



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

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

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Title: AES Saurashtra Windfarms

Version: 4.0

Date of completion of PDD: 06/01/2012

A.2. Description of the project activity:

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AES Saurashtra Windfarms Private Ltd. (ASW) plans to develop a 39.2 MW wind farm in the state of Gujarat in India. The project activity will involve development, supply, commissioning and operation of 49 Wind Turbine Generators (WTGs) of rated capacity 800 kW each. The make of the machines used in the wind farm is Enercon E-53. The project activity will produce electricity which shall be supplied to the state electricity utility in the state of Gujarat. The project activity will assist in promoting sustainable development of the region by providing clean energy to the state electricity grid.

Purpose of the project activity:

The purpose of the project activity is to harness renewable wind energy for generation of electricity. The project activity leads to reduction of anthropogenic emissions of greenhouse gases (GHGs) into the atmosphere.

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 fuels¹. On the other hand the electricity generation from operation of WTGs is free from emissions. 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.

Nature of Project

The Project channels renewable resources in the region, thereby displacing non-renewable natural resources and leading to sustainable development. Enercon (India) Limited (“EIL”) will be the EPC contractor for the Project. The Project is owned by AES Saurashtra Windfarms Private Ltd. (ASW). The generated electricity will be supplied to Gujarat Urja Vikas Nigam Limited (GUVNL) under a long-term Power Purchase Agreement (PPA).

Contribution to Sustainable Development

The National CDM Authority (NCDMA) which is the Designated National Authority (DNA) for the Government of India (GoI) in the Ministry of Environment and Forests (MoEF) has stipulated four aspects for sustainable development in the interim approval guidelines for Clean Development

¹ http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm



Mechanism (CDM) projects from India². The proposed project activity contributes to each of these aspects as described below:

1. Social well being:

- The project activity will lead to the development of supporting infrastructure such as road network etc., in the wind park location, the access to which is also provided to the local population.
- The project activity will lead to alleviation of poverty by establishing direct and indirect benefits through employment generation and improved economic activities by strengthening of local grid of the state electricity utility.
- The project activity requires temporary and permanent, skilled and semi-skilled manpower at the wind park; this will create additional employment opportunities in the region

2. Environmental well being:

- The project activity employs renewable energy source for electricity generation instead of fossil fuel based electricity generation which would have emitted gaseous, liquid and/or solid effluents/wastes.
- Being a renewable resource, using wind energy to generate electricity contributes to resource conservation. Thus the project causes no negative impact on the surrounding environment and contributes to environmental well-being.

3. Economic well being:

- The use of a renewable energy source reduces the nation's dependence on imported fossil fuels and associated price variation thereby leading to increased energy security.
- The generated electricity will be fed into the NEWNE grid through local grid, thereby improving the grid frequency and availability of electricity to the local consumers (villagers & sub-urban habitants) which will provide new opportunities for industries and economic activities to be setup in the area thereby resulting in greater local employment, ultimately leading to overall development.

4. Technological well being:

- Increased interest in wind energy projects will further push R&D efforts by technology providers to develop more efficient and better machinery in future.

In addition to this, the Project Participant (PP) will contribute 2% of the CDM revenue realized from the candidate CDM project for sustainable development including society / community development. The Project Participant is aware of the Indian DNA guideline on commitment of 2% of the CDM revenues towards sustainable development and a formal undertaking will be submitted separately.

² <http://envfor.nic.in/cc/cdm/criteria.htm>

**A.3. Project participants:**

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Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host)	AES Saurashtra Windfarms Private Ltd.	No

The contact details of the entities are provided in Annex – 1.

A.4. Technical description of the project activity:**A.4.1. Location of the project activity:**

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A.4.1.1. Host Party (ies):

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India

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

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Western Region/ Gujarat State

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

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The project is located at the following locations in the state of Gujarat, India:

District	Taluka	Village
Jamnagar	Kalyanpur	Chachlana
Jamnagar	Kalyanpur	Jodhpar
Jamnagar	Kalyanpur	Hadmatiya
Jamnagar	Dwarka	Gorinja
Jamnagar	Dwarka	Vachhu
Jamnagar	Kalyanpur	Virpur Gangadi
Jamnagar	Kalyanpur	Lamba
Jamnagar	Kalyanpur	Hadmatiya
Jamnagar	Dwarka	Kurunga
Jamnagar	Dwarka	Okhamadhi



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

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The details of the physical location of the project activity in Jamnagar district are mentioned in the table below:

S.No.	Loc. No.	Latitude			Longitude			Survey No.	Village	Taluk
		Deg .	Min utes	Sec onds	Deg .	Min utes	Seco nds			
1	CH-01	21	53	59.2	69	22	37.8	416/1	Chachlana	Kalyanpur
2	CH-02	21	54	6.3	69	22	35.7	416/1	Chachlana	Kalyanpur
3	CH-03	21	54	13.6	69	22	23.1	416/1	Chachlana	Kalyanpur
4	CH-04	21	54	19.0	69	22	18.6	416/1	Chachlana	Kalyanpur
5	CH-05	21	54	28.5	69	22	16.0	416/1	Chachlana	Kalyanpur
6	CH-06	21	54	33.4	69	22	12.0	416/1	Chachlana	Kalyanpur
7	CH-07	21	54	40.8	69	22	11.0	416/1/P1	Chachlana	Kalyanpur
8	CH-09	21	54	48.4	69	21	55.7	416/1	Chachlana	Kalyanpur
9	CH-15	21	54	56.0	69	21	43.3	416/1/P1	Chachlana	Kalyanpur
10	JO-44	21	59	52.2	69	17	22.6	38	Jodhpar	Kalyanpur
11	JO-45	21	59	43.6	69	17	27.2	38	Jodhpar	Kalyanpur
12	JO-54N	21	58	59.3	69	17	44.7	8/1/P2	Jodhpar	Kalyanpur
13	JO-58	21	59	28.3	69	17	24.0	69/P1/P1	Jodhpar	Kalyanpur
14	JO-74	22	0	22.1	69	16	45.3	182/1	Hadmatiya	Kalyanpur
15	JO-75	22	0	33.8	69	16	59.8	182/P4/P1	Hadmatiya	Kalyanpur
16	GO-01	22	8	19.6	69	3	19.4	181/P1	Gorinja	Dwarka
17	GO-02	22	8	26.3	69	3	17.6	181/P1	Gorinja	Dwarka
18	GO-03	22	8	34.8	69	3	19.1	181/P1	Gorinja	Dwarka
19	GO-04	22	8	39.1	69	3	11.0	181/P1	Gorinja	Dwarka
20	GO-05	22	9	0.6	69	3	17.6	181/P1	Gorinja	Dwarka
21	GO-06	22	8	53.2	69	3	17.7	181/P1	Gorinja	Dwarka
22	GO-07	22	8	47.1	69	3	23.2	181/P1	Gorinja	Dwarka
23	GO-08	22	8	41.4	69	3	28.4	181/P1	Gorinja	Dwarka
24	GO-09	22	8	35.8	69	3	33.5	181/P1	Gorinja	Dwarka
25	GO-10	22	8	29.8	69	3	39.0	181/P1	Gorinja	Dwarka



26	GO-12	22	8	50.2	69	3	43.2	181/P1	Gorinja	Dwarka
27	GO-11	22	8	56.5	69	3	38.9	181/P1	Gorinja	Dwarka
28	GO-16	22	9	46.5	69	2	4.4	278/P1	Gorinja	Dwarka
29	VA-17	22	9	52.7	69	1	59.0	351/P1	Vachhu	Dwarka
30	VG 414	21	52	52.2	69	21	40.3	180/P1	Virpur Gangadi	Kalyanpur
31	VG 415	21	53	0.7	69	21	26.6	180/P1	Virpur Gangadi	Kalyanpur
32	VG 416	21	52	55.8	69	21	5.4	180/P1	Virpur Gangadi	Kalyanpur
33	VG 422	21	53	36.7	69	20	46.3	19 P	Virpur Gangadi	Kalyanpur
34	VG 423	21	53	48.6	69	20	51.0	19 P	Virpur Gangadi	Kalyanpur
35	VG 424	21	53	59.7	69	20	50.6	19 P	Virpur Gangadi	Kalyanpur
36	VG 426	21	54	9.5	69	20	50.5	19 P	Virpur Gangadi	Kalyanpur
37	LA 448	21	54	53.3	69	17	58.1	415/1/2	Lamba	Kalyanpur
38	LA 456	21	55	22.7	69	18	46.3	30/P1	Lamba	Kalyanpur
39	HA 551	22	1	2.7	69	18	27.6	182/P1	Hadmatiya	Kalyanpur
40	HA 552	22	0	48.3	69	18	27.2	182/P1	Hadmatiya	Kalyanpur
41	HA 553	22	0	40.4	69	18	28.0	182/P1	Hadmatiya	Kalyanpur
42	HA 554	22	0	38.8	69	18	42.4	182/P1	Hadmatiya	Kalyanpur
43	JO 750	21	58	14.9	69	17	26.4	144/P7	Jodhpar	Kalyanpur
44	KU 742	22	3	38.1	69	9	19.1	125/1	Kurunga	Dwarka
45	KU 743	22	3	43.3	69	9	12.4	125/1	Kurunga	Dwarka
46	OK 744	22	5	3.0	69	7	8.7	24 P	Okhamadhi	Dwarka
47	OK 745	22	5	20.2	69	6	42.6	131 P	Okhamadhi	Dwarka
48	OK 746	22	5	25.3	69	6	35.2	131 P	Okhamadhi	Dwarka
49	OK 747	22	5	30.0	69	6	32.0	131 P	Okhamadhi	Dwarka

The nearest airport is in Porbander which is located at a distance of 77 km from Gorinja village and 38 km from Chachlana village.

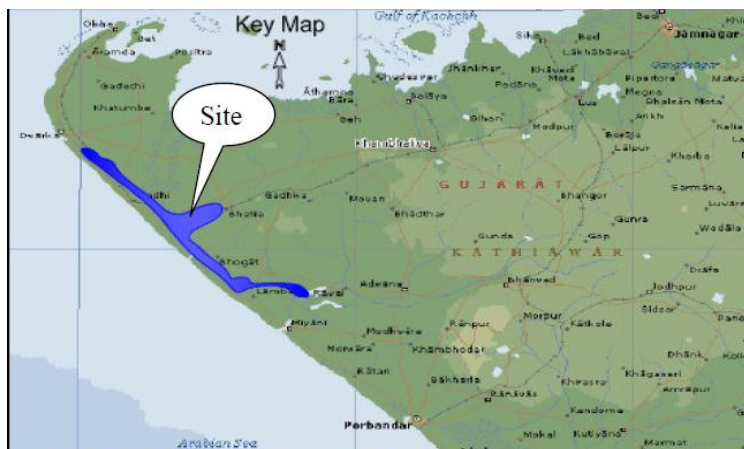


Location map of India



Location map of Gujarat state showing project site





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

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The project activity is considered under CDM category zero-emissions ‘**grid-connected electricity generation from renewable sources**’ that generates electricity in excess of 15 MW (limit for small scale project). Therefore as per the scope of the project activity enlisted in the ‘list of sectoral scopes and related approved baseline and monitoring methodologies’, the project activity may principally be categorized in **Scope Number 1, Sectoral Scope - Energy industries (renewable/ non-renewable sources)**.

