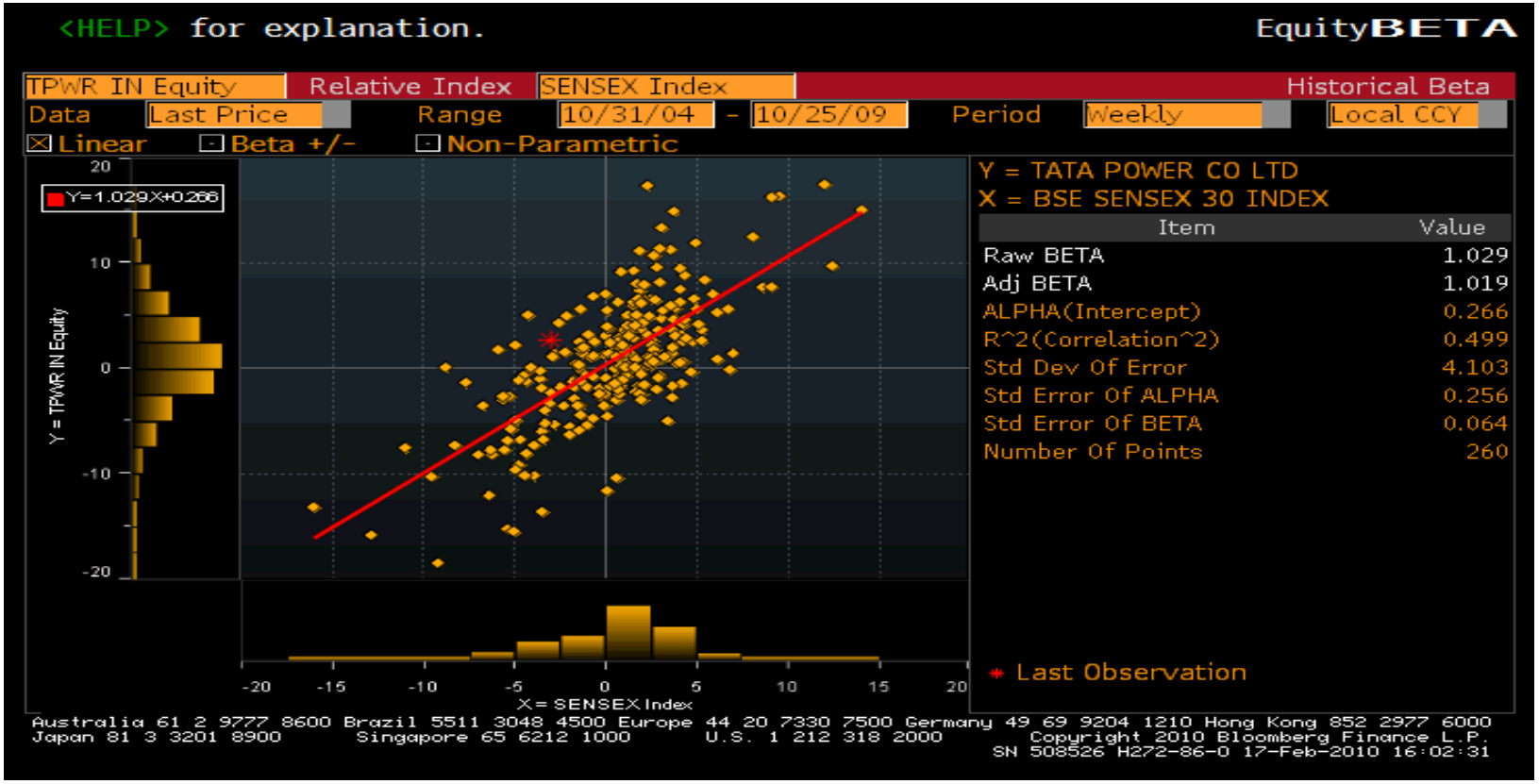
Geo-coordinates of Project Activity

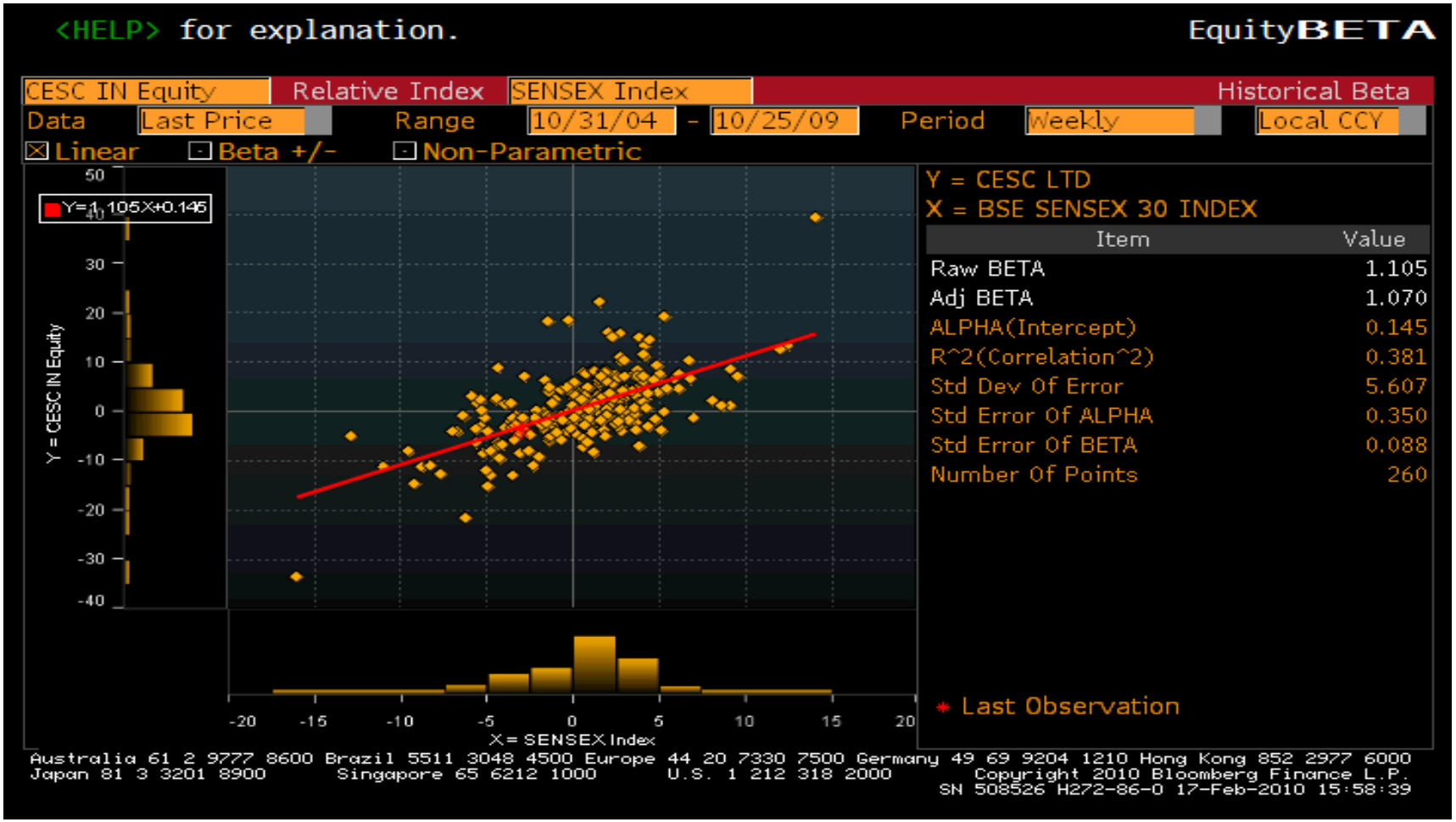
S.No.	Loc No.	Latitude	Longitude	Village
1	62	N22 O 07’ 40.2”	E70 O 15’ 10.7”	Chattar
2	63	N22 O 07’ 46.6”	E70 O 15’00.6”	Chattar
3	64	N22 O 07’ 53.3”	E70 O 14’ 57.1”	Chattar
4	255	N22 O 04’ 33.5”	E70 O 08’ 58.7”	Narmana
5	256	N22 O 04’ 38.7”	E70 O 08’ 58.7”	Narmana
6	525	N22 O 05’ 41.2”	E70 O 08’ 44.9”	Narmana
7	527	N22 O 05’ 32.6”	E70 O 08’ 46.8”	Narmana
8	528	N22 O 05’ 25.1”	E70 O 08’ 48.0”	Narmana
9	535	N22 O 04’ 40.6”	E70 O 05’ 51.9”	Seth Wadala
10	539	N22 O 04’ 46.7”	E70 O 05’ 34.3”	Seth Wadala
11	540	N22 O 04’ 33.3”	E70 O 05’ 43.1”	Seth Wadala
12	541	N22 O 04’ 27.4”	E70 O 05’ 47.6”	Seth Wadala
13	543	N22 O 04’ 17.3”	E70 O 05’ 53.7”	Seth Wadala
14	544	N22 O 04’ 13.5”	E70 O 06’ 00.7”	Seth Wadala
15	545	N22 O 03’ 31.5”	E70 O 05’ 32.6”	Seth Wadala
16	546	N22 O 03’ 40.2”	E70 O 05’ 31.0”	Jam Ambardi
17	547	N22 O 03’ 45.3”	E70 O 05’ 31.9”	Jam Ambardi
18	548	N22 O 03’ 50.7”	E70 O 05’ 34.2”	Jam Ambardi
19	903	N22 O 01’ 23.0”	E70 O 15’ 35.2”	Mevasa/Haripar
