

44.40 MW Wind Energy Project by Ruchi Soya Industries Limited, India



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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project proponent, Ruchi Soya Industries Limited (RSIL), is the flagship company of Ruchi Group of Industries and a leading player in India in edible oils, soya foods and processed foods categories. Besides being a leading manufacturer of high quality edible oils, vanaspati, bakery fats and soya foods, RSIL is also the highest exporter of soya meal and lecithin from India.

The project activity involves the installation of the Wind Turbine Generators (WTGs) with a total capacity of 44.40 MW. The project activity is a conscious attempt by the project proponent to invest in renewable energy despite of the apparent lack of financial feasibility. The WTGs of the project activity are located as follows:

Phase	Capacity	Make / Model	Location
Phase-I	16x600 kW = 9.60 MW	Suzlon / S-52	Piploda, Ratlam (Madhya Pradesh)
Phase-II	6x1500 kW = 9.00 MW	Suzlon / S-82	Fatehgarh, Jaisalmer (Rajasthan)
Phase-III	4x1500 kW = 6.00 MW	Suzlon / S-82	Shergarh & Osiyan, Jodhpur (Rajasthan)
Phase-IV	10x600 kW = 6.00 MW	Suzlon / S-52	Piploda, Ratlam (Madhya Pradesh)
Phase-V	2x1500 kW = 3.00 MW	Suzlon / S-82	Fatehgarh, Jaisalmer (Rajasthan)
Phase-VI	10x600 kW = 6.00 MW	Suzlon / S-52	Palsodi, Ratlam (Madhya Pradesh)
Phase-VII	8x600 kW = 4.80 MW	Suzlon / S-52	Palsodi, Ratlam (Madhya Pradesh)

All WTGs are connected to the regional grid, NEWNE. The electricity generated by the following WTGs is being wheeled for captive use:

WTG Location No.	Location	Capacity	Wheeled to RSIL's plant at
JO-10	Village-Padliya Umat, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	600 kW	Guna, Madhya Pradesh
JO-12	Village-Bargad, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	600 kW	Daloda, Madhya Pradesh
JO-19	Village-Hariyakheda, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	600 kW	Gadarwara, Madhya Pradesh

The electricity generated by all other WTGs is being sold to the respective state electricity utilities. Suzlon Energy Ltd. and its associated companies are the equipment suppliers and operations & maintenance contractor for the project activity.

1. Purpose of the Project Activity:

- To utilize renewable wind energy for generation of the electricity.
- To wheel the generated electricity from three WTGs installed in Ratlam through NEWNE grid for captive use to the company's plants in the Madhya Pradesh.
- To sell the generated electricity from all other WTGs installed in Madhya Pradesh and Rajasthan and connected with the NEWNE grid to the respective state electricity utilities.
- To contribute in mitigating the climate change.

a. Pre-project scenario:

In case of wheeling the electricity for captive use the receiving plants were using grid electricity in the pre-project scenario. While in case of supplying the electricity to the NEWNE grid for selling it was being

generated by the power plants connected to the NEWNE grid in the pre-project scenario. Therefore, in both the cases scenario existing prior to the start of the project activity, baseline scenario would be electricity generation from the existing grid. Hence, 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.

The main emission source in the pre-project scenario is the power plants connected to the NEWNE grid and main GHG involved is CO₂.

b. Project scenario:

The project activity is a renewable source of power generation and supplies the electricity to the NEWNE grid. The total installed capacity of the project activity is 44.40 MW equipped with 44 WTGs with rated capacity of 600 kW each (model S-52) and 12 WTGs with rated capacity of 1500 kW each (model S-82). The electricity generated by three WTGs of capacity 600 kW each in Madhya Pradesh is being wheeled to the company's plants in the state-Madhya Pradesh and the electricity from the remaining WTGs of 42.60 MW installed capacity is being sold to the respective state utilities.