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

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The project activity involves the installation and operation of 49 Enercon 800 kW, E-53 WTGs, to generate power which is transmitted via internal electrical lines to the local power evacuation facility from where the power is distributed for use. 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 WTG 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	Direct driven, horizontal axis wind turbine with variable rotor speed
Power regulation	Independent pitch system for each blade
Cut in wind speed	3 m/s
Rated wind speed	12.6 m/s



Cut out Wind speed	28 m/s
Extreme Wind Speed	59.5 m/s
Rated rotational speed	29 rpm
Operating range rot. speed	11-29.5 rpm
Orientation	Upwind
No of Blades	3
Blade Material	Fiber Glass Epoxy reinforced
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
Tower	74 m concrete

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 fuels³, 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.4.4. Estimated amount of emission reductions over the chosen crediting period:

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The estimated emission reductions over the 10 year fixed crediting period would be 803,850 tCO₂e as per details on annual emission reductions provided below:

Years	Annual estimation of emission reductions in tonnes of CO₂e
Year 1 ⁴	80,385
Year 2	80,385
Year 3	80,385
Year 4	80,385
Year 5	80,385
Year 6	80,385
Year 7	80,385
Year 8	80,385
Year 9	80,385
Year 10	80,385
Total estimated reductions (tonnes of CO ₂ e)	803,850

³ http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

⁴ Year 1 starts from 01/03/2012 or date of submission for “Request For Registration” to UNFCCC, whichever is later. Each year extends for 12 months.



Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO ₂ e)	80,385

A.4.5. public funding of the project activity:

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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 a baseline and monitoring methodology

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

>> **Title:** “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”

Reference: Approved consolidated baseline methodology ACM0002 (Version 12.2.0, EB 65)

ACM0002 (Version 12.2.0, EB 65) draws upon the following tools which have been used in the PDD:

- Tool to calculate the emission factor for an electricity system – Version 2.2
- Tool for the demonstration and assessment of additionality – Version 5.2.1

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

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

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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 to the NEWNE grid by the operation and expansion of the fossil fuel based power plants.

The approved consolidated baseline and monitoring methodology ACM0002 (Version 12.2.0, EB 65) is the relevant baseline and monitoring methodology and it is applicable because:

Para No.	Applicability Conditions as per ACM0002 (Version 12.2.0, EB 65)	Applicability to this Project Activity
1.	The project activity is the installation, capacity addition, retrofit or replacement of a power	The project activity is installation of wind power plant at locations where no renewable



	<p>plant/unit of one of the following types:</p> <ul style="list-style-type: none"> • 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. 	power plant was operated prior to the implementation of the project activity (greenfield plant).
2.	In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition project which 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;	This condition is not applicable as the project activity does not involve capacity additions, retrofits or replacements.
3.	<p>In case of hydro power plants:</p> <ul style="list-style-type: none"> • 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 applicable as the project activity does not involve the installation of a hydro power plant.
4.	<p>The methodology is not applicable to the following:</p> <ul style="list-style-type: none"> • 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; 	The project activity does not involve any of the given criteria.



	<ul style="list-style-type: none"> 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/m². 	
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 maintenance”.	The project activity involves the installation of a new wind power plant. Hence, this criterion is also not relevant to the project activity.

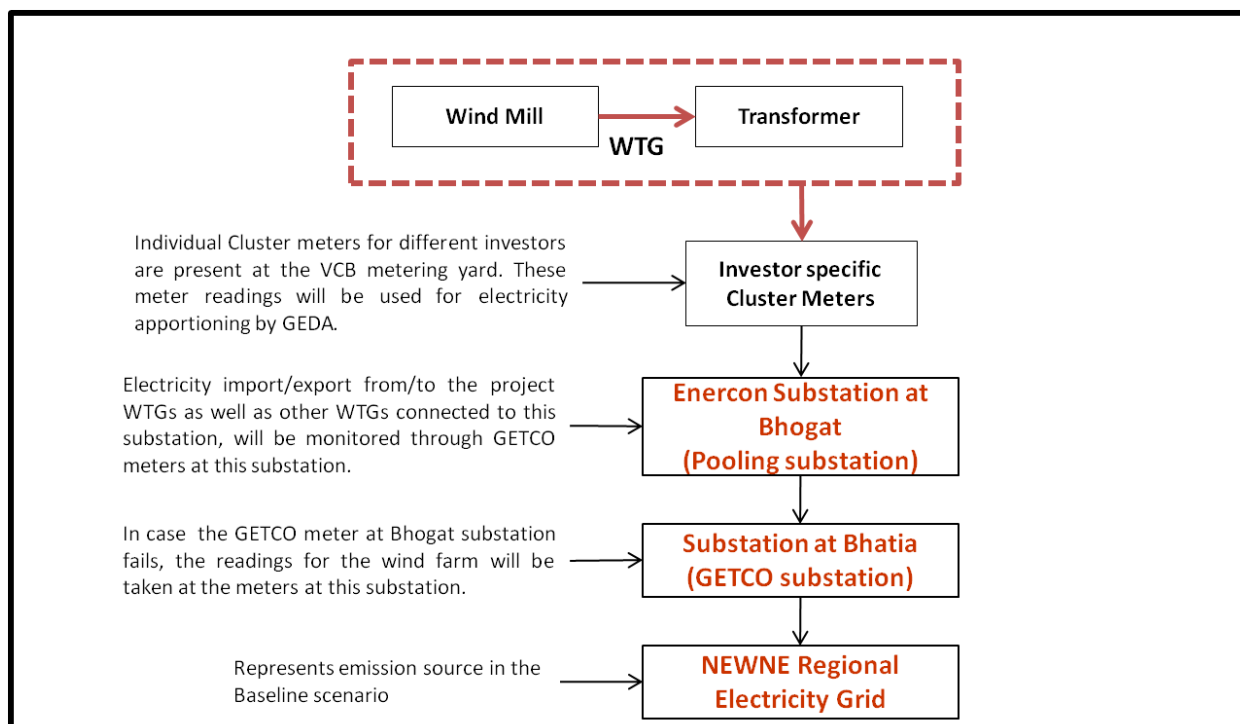
The description provided in the table above shows that the project activity satisfies the applicable conditions of the methodology, ACM0002 (Version 12.2.0, EB 65).


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


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According to the applicable methodology, spatial extent of this project activity includes the project site and all the power plants connected physically to the electricity system connected to the CDM power project. The project activity is connected to the network of state transmission utility which falls in NEWNE grid. Thus the project boundary includes all the power plants physically connected to the NEWNE grid.

Flow diagram of the project boundary:



 Illustrates 49 WTG units in the project activity as well as units of other project owners

 Represents project boundary

The baseline study of NEWNE grid shows that the main sources of GHG emissions in the baseline are CO₂ emissions from the conventional power generating systems, the other emissions are that of CH₄ and N₂O but both emissions were negligible and are excluded for simplification of the project. The project activity is the emission free electricity generation from renewable sources and hence emits no gases in the atmosphere.

Following table indicates the sources and gases included in the 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 ₂ O	No	No nitrous oxide generation is expected to be emitted.
Project Activity	Greenfield wind energy conversion	CO ₂	No	The project activity does not emit any emissions.
		CH ₄	No	No methane generation is expected to be emitted.



	system	N ₂ O	No	No nitrous oxide generation is expected to be emitted.
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B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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According to ACM0002 (Version 12.2.0, EB 65), page 4, “Identification of the baseline scenario,” if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

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

As the Project activity is a new greenfield wind power plant, the baseline scenario is the emissions generated by the operation of existing 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 geographical scope of India electricity grid system is described in the table below:

S.No.	Electricity Grid (Present)	Electricity Grid (Earlier)	Geographical Areas Covered
1.	NEWNE Grid	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, 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 stations⁵; as can be seen from the table below⁶:

Sector	Hydro (MW)	Thermal (MW)				Nuclear (MW)	Renewable (MW)	Total (MW)
		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 comprises of thermal power plants using fossil fuels; thermal power generation is GHG intensive and is a major source of CO₂ 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 electricity exported by the project activity to the NEWNE grid with the emission factor of the NEWNE grid calculated as the combined margin (CM) of the operating margin (OM) and build margin (BM) emission factors.

Variable	Data Source
$EG_{PI,y}$ = 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 Participant
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 (tCO ₂ /MWh)	CEA Database for CO ₂ emission factor, version 5
EF_y – Grid Emission Factor	Calculated as the weighted average of the operating margin and build margin

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

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⁵ <http://www.cea.nic.in/>

⁶ http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm



The project activity has been conceived as a CDM project since its inception. The Project Participant (PP) notified the UNFCCC and the DNA on 23rd September 2010 about the project activity initiative which is prior to the project start date of 22nd October 2010, and hence meets the CDM prior consideration criteria of sending out the intimation within six months of the start date.

The latest Additionality tool i.e. Tool for the demonstration and assessment of Additionality version 5.2.1 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 (Version 12.2.0, EB 65), 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. This option will not require capital investment. Hence investment comparison analysis (option II) cannot be applied.

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

Appropriateness of financial indicator

IRR is a widely accepted financial metric used by many corporations and financial institutions for investment decision-making and is a long-established benchmark for investment decisions in the Indian power sector. Hence the post tax IRR is chosen as the appropriate financial indicator for carrying out the investment analysis.

Appropriateness of Benchmark



The project is a greenfield wind electricity generation project. In accordance with the guidance on assessment of investment analysis (version 05.0) Para 13, EB 62 Annex 05, the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on publicly available data sources which can be clearly validated by the DOE. Accordingly, the external benchmark has been calculated using publically available financial data that is applicable at the time of investment decision making. As per Para12 EB51 Annex 58, return on equity is an appropriate benchmark for equity IRR accordingly same has been considered.