20	904	N22 O 01’ 30.2”	E70 O 15’ 41.0”	Mevasa/Haripar
21	905	N22 O 01’ 36.6”	E70 O 15’ 27.2”	Mevasa/Haripar
22	906	N22 O 01’ 30.7”	E70 O 14’ 55.0”	Mevasa/Haripar
23	907	N22 O 01’ 37.9”	E70 O 14’ 56.8”	Mevasa/Haripar
24	908	N22 O 01’ 44.8”	E70 O 14’ 54.1”	Mevasa/Haripar
25	909	N22 O 01’ 51.2”	E70 O 14’ 51.2”	Mevasa/Haripar
26	910	N22 O 01’ 57.7”	E70 O 14’ 55.7”	Mevasa/Haripar
27	912	N22 O 02’ 09.1”	E70 O 15’ 04.4”	Dhun Dhoraji
28	926	N22 O 06’ 57.6”	E70 O 16’ 33.0”	Chattar
29	927	N22 O 06’ 59.3”	E70 O 16’ 23.3”	Chattar
30	928	N22 O 07’ 10.0”	E70 O 16’ 16.5”	Chattar
31	929	N22 O 07’ 15.9”	E70 O 16’ 11.3”	Chattar
32	931	N22 O 07’ 12.7”	E70 O15’ 23.5”	Chattar
33	932	N22 O 07’ 05.5”	E70 O 15’ 27.2”	Chattar
34	933	N22 O 06’ 59.3”	E70 O 15’ 31.5”	Chattar
35	934	N22 O 06’ 53.9”	E70 O 15’ 27.9”	Chattar
36	935	N22 O 06’ 46.0”	E70 O 15’ 22.7”	Chattar
37	936	N22 O 06’ 40.3”	E70 O 15’ 25.7”	Chattar
38	937	N22 O 06’ 32.0”	E70 O 15’ 23.4”	Chattar
39	938	N22 O 06’ 25.7”	E70 O 15’ 22.1”	Chattar
40	939	N22 O 08’ 19.5”	E70 O 19’ 02.3”	Jamvadi