All WTGs involved in the project activity are developed and supplied by Suzlon Energy Limited. Suzlon Infrastructure Services Limited (SISL), a SUZLON Group Company, will provide all operations and maintenance services to the project activity.

The project activity uses wind energy in producing electricity and no other input is being used, therefore, it will not produce any GHG emission during its lifetime.

c. Baseline scenario:

As the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following as per applied methodology:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system, version 02.2.1".

2. Reduction of GHGs emissions due to the project activity:

The project activity harnesses wind energy to generate and supply electricity to the NEWNE grid, regional electricity grid of India. The employed WTGs can only convert wind energy into electrical energy and do not use any other fuel as input for electricity generation. The operation of WTGs is emission free and no GHG emissions are produced during the lifetime of the project activity.

The electricity currently generated by the NEWNE grid is relatively fossil fuel intensive, with three years weighted average of operating margin emission factor of 0.9941 tCO₂/MWh and a build margin emission factor of 0.8123 tCO₂/MWh (see section 2.4 for further details). The project activity is therefore expected to reduce emissions of GHGs by an estimated 81,853 tCO₂e per year by displacing equivalent amount of the electricity from the NEWNE grid.

1.2 Sectoral Scope and Project Type

Sectoral Scope: 1 - Energy industries (renewable- /non-renewable sources).

Project Type: Non-Grouped

1.3 Project Proponent

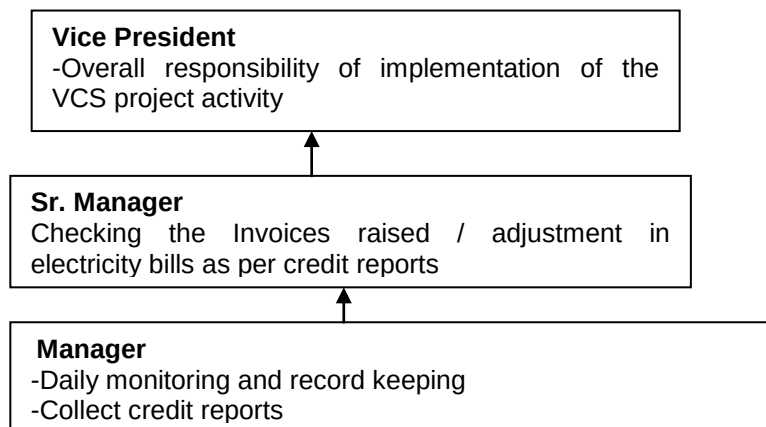
Project Proponent: Ruchi Soya Industries Limited

Contact Information of the Project Proponent:

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Roles and Responsibilities for the Project Proponent:

The Project Proponent has full responsibility of implementing the VCS project activity. The roles and responsibilities of the project proponent are shown below:



1.4 Other Entities Involved in the Project

There is no other entity involved in the project activity.

1.5 Project Start Date

The project start date is the date on which the project began generating GHG emission reductions. The first WTG of the project activity commissioned on 26/02/2010 and started generating GHG emission reductions. Therefore, Project Start Date is 26/02/2010 (Day: 26, Month: February, Year: 2010).

1.6 Project Crediting Period

Crediting Period Start Date: 26/02/2010 (Day: 26, Month: February, Year: 2010)

Crediting Period End Date: 25/02/2020 (Day: 25, Month: February, Year: 2020)

Total Years of the Crediting Period: Ten years.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Estimated average annual GHG emission reductions from the project activity are 81,853 tCO₂e per year, which is less than 1,000,000 tCO₂e per year. Hence the project scale of the project activity will become "Projects" as shown below:

Project	√
Mega-project	

Years	Estimated GHG emission reductions or removals (tCO ₂ e)
26-02-2010 to 31-12-2010	36,740
01-01-2011 to 31-12-2011	76,233
01-01-2012 to 31-12-2012	86,714
01-01-2013 to 31-12-2013	86,477
01-01-2014 to 31-12-2014	86,477
01-01-2015 to 31-12-2015	86,477
01-01-2016 to 31-12-2016	86,714
01-01-2017 to 31-12-2017	86,477
01-01-2018 to 31-12-2018	86,477
01-01-2019 to 31-12-2019	86,477
01-01-2020 to 25-02-2020	13,267
Total estimated ERs	818,530
Total number of crediting years	10
Average annual ERs	81,853