Calculation of Benchmark

The cost of equity has been calculated as per the Capital Asset Pricing Model method. The benchmark has been calculated as follows:

$$K_e = R_f + B \times (R_m - R_f)$$

Where: K_e = Rate of return on equity; R_f = Risk-free rate of return; B = Beta; R_m = Market return

The benchmark Cost of equity hence calculated for the project is calculated as **16.23 %**.

Further details of the benchmark computation have been provided in Annex 5.

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

The decision to invest in the project activity was taken on 14th of July 2010 vide Board resolution of AES Saurashtra Windfarms Private Limited. The board resolution acknowledged that the project does not generate enough returns without considering CDM revenue and the approval for investment in the project has been given upon considering CDM revenue in the cash flows. The board note specifies applicable input parameters available to ASW.

Key assumptions used for calculating post-tax Equity IRR applicable at the time of investment decision, which is in line with para6 of EB51 Annex 58 are set out below:

Assumptions for Financial Model		Basis
Capacity of Machines in kW	800	MoU with EIL
Number of Machines	49	MoU with EIL
Project Capacity in MW	39.20	MoU with EIL
Expected project commissioning date	01-Jul-11	ASW Assumption
Project Cost per MW (Rs. In Millions)	63	Lender's Term sheet
Operations		
PLF	25.38%	Lender's assumption
Generation Based Incentives		
GBI Rs./kWh	0.50	Operational Guidelines for Implementation of "Generation Based Incentive" for Grid Connected Wind Power Projects by IREDA
GBI yearly cap Million INR	60.76	GBI Guidelines
GBI Total Cap Million INR	243.04	GBI Guidelines
Insurance Charges @ % of capital cost	0.13%	Normative as per quotations
Operation & Maintenance Cost base	1.32%	MoU with EIL



year @ % of capital cost		
% of escalation per annum on O & M Charges	5%	MoU with EIL
Tariff		
Base year Tariff fixed for the lifetime of the project - Rs./KWh	3.56	GERC Tariff Order 30.01.2010 applicable at time of investment decision
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	2,468	Lender's Term sheet
Means of Finance		
	INR Million	
Own Source	864 (35%)	Lender's Term sheet
Term Loan	1,604 (65%)	Lender's Term sheet
Total Source	2,468	
Terms of Loan		
Interest Rate	10.75%	Lender's Term sheet
Tenure (years)	13.25	Lender's Term sheet
Income Tax Depreciation Rate (SLM)		
on Wind Energy Generators	7.69%	Income Tax Act
Book Depreciation Rate (SLM)		
Book Depreciation up to (% of asset value)	95%	Companies Act
Salvage Value	5%	Companies Act
Income Tax		
Income Tax rate	33.22%	Income Tax Act
Minimum Alternate Tax	19.93%	Income Tax Act
Working capital		
Receivables (no of days)	30	GERC Tariff Order 30.01.2010 applicable at time of investment decision



O & m expenses (no of days)	30	GERC Tariff Order 30.01.2010 applicable at time of investment decision
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Plant Load Factor: As per EB 48, annex 11, the plant load factor provided to banks and/or equity financiers while applying the project activity for project financing can be used for investment analysis. Accordingly, the plant load factor for the project site has been taken as 25.376%.

The post tax equity IRR for the Project without CDM revenues is 6.96% i.e. less than the benchmark.

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

Sensitivity Analysis

As per the Guidance to investment analysis Version 05.0 (EB 62, Annex 05) para 20 “Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets”

The critical parameters to which the project activity is sensitive are mentioned below:

- Capital Cost
- Plant Load Factor
- O&M cost
- Tariff

Rest all other parameters have less than 20% impact on the project revenues/project expenses, so their impact on project IRR is very insignificant and hence these parameters have not been considered for sensitivity analysis. A detailed explanation of the range of values of parameters considered for the sensitivity analysis is presented below:

Capital Cost

The project cost taken in the investment analysis is based on the final negotiated price offer (as per the MoU signed) of EIL and therefore variation from the fixed price is not expected. However, in accordance with the Guidance on assessment for investment analysis the sensitivity has been conducted at a variation $\pm 10\%$ of the project cost.

	10% decrease in Capital Cost	Capital Cost (Base)	10% increase in Capital Cost
Post tax Equity IRR	9.70%	6.96%	4.49%

Plant Load Factor



Plant Load Factor is the key variable encompassing variation in wind profile. Sensitivity has been conducted for a variation of $\pm 10\%$ over the base case.

	PLF @ 22.84%(10% decrease)	PLF @ 25.376%(Base PLF estimated)	PLF @ 27.91%(10% increase)
Post tax Equity IRR	4.30%	6.96%	9.22%

O&M Cost

The O&M cost taken in the investment analysis is based on the final negotiated price offer (as per the MoU signed) of EIL and therefore variation from the fixed O&M price is not expected. However, in accordance with the Guidance on assessment for investment analysis the sensitivity in O&M cost has been conducted for a variation of $\pm 10\%$ over the base case.

	10% decrease in O&M cost	O&M Cost (Base)	10% increase in O&M cost
Post tax Equity IRR	7.29%	6.96%	6.63%

Tariff

As per Gujarat Electricity Regulatory Commission (GERC) Tariff Order dated 30.01.2010 applicable at time of investment decision, tariff for entire lifetime of wind power projects has been fixed at Rs. 3.56 per Unit. Therefore sensitivity on tariff is not applicable.

Even though the tariff is fixed for the lifetime of the project the sensitivity analysis has been carried out at $\pm 10\%$ variation over base case and the results are presented below

	10% decrease in Tariff	Base Tariff	10% increase in tariff
Post tax Equity IRR	4.32%	6.96%	9.19%

The sensitivity analysis clearly shows even with a 10% variation in key parameters, the project is not able to generate sufficient returns. It can therefore be concluded that the project is financially not viable without CDM benefits.

Sensitivity analysis has been performed for the parameters to analyse the value at which they cross the benchmark. The results are tabulated below:

Parameter	Equity IRR %
Plant Load Factor @ 34.97% (37.8% higher than base PLF)	16.23
O&M Expenses @ Nil (100% reduction)	9.59
Capital cost @ 1846 Million (25.2% reduction)	> 16.23



in capital cost)	
Tariff @ INR 4.94 (38.8% higher than base tariff)	> 16.23

The Equity IRR crosses the benchmark at PLF of 34.697% which is 37.8% higher than the estimated base PLF, which is highly unlikely scenario. The probability of occurrence of such a high annual PLF is very low.

The Equity IRR crosses the benchmark at Tariff of INR 4.94 which is 38.8% higher than the base Tariff, which is highly unlikely scenario as in the PPA the tariff is fixed for the lifetime of the project.

The Equity IRR does not cross the benchmark even if O&M expenses are taken to be nil.

The Equity IRR crosses the benchmark at a reduced capital cost of INR 1846 million which is a 25.2% reduction from the base value. This is also a very unlikely scenario as the price has been taken on the basis of the final negotiated price offered by EIL.

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 5.2.1 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 following project types have been excluded from the further analysis.

<i>Project type</i>	<i>Justification</i>
Small scale wind power project activities bundled together from a large scale CDM project	The scale of investment is not comparable to the project activity under consideration. This also does not include the projects undertaken by a single investor under different purchase orders over the period.
CDM Project activities	Projects which are under the CDM pipeline have to be excluded as per the guidance provided by the tool for demonstration and assessment of additionality.
Project activities implemented post the start date of the project activity	As per the guidance, only those projects can be compared which are under operation prior to the start of the proposed project activity by AES.
Project activities implemented in different regulatory regime i.e. prior to 2002	PP has excluded those projects which have been implemented under different regulatory regime. Broadly the regulatory regime in Gujarat can be classified into a) Regime 1 – Central regime (MNES policy)



	<ul style="list-style-type: none"> a. Projects installed prior to 2002 b. Wind power projects were governed by MNES policy with tariff set at Rs. 2.25 per unit for the base year 1994-95 with a 5% annual escalation, wheeling and banking charges of 2%, etc. <p>b) Regime 2 – State regime (State Government and State Electricity regulatory Commission policies / orders)</p> <ul style="list-style-type: none"> a. Projects installed after 2002 b. Tariff as per specific orders / policies of the state bodies <p>This project activity falls under category (b) i.e. the state regime where the tariff is determined by the applicable GERC tariff order.</p>
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As per the definition given in the additionality tool, all project activities which are of a similar scale (more than 15 MW) and in a similar regulatory environment (in the state of Gujarat post 2002) whose data was available prior to start of the ASW wind project, have been considered for carrying out the Common Practice Analysis.

As per the latest data available on wind farm owners in India at start of the project, there are 114 individual investors who have wind installations greater than 15 MW (in any state)⁷. The list of wind power investors was analysed using the Directory on Indian Wind Power⁸ to identify the state-wise aggregate installed capacity for the investors. From the aggregate installed capacity for each investor in Gujarat, specific project activities greater than as well as lesser than 15 MW were identified using publicly available information sources such as UNFCCC website and Directory on Indian Wind Power. It was seen that there are 16 investors who have wind project activities greater than 15 MW in the state of Gujarat. An analysis of all these project activities greater than 15 MW in the state of Gujarat has been presented in the table below.