41	941	N22 O 08’ 07.2”	E70 O 18’ 57.8”	Jamvadi
42	942	N22 O 08’ 08.6”	E70 O 19’ 30.2”	Jamvadi

43	943	N22 O 08’ 00.9”	E70 O 19’ 25.4”	Jamvadi
44	944	N22 O 07’ 53.9”	E70 O 19’ 26.0”	Jamvadi
45	945	N22 O 07’49.5”	E70 O 19’ 31.4”	Jamvadi
46	947	N22 O 06’ 04.0”	E70 O 18’ 16.9”	Moti Vavdi
47	948	N22 O 05’ 57.0”	E70 O 18’ 17.8”	Moti Vavdi
48	950	N22 O 05’ 45.7”	E70 O 18’ 21.5”	Moti Vavdi
49	951	N22 O 05’ 38.3”	E70 O 18’ 18.4”	Moti Vavdi
50	952	N22 O 05’ 31.6”	E70 O 18’ 16.9”	Moti Vavdi
51	958	N22 O 02’ 32.4”	E70 O 16’ 42.8”	Dhun Dhoraji
52	959	N22 O 02’ 26.2”	E70 O 16’ 44.6”	Dhun Dhoraji
53	960	N22 O 02’ 19.0”	E70 O 16’ 44.4”	Dhun Dhoraji
54	961	N22 O 02’ 13.0”	E70 O 16’ 44.9”	Dhun Dhoraji
55	992	N22 O 03’ 13.6”	E70 O 10’ 37.3”	Sadodar
56	993	N22 O 03’ 09.5”	E70 O 10’ 40.0”	Sadodar
57	994	N22 O 02’ 59.6”	E70 O 10’ 36.4”	Sadodar
58	995	N22 O 02’ 54.2”	E70 O 10’ 33.5”	Sadodar
59	996	N22 O 02’ 47.4”	E70 O 10’ 22.2”	Sadodar
60	997	N22 O 02’ 41.3”	E70 O 10’ 32.4”	Sadodar
61	1027	N22 O 03’ 12.8”	E70 O 08’ 36.5”	Narmana
62	1028	N22 O 03’ 06.0”	E70 O 08’ 36.9”	Seth Wadala