Emission reductions for the year 2010 are calculated from crediting period start date 26/02/2010 to 31/12/2010 and for the year 2020 emission reductions are calculated till crediting period end date 25/02/2020 keeping crediting period of 10 years i.e. from 26/02/2010 to 25/02/2020.

1.8 Description of the Project Activity

Project Activity:

The project activity generates electricity from renewable wind energy and supplies the electricity to the NEWNE grid. The total installed capacity of the project activity is 44.40 MW. The electricity generated by three WTGs of capacity 600 kW each in Madhya Pradesh is being wheeled to the company's plants as shown below:

Physical Location	Location No.	Capacity	Wheeled to RSIL's plant at
Village-Padliya Umat, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	JO-10	600 kW	Guna, Madhya Pradesh
Village-Bargad, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	JO-12	600 kW	Daloda, Madhya Pradesh
Village-Hariyakheda, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	JO-19	600 kW	Gadarwara, Madhya Pradesh
Total Capacity		1.80 MW	

The electricity generated by the other WTGs of the project activity is being sold to the state electricity utilities as detailed below:

Physical Location	Location No.	Capacity	Sale to
Village-Naulakha, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	NL-01, NL-02, NL-03, NL-04, NL-05, L-06, NL-07, NL-08, NL-09, NL-10	10x0.60 = 6 MW	M.P.Power Trading Company Limited
Village-Padliya Umat, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	JO-08	1x0.60 = 0.60 MW	M.P.Power Trading Company Limited
Village-Bargad, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	JO-13	1x0.60 = 0.60 MW	M.P.Power Trading Company Limited
Village-Hariyakheda, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	JO-14, JO-15, JO-16, JO-17, JO-18	5x0.60 = 3 MW	M.P.Power Trading Company Limited
Village-Chourasi Badayla, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	JO-03, JO-04, JO-05	3x0.60 = 1.80 MW	M.P.Power Trading Company Limited
Village-Uperwada, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	JO-20, JO-21, JO-22	3x0.60 = 1.80 MW	M.P.Power Trading Company Limited
Village-Akal, Taluka-Fatehgarh, District-Jaisalmer (Rajasthan)	AK-400, AK-401, AK-414, AK-415, AK-416, AK-417, AK-253, AK-308	8x1.50 = 12 MW	Jodhpur Vidyut Vitaran Nigam Limited
Villages-Belwa Ranaji & Sagat Nagar, Taluka-Shergarh, District-Jodhpur (Rajasthan)	RKB-075, RKB-076	2x1.50 = 3 MW	Jodhpur Vidyut Vitaran Nigam Limited
Village-Dhundhariya, Taluka-Osiyan, District-Jodhpur (Rajasthan)	OS-48, OS-49	2x1.50 = 3 MW	Ajmer Vidyut Vitaran Nigam Limited
Village-Gopalpura, Taluka-Ratlam, District - Ratlam (Madhya Pradesh)	PR-01, PR-02, PR-03, PR-04, PR-05, PR-06, PR-08, PR-17, PR-19	9x0.60 = 5.4 MW	M.P.Power Trading Company Limited

Village-Rampuriya, Taluka-Ratlam, District - Ratlam (Madhya Pradesh)	PR-09, PR-10, PR-11, PR-12, PR-13, PR-14, PR-15, PR-16, PR-18	9x0.60 = 5.40 MW	M.P.Power Trading Company Limited
Total Capacity		42.60 MW	

All WTGs involved in the project activity are developed and supplied by Suzlon Energy Limited, which is a well-known Indian supplier of wind turbines and so far has installed different capacities of WTGs in various countries. Suzlon Infrastructure Services Limited (SISL), a SUZLON Group Company, will provide all operations and maintenance services to the project activity.