S.No	Name of Owner	Similar Project activities (> 15 MW, in Gujarat, post 2002)	CDM	Web-links and Explanation
1	DLF Limited	150 MW project	Yes	150 MW WTG Installations are in PDD titled "150 MW grid connected Wind Power based electricity generation project in Gujarat, India". The project activity has been registered on 18-Jun-2009. Web-link - http://cdm.unfccc.int/Projects/DB/BVQI1229917560.71/view
2	HZL	88.8 MW project	Yes	88.8 MW WTG Installations are in PDD titled "Wind power project by HZL in Gujarat". The project activity has been registered on 15-Jan-2009. Web-link - http://cdm.unfccc.int/Projects/DB/BVQI1211956663.14/view

⁷ http://www.windpowerindia.com/index.php?option=com_content&view=article&id=21&Itemid=26 which gives details of all wind power investments greater than 15 MW in India

⁸ Directory of Indian Wind Power 2009, 9th Edition, Publisher/ Author - CECL (Consolidated Energy Consultants Ltd.), Year of Publishing - 2009



3	Gujarat NRE Coke Limited	1) 26.25 MW project 2) 60 MW project	Yes	WTG Installations are in two CDM PDDs 1) 26.25 MW is under PDD titled "26.25 MW wind electricity generation project of Gujarat NRE Coke Limited at Jamnagar and Kachchh" Web-link - http://cdm.unfccc.int/Projects/Validation/DB/2WHFROEPK85ARNQ1TVKJV4WC8ATMAB/view.html 2) 60 MW is under PDD titled "GHG abatement project through wind based energy generation, in Kutch, Gujarat" Web-link http://cdm.unfccc.int/Projects/Validation/DB/3XJDEJWIXD7AE8K5O7RYT5HU1CV2HB/view.html
4	GACL	1) 23.75 MW project 2) 39 MW project	Yes	WTG Installations are in the CDM PDDs 1) 23.75 MW is under PDD titled "Grid-connected electricity generation from 23.75MW wind energy by GACL in Gujarat" Web-link - http://cdm.unfccc.int/Projects/Validation/DB/PLJVAOHCZK3WX6GN4QGVVAH8C3MGAYP/view.html 2) 39 MW is under PDD titled "Grid-connected electricity generation from 39 MW wind energy by GACL in Gujarat" Web-link - http://cdm.unfccc.int/Projects/Validation/DB/CBEZRP9HZI993GZEUKGZF6JOGZJB45/view.html
5	ONGC	51 MW project	Yes	51 MW WTG installations are in PDD titled "51 MW wind power project of ONGC at Surajbari, Gujarat in India". The project activity has been registered on 01 March 2010. Web-link - http://cdm.unfccc.int/Projects/DB/DNV-CUK1249377814.84/view
6	Gujarat Paguthan Energy Corp.Ltd.	50.4 MW project	Yes	50.4 MW WTG Installations are part of CDM PDD titled "Wind based renewable energy project in Gujarat". The project activity has been registered on 13-Feb-2010. Web-link - http://cdm.unfccc.int/Projects/DB/RWTUV1250689673.15/view
7	Gujarat Gardian Limited	23.2 MW project	Yes	23.2 MW WTG Installations are part of CDM PDD titled "Gujarat Gardian wind power project in the State of Gujarat managed by EIL India Limited" spread across villages in Satapar, Kuranga and Bamnasa of Jamnagar District of Gujarat state in India" Web-link - http://cdmindia.nic.in/cdmindia/projects/PCN_696_07.pdf (no longer functional) and http://www.infraline.com/power/RenewableEnergy/CDM/ProjectList.aspx?AspxAutoDetectCookieSupport=1 (functional)
8	Patnaik Minerals Pvt Ltd	30.4 MW project	Yes	WTG Installations are part of CDM PDD "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



9	MSPL GROUP	30 MW project	Yes	30 MW WTG Installations are part of CDM PDD titled "30 MW wind power project at Surajbari, Gujarat in India". The project has been registered on 17-Jan-2011. Web-link - http://cdm.unfccc.int/Projects/Validation/DB/L59OGCJY0XLZUC0W8MMB84A2T4NKNX/view.html
10	Tata Power Company Limited	29.6 MW project	Yes	29.6 MW WTG installations are part of CDM PDD titled "Tata Power - Wind power project at Samana in Jamnagar district, Gujarat" Web-link - http://cdm.unfccc.int/Projects/Validation/DB/V3VLCQGE9AP9TX41VS9FJI8UKLMBOA/view.html
11	SREI	24.8 MW project	Yes	24.8 MW WTG Installations are part of 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
12	IOCL	21 MW project	Yes	21 MW WTG Installations are part of PDD titled "21 MW Wind Power Project by Indian Oil Corporation Limited in Gujarat" http://cdm.unfccc.int/Projects/Validation/DB/6F92LAJ7ZAGAUDLEMLPC5CKL8KKDS5/view.html
13	Aarvee Denims & Exports Ltd.	18 MW project	Yes	18 MW WTG Installations are part of PDDs titled "18 MW Wind Power Project in Kutch (Gujarat in India) managed by Aarvee Denims & Exports Ltd." http://cdm.unfccc.int/Projects/Validation/DB/FLUB2VU6RT4P2MU7QAE0L176AYBVLX/view.html
14	GSEC (ELECTRIC)	20 MW project	Yes	There are several references that state that CDM development for the project is underway. http://www.gudcltd.com/public/CDM-Bulletin.pdf , http://www.docstoc.com/docs/2825129/Section-1-Letter-of-Invitation
15	Ratnamani Metals & Tubes Ltd.	18.25 MW project	Yes	WTG Installations are part of 3 PDDs 1) 2.5 MW installations are part of PDD titled "22.3 MW Bundled grid connected Wind Power based electricity generation project in Gujarat." Web-link - http://cdm.unfccc.int/Projects/Validation/DB/OW17ZT WQUDGVXQGE059WCBOC9C6LIR/view.html 2) 2.5 MW installations are under PDD titled "13.7 MW Bundled Grid-connected wind electricity generation in Jamnagar & Kachchh" Web-link - http://cdm.unfccc.int/Projects/Validation/DB/HAZNBLU455HVNR7QGA4I3R7T5JWWLT/view.html 3) 13.25 MW installations are under PDD titled "13.25 MW Wind Power Generation by RMTL, in Kutch, Gujarat". This project activity has been registered on 25-Mar-09. Web-link - http://cdm.unfccc.int/Projects/Validation/DB/FQOM561A0W



				JL6VAG2NT568TNPCLZCG/view.html
16	Surajbari Windfarm Dev. Pvt. Ltd	16.5 MW project activity	Yes	16.5 MW WTG Installations are part PDD titled "16.5 MW Wind Power Project in Surajbari, Gujarat " http://cdm.unfccc.int/Projects/Validation/DB/51AZ1NLK643Y7W70DT6EH6HSR6HV54/view.html

Source: *Directory on Indian Wind Power-2009*

It can be seen that, all similar activities in the state of Gujarat i.e. with project activities greater than 15 MW in the same regulatory regime, have developed these projects as 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.

The above additionality discussions show that wind power development is not a common practice in the state of Gujarat and the project activity is not financially attractive; hence the project activity is additional. The project participant has considered CDM as a source of revenue to improve financial viability of the project and had decided to invest in the project on this consideration.

Chronology of events for the project activity

The prior consideration notification for the project was submitted to the UNFCCC and host country DNA on 23rd September 2010. In addition, the CDM consultant was appointed prior to start of project, showing that CDM was a serious consideration for undertaking the project activity. The following table details the chronology of events for the project.

Event	Documentary Evidence	Date
AES India first discussion on prospective wind opportunities, where AES India decided to dedicate a team to explore the opportunities for investment in India.	Extracts of Minutes of meeting of Board of Directors of AES India Private Limited	18 th May 2009
AES India discussion of key project design, risks regarding wind projects and CER revenue being essential for making the projects viable.	Extracts of Minutes of meeting of Board of Directors of AES India Private Limited	24 th December 2009
AES India discussion on creating a special purpose vehicle for taking matters further regarding the investment	Extracts of Minutes of meeting of Board of Directors of AES India	14 th April 2010



in wind energy project.	Private Limited	
Signing of MoU with EIL for their offer of 39.2 MW wind project in Gujarat	Extracts of Minutes of meeting of Board of Directors of AES India Private Limited	10 th May 2010
Creation of SPV AES Saurashtra Windfarms Private Limited	Registrar of Companies Certificate	28 th May 2010
Loan term sheet received from Lender for loan of the project	Lender's letter of intent of Intent	6 th July 2010
Decision to invest in 39.2 MW wind power project by AES Saurashtra Windfarms Private Limited	Board resolution for investment in the wind farm	14 th July 2010
Finalisation and appointment of CDM consultant	Engagement Letter from PwC	3 rd August 2010
Prior consideration of CDM notification submitted to the UNFCCC and host country DNA	Notification Letter	23 rd September 2010
Acknowledgement of receipt of notification from MoEF (Host Country DNA)	E-mail of confirmation	27 th September 2010
Acknowledgement of receipt of notification from UNFCCC	E-mail of confirmation	7 th October 2010
Placement of Purchase order for WTGs to EIL	Purchase Order	22 nd October 2010
Local stakeholder meeting for the wind power CDM project	Minutes of local stakeholder meeting	29 th October 2010
Initial filling of documents with the DNA for Host Country Approval and subsequent response from the MoEF	Email from MoEF	8 th March 2011

Status of the project activity as on 31.12.2011 –

The project construction has already commenced and 44 WEGs were commissioned as on 31st December 2011 and the remaining 5 WEGs are scheduled to be commissioned during the month of January 2012.

B.6. Emission reductions:**B.6.1. Explanation of methodological choices:**

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According to the approved methodology ACM0002 (Version 12.2.0, EB 65) Emission Reductions are calculated as:-

$$ER_y = BE_y - PE_y \dots\dots\dots (1)$$

Where:

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

Estimation of Baseline Emissions:

Baseline emissions include only CO₂ 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:

$$BE_y = EG_{PJ,y} * EF_{grid, CM, y} \dots\dots\dots (2)$$

Where:

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

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)

EF_{grid,CM,y} = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO₂/MWh)

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

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

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 Grid	16.84%	18.0%	18.5%	19.0%	17.3%
Southern Regional Grid	21.61%	27.0%	28.3%	27.1%	22.8%
India	18.01%	20.1%	20.9%	21.0%	18.6%

Source: CO₂ 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 Participant 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 CO₂ emissions per unit net electricity generation (tCO₂/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 CO₂ 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 CO₂ 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 CO₂ 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:

$$EF_{grid,OMsimple,y} = \Sigma (EG_{m,y} \times EF_{EL,m,y}) / \Sigma EG_{m,y} \dots\dots\dots (a)$$

Where:

- EF_{grid,OMsimple,y} Simple operating margin CO₂ emission factor in year y (tCO₂/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} CO₂ 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:

$$EF_{EL,m,y} = (\Sigma FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}) / EG_{m,y} \dots\dots\dots (b)$$

Where:

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



$FC_{i,m,y}$	Amount of fossil fuel type i consumed by power 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)
$EF_{CO_2,i,y}$	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:

- The set of five power units that have been built most recently, or
- 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:

$$EF_{grid,BM,y} = (\sum EG_{m,y} \times EF_{EL,m,y}) / \sum EG_{m,y} \dots\dots\dots (c)$$

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 CO₂ 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 $EF_{grid,CM,y}$ 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 $EF_{grid,CM,y}$ is given by:



$$EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y} \dots\dots\dots (d)$$

Where:

- $EF_{grid,BM,y}$ Build margin CO₂ emission factor in year y (tCO₂/MWh)
 - $EF_{grid,OM,y}$ Operating margin CO₂ emission factor in year y (tCO₂/MWh)
 - w_{OM} Weighting of operating margin emissions factor (%)
 - w_{BM} Weighting of build margin emissions factor (%)
- (where $w_{OM} + w_{BM} = 1$).

According to ACM0002 (Version 12.2.0, EB 65), 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 922.52 tCO₂e/GWh.