63	1045	N22 O 08’ 43.4”	E70 O 15’ 11.4”	Bodi
64	1046	N22 O 08’ 48.8”	E70 O 15’ 08.5”	Bodi
65	3017	N22 O 05’ 27.6”	E70 O 19’ 41.5”	Machharda
66	3020	N22 O 06’ 19.0”	E70 O 18’ 45.7”	Machharda
67	3021	N22 O 06’ 23.5”	E70 O 18’ 43.7”	Machharda
68	3022	N22 O 06’ 29.7”	E70 O 18’ 44.6”	Machharda
69	3072	N21 O 57’ 19.6”	E70 O 15’ 05.0”	Padavala
70	3073	N21 O 57’ 14.9”	E70 O 15’ 11.7”	Padavala
71	3075	N21 O 56’43.1”	E70 O 15’ 20.6”	Padavala
72	3076	N21 O 55’ 59.2”	E70 O 15’ 33.7”	Padavala
73	3087	N21 O 56’ 04.5”	E70 O 14’ 18.8”	Padavala
74	3088	N21 O 56’ 19.3”	E70 O 14’ 38.0”	Padavala

*Primarily 74 locations have been identified, out of which 64 would be finally selected during the commissioning of the project. The reason for identifying 74 locations is the uncertain land mass at some of the locations which might be detrimental to laying foundation at those locations.

Annexure 3: The Beta Snapshots

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CESC IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
10/31/04
-
10/25/09