The project activity uses wind energy in producing electricity and no other input is being used, therefore, it will not produce any GHG emission during its lifetime.

Purpose of the Project Activity:

- To utilize renewable wind energy for generation of the electricity.
- To wheel the generated electricity from three WTGs installed in Ratlam through NEWNE grid for captive use to the company's plants in Madhya Pradesh.
- To sell the generated electricity from all other WTGs installed in Madhya Pradesh and Rajasthan and connected with the NEWNE grid to the respective state electricity utilities.
- To contribute in mitigating the climate change.

Technology:

The use of wind energy to generate electricity involves the conversion of power contained in masses of moving air into rotating shaft power. The conversion process utilises aerodynamic forces (lift and/or drag) to produce a net positive turning moment on a shaft, resulting in the production of mechanical power which can be converted to electrical power.

The efficiency of wind turbines differs from location to location significantly due to various factors / parameters like latitude, land-sea disposition, altitude and season. In India the factor which mostly governs the availability of wind energy at a particular site is its geographical location with respect to the monsoon wind. The availability of wind speed data is a basic requirement for determining the feasibility of wind power generation at any site. As the distribution of wind speed is highly uneven over the country, the Govt. agencies undertake the assessment of the wind energy resource over different regions before any plan of harnessing the wind energy is drawn for implementation.

The important parts of a WTG are:

- i. Main Tower
- ii. Blades
- iii. Nacelle
- iv. Hub
- v. Main shaft
- vi. Gearbox, bearing and housing
- vii. Brake
- viii. Generator

The project activity involves WTGs made by Suzlon, models S82- rated capacity 1500 kW, and S52-rated capacity 600 kW. The technical details of both models are provided below:

Suzlon S82 model¹:

S82-1.5 MW is designed for generating the optimal power output even at sites with a modest wind speed regime. The wind turbine concept is based on robust design with pitch regulated blade operation, a 3-

¹ <http://www.suzlon.com/pdf/S82%20product%20brochure.pdf>

stage gearbox with 1650 kW rating and flexible coupling to the asynchronous induction generator. The Suzlon Flexi-slip System provides efficient control of the load and power control. The turbine operation is efficiently controlled by the Suzlon controller. These technologies are all well-known in the wind power industry and have proven themselves. The S82-1.5 MW is designed to withstand extreme conditions and operate effectively with low maintenance cost.

Suzlon S52 model²:

The S52-600 kW has well-suited ratio between rotor diameter and generator for most sites in a medium wind speed regime. The wind turbine concept is based on robust design with pitch regulated blade operation, a three-stage gearbox with 660 kW rating and a safe peak load damping with a flexible coupling to the asynchronous induction generator. The turbine operation is efficiently controlled by the Suzlon controller. These technologies are well known in the wind power industry and have proven themselves. The S52-600 kW wind turbine is designed to withstand the most extreme conditions and operate effectively.

The technical details of both models are as follows:

MODEL	S82-1500 kW	S52-600 kW
OPERATING DATA		
Rated power	1500 kW	600 kW
Cut-in wind speed	4 m/s	4 m/s
Rated wind speed	14 m/s	13 m/s
Cut-off wind speed	20 m/s	25 m/s
Survival wind speed	52.5 m/s	59.5m/s
ROTOR		
Type	3 Blades, Upwind / Horizontal axis	3 Blades, Upwind / Horizontal axis
Diameter	82 m	52 m
Rotational speed at rated power	15.6 to 18.4 rpm	24.19 rpm (fix speed machine, maximum over speed 28.29 rpm)
Rotor blade material	Epoxy bonded fiber glass	Epoxy bonded fiber glass
Swept area	5281 m ²	2124 m ²
Power regulation	Active pitch regulated with Suzlon Flexi Slip System	Active pitch regulated
GEARBOX		
Type	1 planetary stage / 2 helical stages	1 planetary stage / 2 helical stages
Ratio	1 : 95.09	1:63.6
Nominal load	1650 kW	660 kW
Type of cooling	Forced oil cooling lubrication system	Forced oil cooling lubrication system
GENERATOR		
Type	Single speed induction generator with slip rings, variable rotor resistance via Suzlon Flexi slip system	Single speed induction generator (asynchronous)
Speed at rated power	1511 rpm	1539 rpm
Rated power	1500 kW	600 kW
Rated voltage	690 V AC (phase to phase)	690 V AC (phase to phase)
Frequency	50 Hz	50 Hz
Insulation	Class H	Class H
Enclosure	IP 54 / IP 23 (slip ring unit)	IP 56
Cooling system	Air cooled	Air cooled
TOWER		

² <http://www.suzlon.com/pdf/S52%20product%20brochure.pdf>

Type	Tubular tower (corrosion proof painting on inner and outer surface with welded steel plates)	Lattice tower (Hot deep galvanized)
Tower height	76 m	73 m
Hub height (including foundation)	Approximately 78.5 m	Approximately 75 m
BRAKING SYSTEM		
Aerodynamic braking	3 Independent systems with blade pitching	3 Independent systems with blade pitching
Mechanical braking	Hydraulic fail safe disk brake system	Hydraulic fail safe disk brake system
YAW SYSTEM		
Type	Active electrical yaw motor	Active electrical yaw motor
Bearing	Polyamide Slide bearing with gear ring & automatic greasing system	Polyamide Slide bearing with gear ring & automatic greasing system
Protection	Cable twist sensor, proximity sensor	Cable twist sensor, proximity sensor
PITCH SYSTEM		
Type	3 independent blade pitch control with battery backup for each blade	3 independent blade pitch control with battery backup for each blade
Operating range	-5 ° to +90 °	-5 ° to +90 °
Resolution	0.1 to 10 Deg	0.1 to 10 Deg
CONTROLLER		
	Suzlon Control System with following salient features:	Suzlon Control System with following salient features:
	- Park slave	- Park slave
	- Power output control / limitation	- Power output control / limitation
	- Reactive power control	- Reactive power control
	- Grid measurement	- Grid measurement
	- Low voltage ride through (LVRT)	- Low voltage ride through (LVRT)
	- Weather measurement	- Weather measurement
	- Time synchronization	- Time synchronization
	- Statistics	- Statistics
Wind Class	III a	II a
Certification & Standards	GL (T-GL-009A-2007)	GL (T-GL-020-2007)
Quality System	ISO 9001:2000	ISO 9001:2000

The electricity production through wind turbines depends on several external factors including wind speed and the grid availability factors. The project proponent hired an engineering company to estimate taluka-wise PLF of the project activity. The PLFs estimated by the third party are as follows:

Site	WTG	Estimated PLF
Jaora, Piploda, District – Ratlam (Madhya Pradesh)	S52 (600 kW)	23.70%
Akal, Fatehgarh, District-Jaisalmer (Rajasthan)	S82 (1500 kW)	23.36%
RKB, Shergarh, District-Jodhpur (Rajasthan)	S82 (1500 kW)	22.81%
Osiyan, District-Jodhpur (Rajasthan)	S82 (1500 kW)	22.64%
Palsodi, District-Ratlam (Madhya Pradesh)	S52 (600 kW)	23.54%

The PLFs estimated by third party, an engineering company, are used in evaluating the financial viability of the project activity.

Reduction of GHGs emissions due to the project activity:

The project activity harnesses wind energy to generate and supply electricity to the NEWNE grid, regional electricity grid of India. The employed WTGs can only convert wind energy into electrical energy and do not use any other fuel as input for electricity generation. The operation of WTGs is emission free and no GHG emissions are produced during the lifetime of the project activity.