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 CO₂ 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/reports/planning/cdm_co2/cdm_co2.htm

Estimation of Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 (Version 12.2.0, EB 65), there will be zero project emissions in the project activity

$$PE_y = 0 \dots\dots\dots (4)$$

Estimation of Leakage Emissions

As per ACM0002 (Version 12.2.0, EB 65), zero leakage has been considered for the calculation of emission factor

$$LE_y = 0 \dots\dots\dots (5)$$

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

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

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO ₂ e/MWh
Description:	Operating Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data used:	“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 http://www.cea.nic.in
Value applied:	1.0049
Justification of the choice of data or description of measurement methods and procedures actually applied:	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002 (Version 12.2.0, EB 65)
Any Comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	<i>EF_{grid, BM, y}</i>
Data unit:	tCO ₂ e/MWh
Description:	Build Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data used:	“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 http://www.cea.nic.in
Value applied:	0.6752
Justification of the choice of data or description of measurement methods and procedures actually applied:	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002 (Version 12.2.0, EB 65).
Any Comment	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	<i>EF_{grid, CM, y}</i>
Data unit:	tCO ₂ e/MWh
Description:	Combined Margin Emission Factor of NEWNE Regional Electricity Grid
Source of data used:	The “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 http://www.cea.nic.in



Value 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 (Version 12.2.0, EB 65). <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Combined Margin Emission Factor (EFy or $EF_{CM,y}$)</td> <td style="text-align: center;">0.9225</td> </tr> </table> Refer Annex – 3 for comprehensive calculation of Combined Margin Emission Factor.	Combined Margin Emission Factor (EFy or $EF_{CM,y}$)	0.9225
Combined Margin Emission Factor (EFy or $EF_{CM,y}$)	0.9225		
Justification of the choice of data or description of measurement methods and procedures actually applied:	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002 (Version 12.2.0, EB 65), and Tool to Calculate the emission Factor for an Electricity System.		
Any 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:

>>

There is zero leakage.

Baseline emission factor (Combined Margin) (EFy)
= 0.9225 tCO₂e/MWh

Annual electricity supplied to the grid by the Project (EGy) is calculated as:
= 39.2 MW (Capacity) x 25.376% (PLF) x 8,760 (hours) MWh
= 87,139 MWh

Annual Baseline Emissions Reduction: $ERY = EF_{grid,CM,y} * EG_{PJ,y}$
= 0.9225 tCO₂e/MWh x 87,139 MWh
= 80,385 tCO₂e

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

>>

Year	Estimation of project activity emissions (tonnes of CO ₂ e)	Estimation of baseline emissions (tonnes of CO ₂ e)	Estimation of leakage (tonnes of CO ₂ e)	Estimation of overall emission reductions (tonnes of CO ₂ e)
Year 1 ⁹	0	80,385	0	80,385
Year 2	0	80,385	0	80,385
Year 3	0	80,385	0	80,385

⁹ Year 1 starts from 01/03/2012 or date of submission for “Request For Registration” to UNFCCC, whichever is later. Each year extends for 12 months.



Year 4	0	80,385	0	80,385
Year 5	0	80,385	0	80,385
Year 6	0	80,385	0	80,385
Year 7	0	80,385	0	80,385
Year 8	0	80,385	0	80,385
Year 9	0	80,385	0	80,385
Year 10	0	80,385	0	80,385
Total (tonnes of CO₂e)	0	803,850	0	803,850

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

Data / Parameter:	$EG_{PJ,y}$
Data unit:	MWh
Description:	Net Quantity of Electricity exported to the grid
Source of data to be used:	Share certificate issued by SLDC/GETCO
Value of data applied for the purpose of calculating expected emission reductions in section B.5	87,139 MWh/year
Description of measurement methods and procedures to be applied:	<p>The procedures for metering will be as per the provisions of the power purchase agreement. The WTGs of a single customer (ASW in this case) at a particular site are connected to a cluster meter at the Vacuum Circuit Breaker metering yard (VCB) which in turn connects to a feeder that ultimately leads to the shared main GETCO meter (also known as revenue meter) at the substation maintained by EIL in Bhogat. Data monitoring takes place at the cluster meters at the VCB metering yard and GETCO meter at the Bhogat substation. The electricity metered at the GETCO meter is proportionally divided by GEDA among the customers connected to the Bhogat substation on the basis of the prorated readings taken at the VCB end.</p> <p>The net electricity generated is calculated by GEDA on the basis of GETCO main meter reading (the net electricity supplied to the grid for the wind farm) and the meter readings taken at VCB metering yard after adjusting transmission loss. GEDA gives this data to GETCO/SLDC who certifies this data. The net electricity generated by the project activity is taken directly from the share certificate issued by SLDC/GETCO on monthly basis.</p>
QA/QC procedures to be applied:	Calibration of all the meters will be undertaken at least once in three years as per PPA. Faulty meters will be duly replaced. The ASW CDM co-ordinator will oversee that the calibration is done as per the appropriate time frequency and proper procedures as mentioned in the PDD.
Any comment:	The data will be archived for the entire crediting period plus two years.

Data / Parameter:	$EG_{\text{cluster meter, Export}}$
--------------------------	-------------------------------------



Data unit:	kWh
Description:	Electricity export recorded at the 0.2 accuracy class cluster meter at the Vacuum Circuit Breaker (VCB) yard
Source of data to be used:	Daily generation from individual cluster meter is recorded by EIL and are provided to GEDA on monthly basis.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This reading is adjusted for transmission loss by GEDA for computing net electricity exported by the project activity and is not directly used for calculation of emission reductions.
Description of measurement methods and procedures to be applied:	The WTGs of the individual project owners at a particular site connect to a cluster meter at the VCB metering yard. Each project owner have exclusive cluster meter at VCB metering yard.
QA/QC procedures to be applied:	Calibration of all the cluster meters will be undertaken atleast once in three years in accordance with the PPA and all faulty meters will be duly replaced. The ASW CDM co-ordinator will oversee that the calibration is done as per the appropriate time frequency and proper procedures as mentioned in the PDD.
Any comment:	The data will be archived for the entire crediting period plus two years.

Data / Parameter:	$EG_{\text{cluster meter, Import}}$
Data unit:	kWh
Description:	Electricity import recorded at the 0.2 accuracy class cluster meter at the Vacuum Circuit Breaker (VCB) yard
Source of data to be used:	Daily generation from individual cluster meters is recorded by EIL and are provided to GEDA on monthly basis.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This reading is adjusted for transmission loss by GEDA for computing net electricity imported by the project activity and is not directly used for calculation of emission reductions.
Description of measurement methods and procedures to be applied:	The WTGs of the individual project owners at a particular site connect to a cluster meter at the VCB metering yard. Each project owner have exclusive cluster meters.
QA/QC procedures to be applied:	Calibration of the cluster meters will be undertaken atleast once in three years in accordance with PPA and all faulty meters will be duly replaced. The ASW CDM co-ordinator will oversee that the calibration is done as per the appropriate time frequency and proper procedures as mentioned in the PDD.
Any comment:	The data will be archived for the entire crediting period plus two years.

Data / Parameter:	$EG_{\text{GETCO, Export}}$
Data unit:	kWh
Description:	Net Electricity export recorded at 0.2 accuracy class GETCO meter at the EIL



	Bhogat Substation
Source of data to be used:	Joint Meter Reading (JMR)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This reading is used for calculation of transmission loss by GEDA and is not directly used for calculation of emission reductions.
Description of measurement methods and procedures to be applied:	The meter reading is taken jointly by the representatives of EIL and GEDA/GETCO in the form of JMR at the Bhogat Substation
QA/QC procedures to be applied:	Calibration of the GETCO meter will be undertaken at least once in three years as per the PPA and all faulty meters will be duly replaced. The ASW CDM co-ordinator will oversee that the calibration is done as per the appropriate time frequency and proper procedures as mentioned in the PDD.
Any comment:	The data will be archived for the entire crediting period plus two years.

Data / Parameter:	$EG_{GETCO, Import}$
Data unit:	kWh
Description:	Net Electricity import recorded at 0.2 accuracy class GETCO meter at the EIL Bhogat Substation
Source of data to be used:	Joint Meter Reading (JMR)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This reading is used for calculation of transmission loss by GEDA and is not directly used for calculation of emission reductions.
Description of measurement methods and procedures to be applied:	The meter reading is taken jointly by the representatives of EIL and GEDA/GETCO in the form of JMR at the Bhogat Substation
QA/QC procedures to be applied:	Calibration of the GETCO meter will be undertaken atleast once in three years as per the PPA and all faulty meters will be duly replaced. The ASW CDM co-ordinator will oversee that the calibration is done as per the appropriate time frequency and proper procedures as mentioned in the PDD.
Any comment:	The data will be archived for the entire crediting period plus two years.

B.7.2. Description of the monitoring plan:

>>

Approved monitoring methodology ACM0002 (Version 12.2.0, EB 65) 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.



EIL is the O&M contractor for the project activity. EIL will be responsible for the maintaining all the monitoring data on behalf of ASW in respect of the project activity. EIL 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 exclusive cluster meters at the VCB metering yard(s) and the meter reading taken at this metering point will be provided by the representatives of EIL to GEDA. These meters will be sealed by GEDA and will also be calibrated at least once in three years.

EIL substation at Bhogat has main meter(s) known as GETCO meters (also known as revenue meter) which are connected to the wind turbines installed by the Project Participant (through the PP's cluster meters) and wind turbines installed by other project owners (through the other project owner's cluster meters). Gujarat Electricity Development Authority (GEDA) apportions the net electricity supplied to the grid at the EIL substation at Bhogat to all the project owners after adjusting transmission loss using the cluster meter reading taken at VCB metering yard. GEDA provides this data to GETCO/SLDC who certifies the data and issues a monthly statement of share of electricity.

The net electricity generated by the project owners is provided by SLDC/GETCO in the form of a share certificate of electricity generated. The value of the net electricity generated by the project activity will be taken directly by the Project Participant from the share certificate provided by SLDC/GETCO for calculation of emission reductions.

The GETCO meter at the EIL Bhogat Substation is of 0.2 accuracy class and is calibrated at least once in three years. If during meter testing the main meter at the EIL Bhogat substation is found beyond the permissible limit of error, the meter reading will be taken from the GETCO meter located at the utility substation (at Bhatia) after addition of average historical transmission loss.

If during meter testing the cluster meter (0.2 accuracy class) at VCB metering yard is found beyond the permissible limit of error, the sum 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 Project is operated by EIL (O&M contractor for the project activity) and managed by the PP. The operational and maintenance contract for the project is with EIL. EIL is an ISO 9001:2000 certified Quality Management system from Germanischer Lloyd. EIL 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.