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Y=1.105X+0.145
Y = CESC IN Equity
X = SENSEX Index
Y = CESC LTD
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA 1.105
Adj BETA 1.070
ALPHA(Intercept) 0.145
R^2(Correlation^2) 0.381
Std Dev Of Error 5.607
Std Error Of ALPHA 0.350
Std Error Of BETA 0.088
Number Of Points 260
* Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
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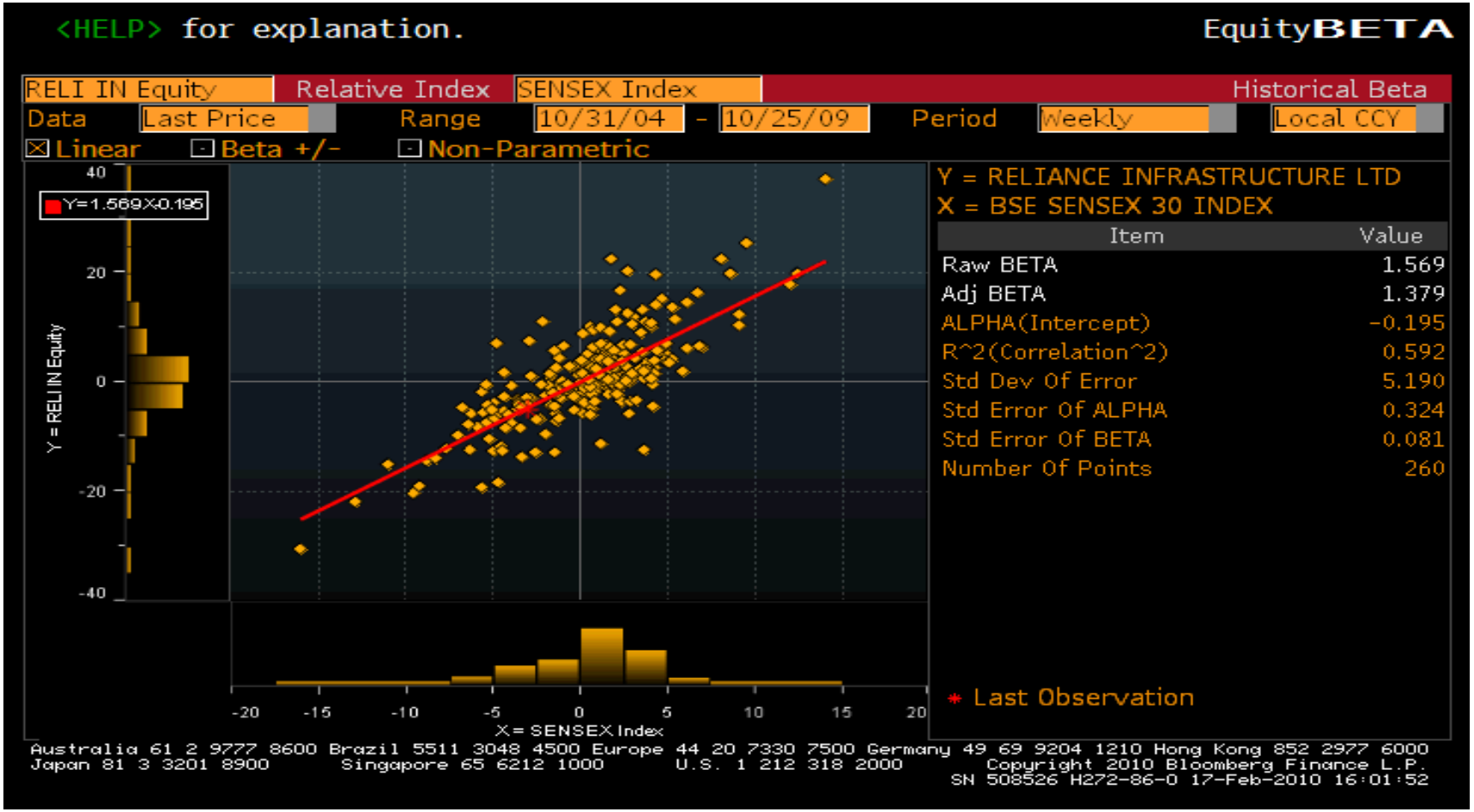
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RELI IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
10/31/04
-
10/25/09
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Y=1.569X-0.195
Y = RELI IN Equity
X = SENSEX Index
Y = RELIANCE INFRASTRUCTURE LTD
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA 1.569
Adj BETA 1.379
ALPHA(Intercept) -0.195
R^2(Correlation^2) 0.592
Std Dev Of Error 5.190
Std Error Of ALPHA 0.324
Std Error Of BETA 0.081
Number Of Points 260
* Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
Copyright 2010 Bloomberg Finance L.P.