The electricity currently generated by the NEWNE grid is relatively fossil fuel intensive, with a 3-year weighted average of simple operating margin emission factor of 0.9941 tCO₂/MWh and a build margin emission factor of 0.8123 tCO₂/MWh (see section 2.4 for further details). The project activity is therefore expected to reduce emissions of GHGs by an estimated 81,853 tCO₂e per year by displacing equivalent amount of the electricity in the NEWNE grid.

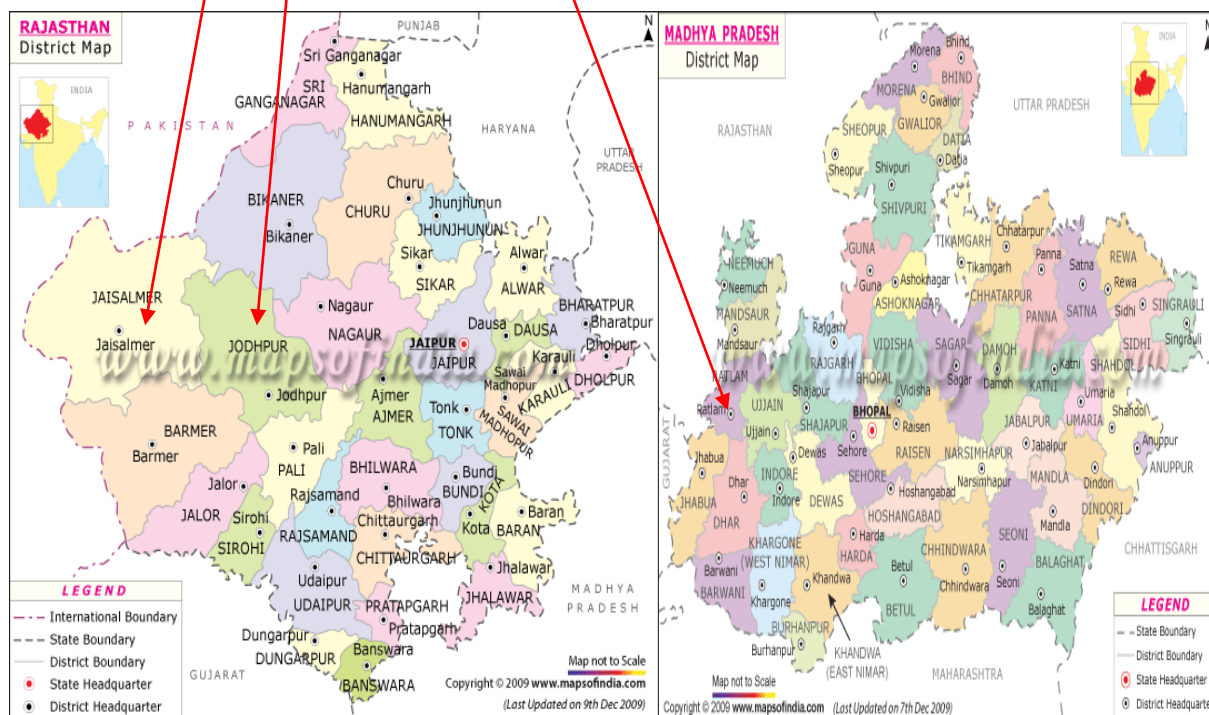
The wind turbines have an average lifetime of 20 years as specified by the WTGs supplier. The wind turbines constituting the project activity are newly commissioned and the details of the date of commissioning are given in Appendix -1.