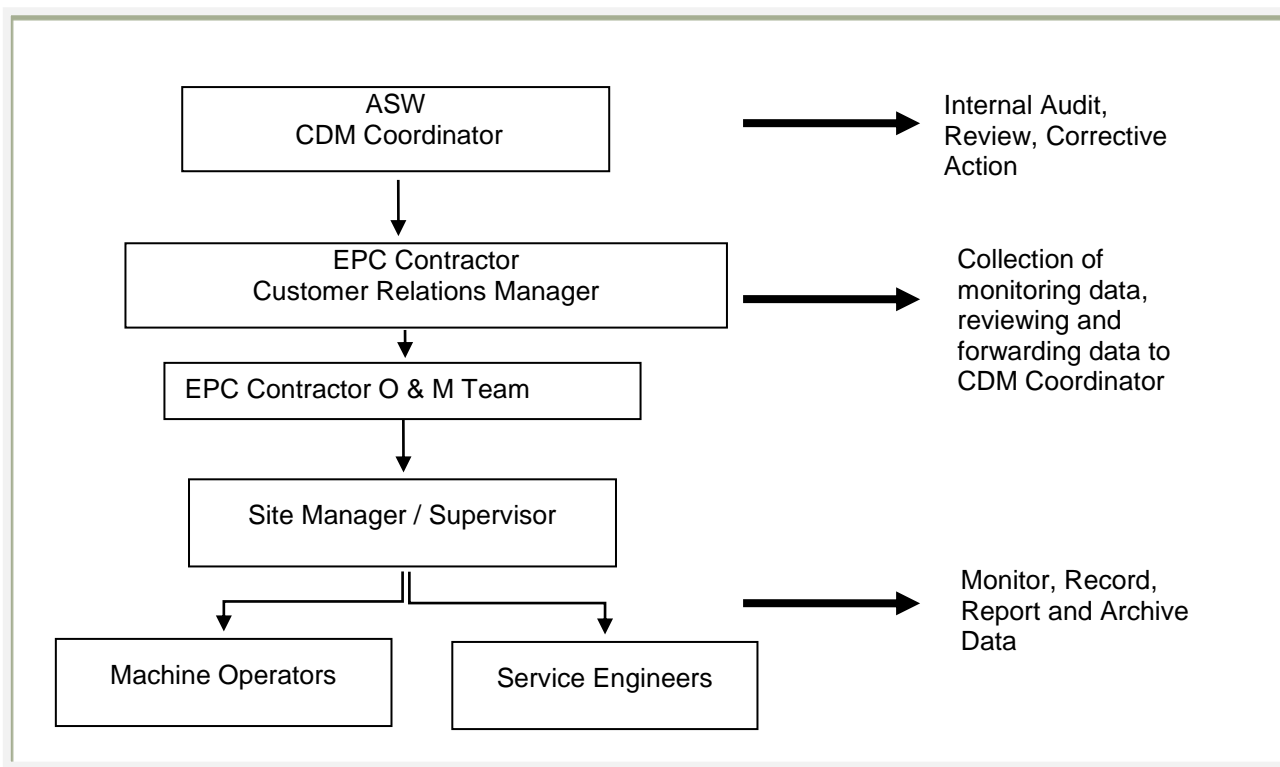
The accuracy of monitoring parameter is ensured by adhering to the calibration and testing of the metering equipment. EIL is Operation and Maintenance contractor for the project activity and provides the daily generation report to the Project Participant. The Project Participant also maintains the records 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 Turbine Generators (WTGs), it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that EIL's service staffs are 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 EIL Training Academy provides need-based training to meet the training requirements of EIL 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:



Details of the procedures for monitoring followed are provided in Annex 4

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

>>

Date of completion: 18/01/2011



Name of responsible person/entity: AES Saurashtra Windfarms Private Ltd (Project Participant) and their consultant.

The details are given in Annex-1.

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

>>

22/10/2010, being the date of placement of purchase order for the wind energy generators.

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

>>

20 years

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

The Project Participant has selected the fixed crediting period for the project activity.

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

Not Applicable

C.2.1.2. Length of the first crediting period:

Not Applicable

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

>>

1st March 2012 or the date of submission to UNFCCC requesting registration, whichever is later.

C.2.2.2. Length:

>>

10 years and 0 months

**SECTION D. Environmental impacts**

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

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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 studies¹⁰ 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. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

The 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. Stakeholders' comments

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

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A local stakeholder meeting was conducted in Porbandar, Gujarat on 29th October 2010 to invite comments from local stakeholders and to understand their concerns with regard to the project activity. An advertisement was placed in the local newspaper "Sandesh" on 14th October 2010 inviting the local stakeholders for the meeting. The personal invitations were also sent to the local villagers. The local stakeholders were notified 15 days in advance (notice period) to the actual date of the local stakeholder consultation meeting. The stakeholders included the members of the local village Panchayats and, resident villagers of the area, EIL representatives as well as Project Participant (ASW) representative.

The meeting was presided over by Mr. Rahul Mishra (ASW), Mr. Manoj Panda (EIL) and Mr. Alpesh Patel (EIL).

E.2. Summary of the comments received:

>>

The meeting commenced with Mr. Alpesh of EIL welcoming all the stakeholders and explaining that basic purpose and the agenda for convening the meeting.

¹⁰ <http://envfor.nic.in/legis/eia/so1533.pdf>



Mr. Manoj Panda of EIL proceeded by asking the attendees to elect a chairperson for the meeting. Mr. Kandoria Murubhai H was chosen as the chairperson. The stakeholders were presented, in vernacular (Gujarati), with an overview of CDM and the project activity as well as the technological, economic, environmental and social issues associated with it. This was followed by a speech by representative of ASW, Mr. Rahul Mishra, further explaining the project activity.

The stakeholders were then invited to give their comments, suggestions and concerns regarding the project activity. A questionnaire was circulated to all the stakeholders. A representative of the CDM consultant was also present at the stakeholder meeting.

The stakeholders gave their opinion on the project through the filled questionnaires. Overall a positive response was received from the stakeholders. The attendees identified development of local area, generation of employment opportunities and more awareness about these kinds of projects as potential benefits from the project activity.

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

>>

A list of all the questions and replies asked along with the name of the person who raised the question and the name of the person who responded is also attached.

S.No.	Question	Asked by	Responded by	Response
1	What are all the benefits that the villagers can expect from this the project?	Kandoria Murubhai H	Mr. Rahul Mishra (ASW)	The social as well as economic development of the nearby villages will take place as a result of all the employment opportunities created by the project activity during the construction phase as well as the operation phase. As a private company, ASW will also undertake initiatives as part of it Corporate Social Responsibility.
2	Will the local infrastructure like roads suffer any harm because of the construction of the project activity?	Narun Karamsinh	Mr. Alpesh Patel (EIL)	No local infrastructure will bear any harm from the project activity. As a matter of fact, local infrastructure, such as roads will be improved.
3	How is electricity generated from windmills and climate change related?	Dubhi Bhikhu Muruji	Mr. Manoj Panda (EIL)	Wind energy is a renewable form of energy and is clean. It does not generate any green house gas emissions. Therefore, as compared to energy generated from fossil fuels like coal, wind energy helps in reducing green house gas emissions



				and hence in mitigating adverse effects of climate change.
4	Will there be any facilities available at the windfarm which can be beneficial to the local villagers?	Sumaniya Mayabhu Karanbhu	Mr. Alpesh Patel (EIL)	Under their respective corporate social responsibility initiatives, EIL and ASW will promote development in the nearby areas.

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

Organization:	AES Saurashtra Windfarms Private Limited
Street/P.O.Box:	Cyber City, Phase-II
Building:	9th Floor, Tower B , DLF Building no. 10
City:	Gurgaon
State/Region:	Haryana
Postcode/ZIP:	122002
Country:	India
Telephone:	+91 124 4688100
FAX:	+91 124 4300299
E-Mail:	
URL:	
Represented by:	
Title:	Director
Salutation:	Mr.
Last name:	Singh
Middle name:	
First name:	Surya Pratap
Department:	
Mobile:	(+91) 9650855122
Direct FAX:	(+91) 124-4300299
Direct tel:	(+91) 124-4688165
Personal e-mail:	surya.singh@aes.com



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

**Annex 3****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 (tCO₂e/MWh)
Simple Operating Margin – 2006-07	1.0085
Simple Operating Margin – 2007-08	0.9999
Simple Operating Margin – 2008-09	1.0066
Average Operating Margin of last three years	1.0049

Build Margin

	NEWNE Grid (tCO₂e/MWh)
Build Margin- 2008-09	0.6752

Combined Margin Calculations

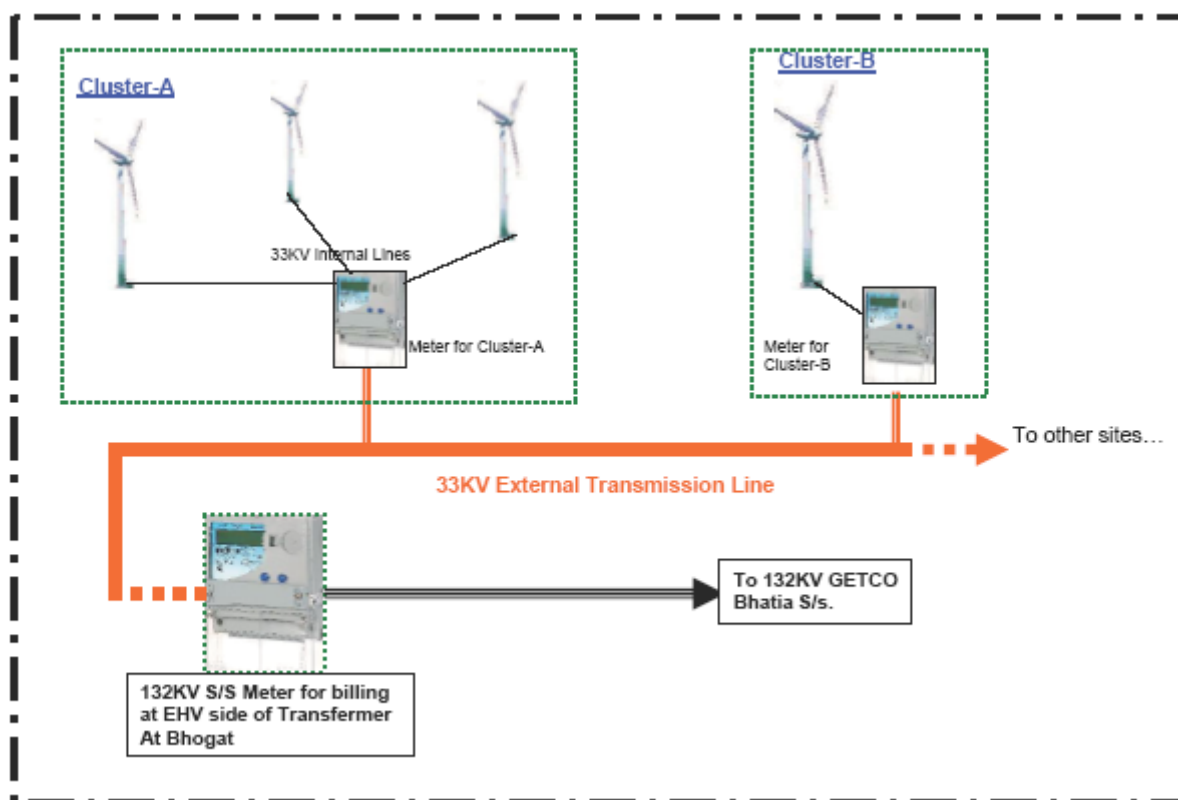
	Weights	NEWNE Grid (tCO₂e/MWh)
Operating Margin	0.75	1.0049
Build Margin	0.25	0.6752
Combined Margin		0.9225