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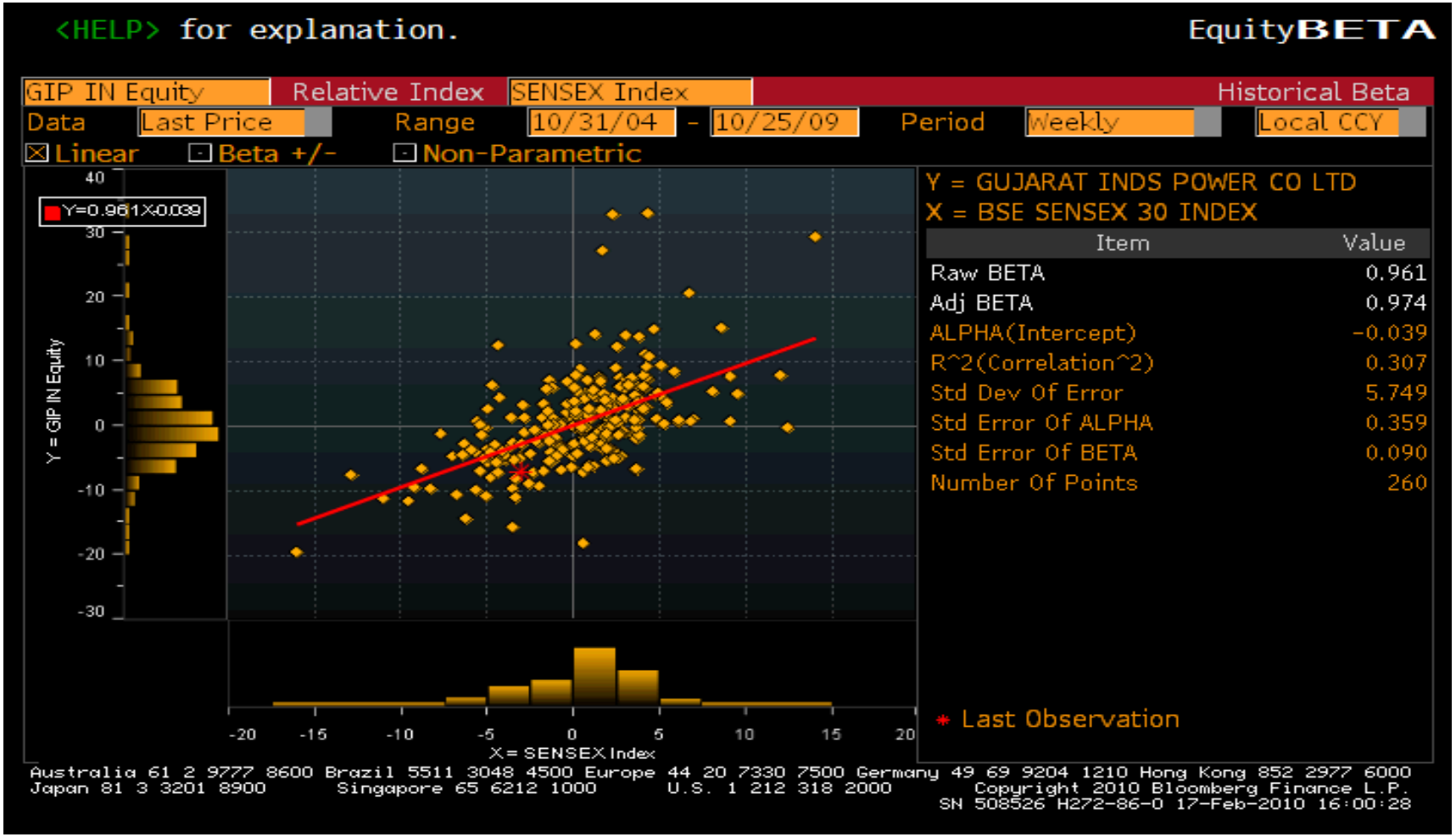
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GIP IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
10/31/04
-
10/25/09
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Y=0.961X-0.039
Y = GIP IN Equity
X = SENSEX Index
Y = GUJARAT INDS POWER CO LTD
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA 0.961
Adj BETA 0.974
ALPHA(Intercept) -0.039
R^2(Correlation^2) 0.307
Std Dev Of Error 5.749
Std Error Of ALPHA 0.359
Std Error Of BETA 0.090
Number Of Points 260
* Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
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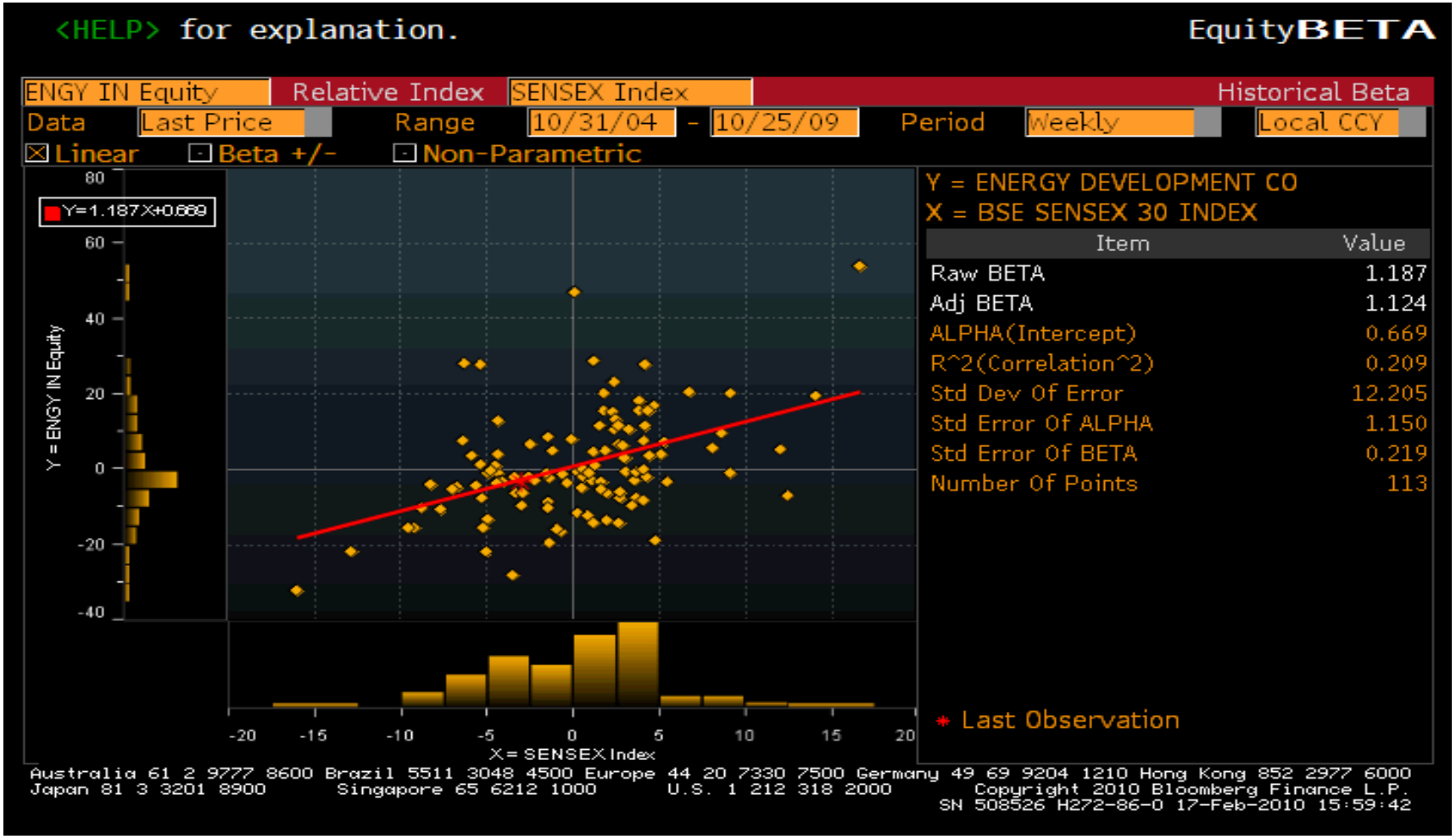
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EquityBETA
ENGY IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
10/31/04
10/25/09
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Y=1.187X+0.669
Y = ENGY IN Equity
X = SENSEX Index
Y = ENERGY DEVELOPMENT CO
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA 1.187
Adj BETA 1.124
ALPHA(Intercept) 0.669
R^2(Correlation^2) 0.209
Std Dev Of Error 12.205
Std Error Of ALPHA 1.150
Std Error Of BETA 0.219
Number Of Points 113
* Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).
03	EB 25, Annex 15 26 July 2006	
02	EB 14, Annex 06b 14 June 2004	
01	EB 05, Paragraph 12 03 August 2002	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		