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

Annex 4

MONITORING INFORMATION

Metering Procedures



The procedures for metering will be as per the provisions of the power purchase agreement. The WTGs of a single customer in this case ASW 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 & sealed main GETCO meter (also known as revenue meter) at the EIL Bhogat substation maintained by EIL. Data monitoring takes place at the cluster metering points and GETCO main meter at the EIL Bhogat substation.

The net electricity supplied to the grid by the wind farm is calculated by Gujarat Energy Development Agency (GEDA) and certified by State Load Dispatch Centre SLDC (GETCO) 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 points connected to the Bhogat Substation.

The net electricity generated by this project activity will be taken directly from the share certificate issued by SLDC/GETCO on monthly basis.



The meter reading at EIL substation is taken jointly by the representatives of EIL and GEDA/GETCO EIL in the form of JMR. The electricity from EIL's substation is finally supplied to the utility's substation at Bhatia. The net electricity generated by the project owners is provided by SLDC/GETCO in the form of a share certificate.

Frequency of meter reading

The meter reading at the individual WTGs, Cluster meter and main meter at GETCO Bhogat substation is recorded on a monthly basis.

Data collection

- The meter reading of the main meter at the GETCO Bhogat substation and the cluster meters at VCB metering yard of the project activity will be taken each month.
- The SLDC/GETCO share certificate which is the source of the data for emission reduction calculation will be available at the wind farm site office, as well as at ASW's office.
- In addition, the LCS meter reading is recorded continuously by the online monitoring system provided by EIL. All the monitored data will be recorded and filed electronically and in hard format for 2 years beyond the crediting period or last issuance whichever is later.
- The CDM co-ordinator of ASW will be responsible for overall review of the monitoring process, including collection of the monthly SLDC/GETCO certificates and ensuring quality of data.

Data archiving

Data will be archived electronically. The data would be archived two years after crediting period or last issuance whichever is later.

Meter Testing

- Main meter at EIL Bhogat Substation will be tested and calibrated at least once in three years as per the PPA.
- If during meter testing the main meter at the EIL substation (at Bhogat) 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 Bhatia after addition of average historical transmission losses.
- The main meter at utility substation at Bhatia will also be calibrated at least once in three years by utility.
- All cluster meters connected to the EIL Bhogat substation will be calibrated at least once in three years as per PPA.
- 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 WTGs. 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 preceding test.

Emergency Preparedness

During the calibration if the cluster meter at the VCB metering yard or the Bhogat substation is found to be outside the permissible limit of error then the meter will be replaced immediately. The error will be applied to the monitored data from the date of last calibration.

Routine Maintenance Services:

Routine maintenance labor work involves making available suitable manpower for operation and maintenance of the equipment and covers periodic preventive maintenance, cleaning and upkeep of the equipment. Technical assistance including checking of various technical, safety and operational parameters of the equipment, trouble shooting and relevant technical services.

Apportioning mechanism followed by GEDA

Transmission losses are incurred from the cluster meters to the GETCO metering point at the Bhogat Substation. The electricity sent out to the GETCO substation meter is lesser than the sum of the electricity generated by all the cluster meters connected to the substation. Therefore, for adjustment of transmission loss, the electricity metered at the GETCO (revenue) 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 points connected to the meter

Based on the generation recorded in the monthly JMR reports of the primary metering points at the Bhogat substation and the power generation recorded from each of the cluster meters at the VCB metering yards, the transmission losses are proportionally divided to all the cluster meters by GEDA. GEDA provides this apportioned data to GETCO/SLDC and GETCO/SLDC issues monthly share certificates for each individual cluster meter.

This accounts for the transmission losses incurred from the cluster meter to the substation meter. The GETCO/SLDC share certificates are taken as the basis for net electricity supplied to the grid by this project activity.



Annex 5

Selection of Appropriate Benchmark:

The guidance to investment analysis (version 05.0) issued in EB 62- Annex 05 (para 12) states that in cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Required/expected returns on equity are appropriate benchmarks 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 can have many potential project developers. The guidance in Para 13 states that in such cases (where the projects could be developed by an entity other than the project participant) the benchmark should be based on publicly available data sources which can be clearly validated by the DOE. Hence the benchmark has been calculated based on parameters that are standard in the market, considering the specific characteristics of the project type.

Accordingly, the required return on equity applicable to the project type has been calculated as follows.

The expected return on equity has been determined using the Capital Asset Pricing Model (CAPM)¹¹. 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.

$$K_e = R_f + B \times (R_m - R_f)$$

where:

K_e = Rate of return on equity capital;

R_f = Risk-free rate of return;

B = Beta;

$R_m - R_f$ = Market risk premium;

In calculating the benchmark rate of return on equity 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 world wide. 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.

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 rate of interest on government bonds are considered as risk free rates.

Accordingly the risk free rate has been taken from long dated Indian government bond rates available at the time of decision to invest in the project (July 14, 2010). The risk free rate of the year 2009-10 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 government bond rates is published by Reserve Bank of India. (Web-link: <http://rbidocs.rbi.org.in/rdocs/AnnualReport/PDFs/7PUBLI240810.pdf>)

¹¹ 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>



The applicable risk free rate is 7.23%.

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 average return on government securities over an extended period of history. The market return for the BSE Sensex, BSE 100, BSE 200 and BSE 500 indices were reviewed. The market return computed on the BSE 200 index (15.82%) is the lowest amongst the four BSE indices considered and conservatively, the same has been used for calculating the market risk premium. The risk premium has been calculated as the difference in compounded annual return between the Government bond rates and the BSE-200 index as long term data since inception of BSE-200 index, i.e. 1989 – 90 is available. The detailed calculations are presented in the attached excel sheet.

The applicable risk premium is 8.59%.

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. The beta can then be determined by referring beta values of publicly listed similar companies that are engaged in similar types of business. The project activity type is wind power generation and AES is a private company; the approach therefore should be to base the beta for the project on the beta values of listed private wind power generation companies in India. However, there are no companies listed on any stock exchange in India (both BSE-Bombay Stock Exchange and NSE-National Stock Exchange) till the project start date, that are exclusively into the wind energy business. Therefore, in the absence of adequate data on companies which are exclusively into the same type of business (i.e. wind power), the next best option for assessing the risk of these projects is to consider the data available on private companies which are involved in similar businesses.

Therefore, we have considered beta values of listed private electricity generating companies in India. The group of companies considered include power generating companies that are involved in conventional power generation as well as renewable energy.

Conservativeness of Beta

The beta values of the companies chosen would reflect the risk in both conventional energy as well as the wind energy business. 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 private power generating companies in India which were listed on the stock exchange at the time of investment decision.

Three years weekly Beta values (for the period of three years prior to investment decision date i.e. July 2007 to July 2010) of individual companies have been sourced from Bloomberg. From the sub-set of the



companies, the minimum beta has been taken for the most conservative estimate of the risk relating to similar project activities.

The table below summarises the beta values:

Company Name	Beta Value
BF Utilities	1.16
CESC Ltd.	1.14
Reliance Infrastructure Ltd.	1.73
Tata Power Co. Ltd.	1.05
Minimum Beta	1.05

Beta screenshots are included as Appendix 2.

Calculation of benchmark i.e. Return on equity/Cost of equity:

Required return on equity = $[R_f + B \times (R_m - R_f)]$

$(7.23\% + 1.05 \times 8.59\%) = 16.23\%$

Therefore the benchmark for equity IRR of the project is the Cost of equity of companies engaged in similar business as that of the project which is calculated as 16.23 %.

**Appendix 1****ACTION PLAN FOR MONITORING OF 2% CER REVENUE CONTRIBUTED TOWARDS SUSTAINABLE DEVELOPMENT**

ASW is committed to contribute a minimum of 2% of the CER revenue accrued every year for sustainable development activities for the local population. The undertaking indicating the same is available. The annual estimated emission reductions and the corresponding estimation of 2% CER revenue are presented below in the following table. The revenue committed will vary every year as per the actual CERs generated, the CER price that is actually transacted at a later date and the prevailing exchange rate at the time of transaction.

Year	Estimation of total emission reduction (tCO _{2e})	Minimum revenue commitment (% of CER revenue)	Number of CERs committed (tCO _{2e}) for Sustainable Development *
1	80,385	2%	1,608
2	80,385	2%	1,608
3	80,385	2%	1,608
4	80,385	2%	1,608
5	80,385	2%	1,608
6	80,385	2%	1,608
7	80,385	2%	1,608
8	80,385	2%	1,608
9	80,385	2%	1,608
10	80,385	2%	1,608

* 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.

Annual Review Process for monitoring contribution towards sustainable development

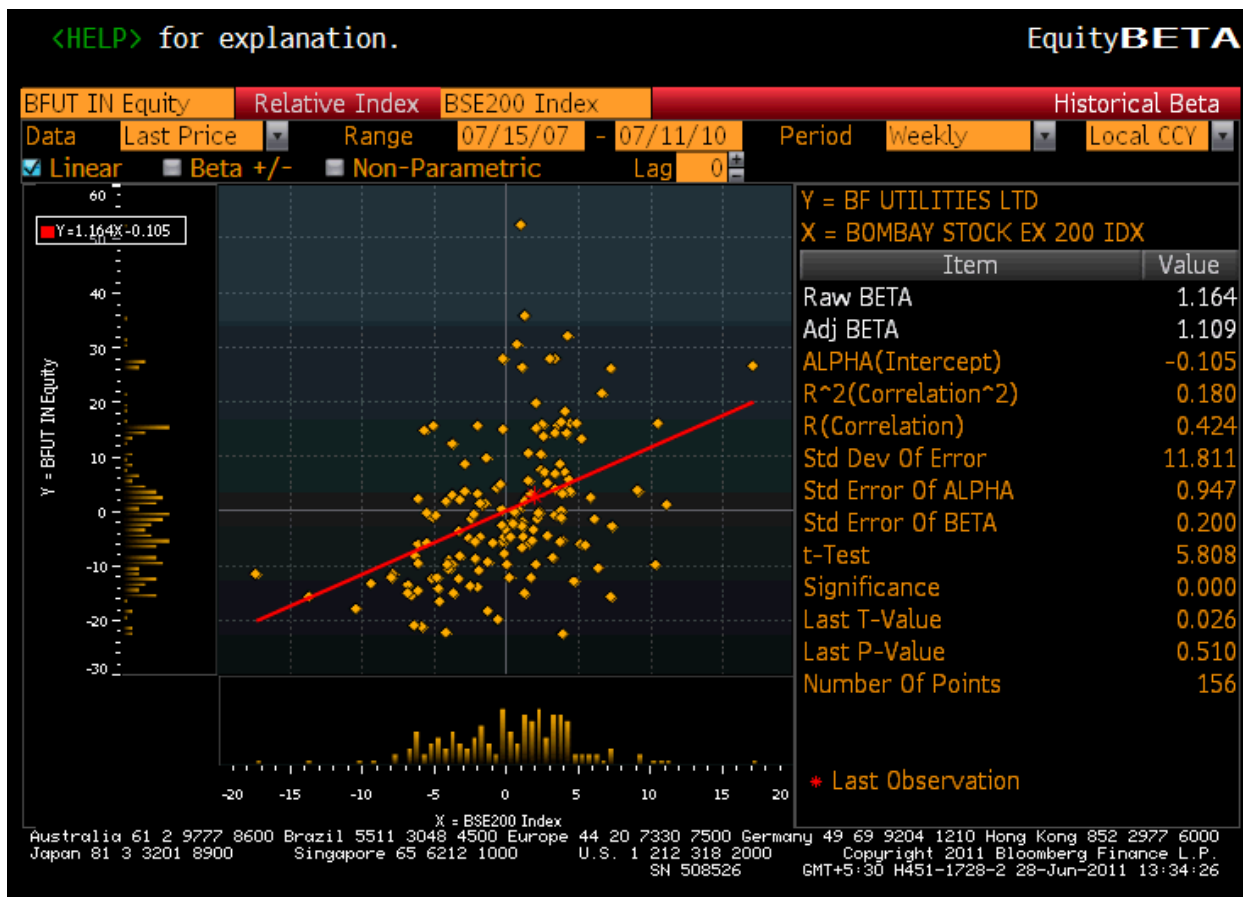
ASW will undertake an annual review process of the actual CERs accrued and the price transacted. On the basis of the actual price and exchange rate, ASW will commit 2% of the revenue for sustainable development activities in the local areas.

- As part of the annual review, ASW 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 the following:
 - 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.
- In addition, there would be visits to the project location to monitor the progress / implementation of the sustainable development activities.
- Acknowledgements from the relevant authorities / people associated with each of the sustainable development activities undertaken will also be collected and available for verification at a later date.



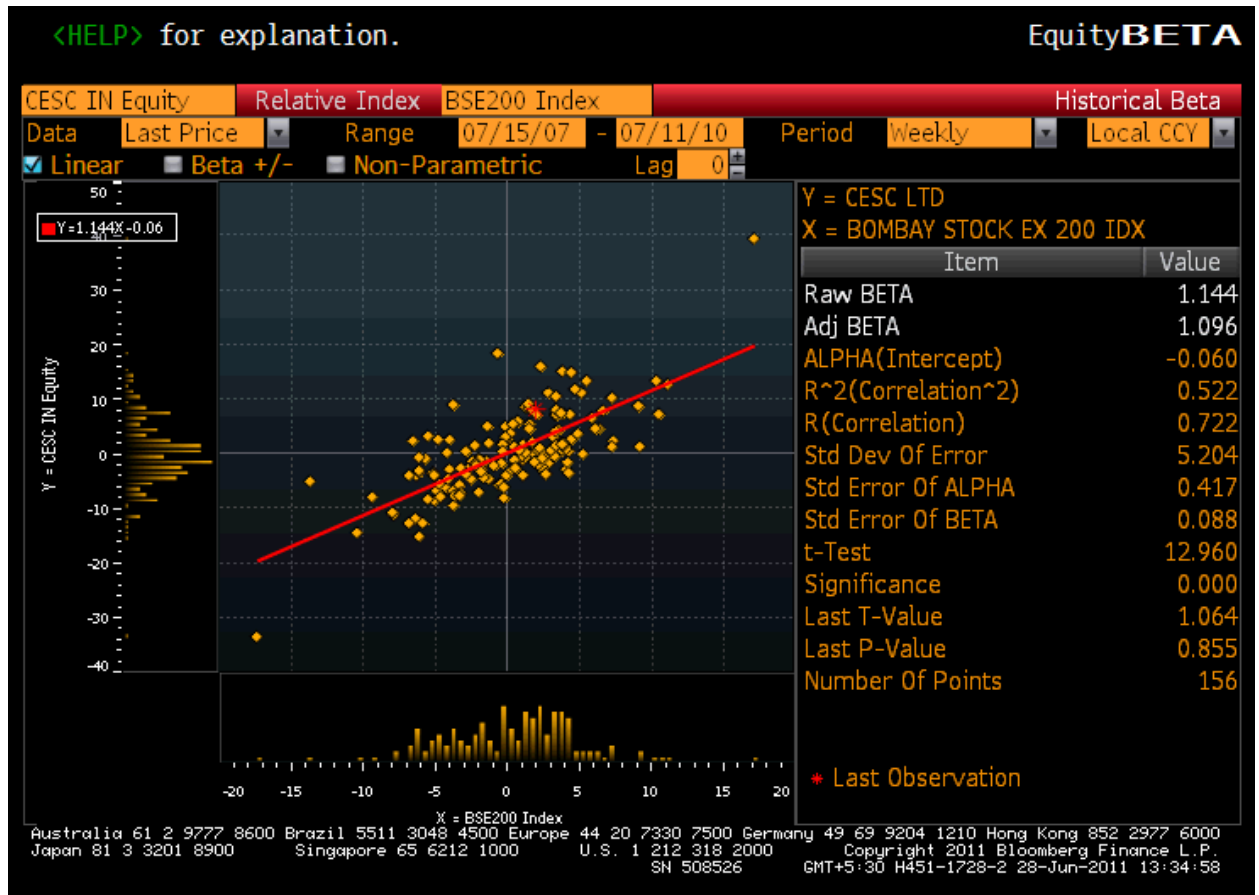
Appendix 2 – Beta Screenshots

BF Utilities



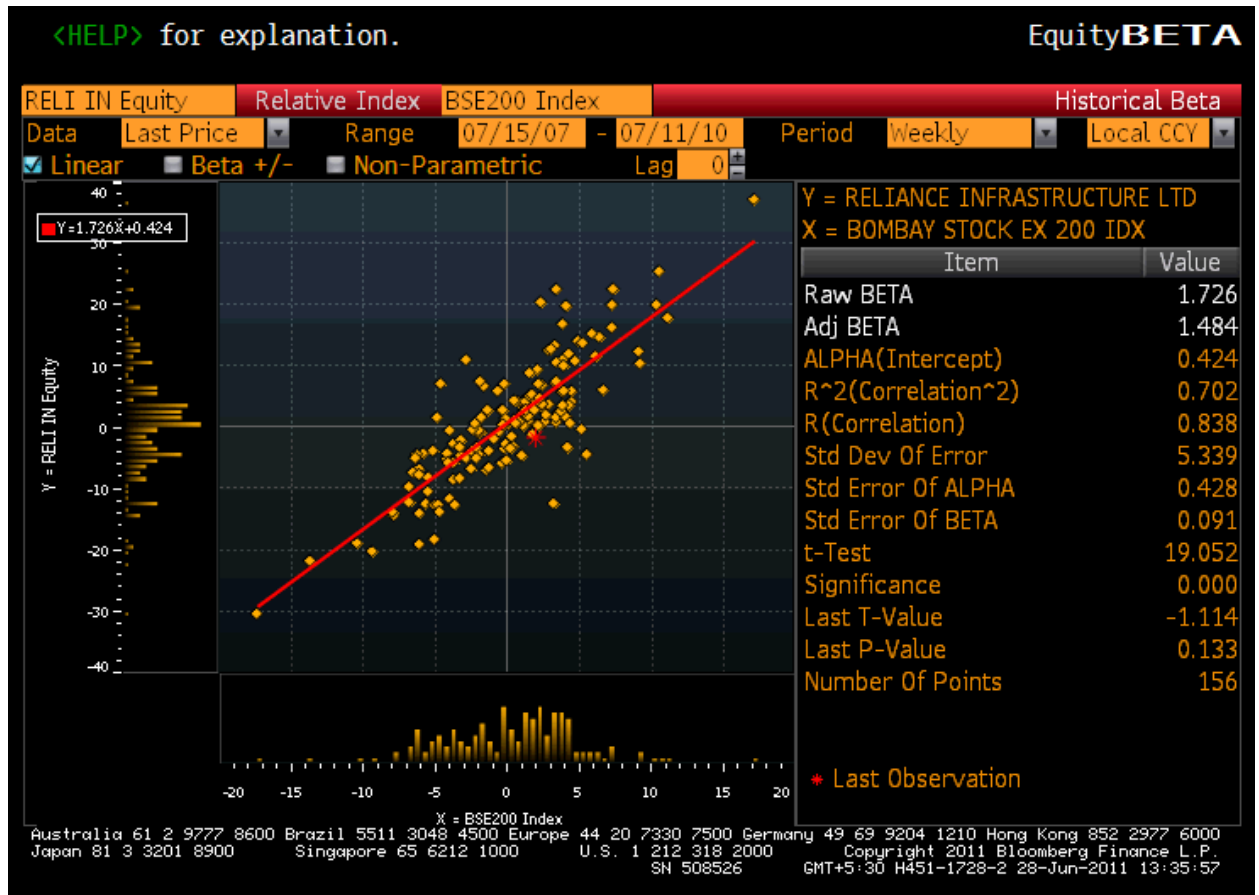


CESC





Reliance Infrastructure





Tata Power