1.9 Project Location

The physical locations of the WTGs installed in the project activity spread across two states of India – Madhya Pradesh and Rajasthan. A summary of the physical locations of the installed WTGs is as follows:

S. No.	Village	Taluka	District	State	Installed Capacity
1.	Naulakha	Piploda	Ratlam	Madhya Pradesh	10x0.60 = 6.00 MW
2.	Padliya Umat	Piploda	Ratlam	Madhya Pradesh	2x0.60 = 1.20 MW
3.	Bargad	Piploda	Ratlam	Madhya Pradesh	2x0.60 = 1.20 MW
4.	Hariyakheda	Piploda	Ratlam	Madhya Pradesh	6x0.60 = 3.60 MW
5.	Chourasi Badayla	Piploda	Ratlam	Madhya Pradesh	3x0.60 = 1.80 MW
6.	Uperwada	Piploda	Ratlam	Madhya Pradesh	3x0.60 = 1.80 MW
7.	Akal	Fatehgarh	Jaisalmer	Rajasthan	8x1.50 = 12.00 MW
8.	Belwa Ranaji & Sagat Nagar	Shergarh	Jodhpur	Rajasthan	2x1.50 = 3.00 MW
9.	Dhundhariya	Osiyan	Jodhpur	Rajasthan	2x1.50 = 3.00 MW
10.	Gopalpura	Ratlam	Ratlam	Madhya Pradesh	9x0.60 = 5.40 MW
11.	Rampuriya	Ratlam	Ratlam	Madhya Pradesh	9x0.60 = 5.40 MW

Geo-graphical locations of the project activity can be viewed in the following maps:



Location number, latitude and longitude of each WTG are provided below:

S. No.	Physical Location	Rated Capacity of the WTG (kW)	Location No.	Latitude	Longitude
1.	Village-Naulakha, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	600	NL-1	23°38'23.0" N	74°59'12.7" E
		600	NL-2	23°38'25.9" N	74°59'07.1" E
		600	NL-3	23°38'37.3" N	74°59'13.1" E
		600	NL-4	23°38'45.1" N	74°59'25.7" E
		600	NL-5	23°38'35.9" N	74°59'33.3" E
		600	NL-6	23°38'25.9" N	74°59'39.7" E
		600	NL-7	23°38'17.1" N	74°59'39.4" E
		600	NL-8	23°38'21.9" N	74°59'53.7" E
		600	NL-9	23°38'33.5" N	75°00'00.2" E
		600	NL-10	23°38'43.1" N	75°00'00.2" E
2.	Village-Padliya Umat, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	600	JO-10	23°35'51.6" N	75°04'44.1" E
		600	JO-08	23°35'45.5" N	75°04'47.9" E
3.	Village-Bargad, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	600	JO-12	23°36'10.3" N	75°04'30.3" E
		600	JO-13	23°36'17.2" N	75°04'26.6" E
4.	Village-Hariyakheda, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	600	JO-14	23°36'23.7" N	75°04'24.3" E
		600	JO-15	23°36'31.0" N	75°04'21.8" E
		600	JO-16	23°36'37.7" N	75°04'20.8" E
		600	JO-17	23°36'45.9" N	75°04'15.2" E
		600	JO-18	23°36'59.3" N	75°04'12.6" E
		600	JO-19	23°37'05.9" N	75°02'48.5" E
5.	Village-Chourasi Badayla, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	600	JO-03	23°34' 46.9" N	75°05' 46.8" E
		600	JO-04	23°34' 53.5" N	75°05' 48.4" E
		600	JO-05	23°34' 57.2" N	75°05' 22.1" E
6.	Village-Uperwada, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	600	JO-20	23°36' 46.5" N	75°02' 20.9" E
		600	JO-21	23°36' 38.2" N	75°02' 21.7" E
		600	JO-22	23°36' 58.6" N	75°02' 46.0" E
7.	Village-Akal, Taluka-Fatehgarh, District-Jaisalmer (Rajasthan)	1500	AK-400	26°47'17.3" N	77°05'12.0" E
		1500	AK-401	26°47'05.0" N	77°05'25.3" E
		1500	AK-414	26°48'12.4" N	77°05'06.8" E
		1500	AK-415	26°48'33.5" N	77°05'23.5" E
		1500	AK-416	26°48'25.6" N	77°05'35.8" E
		1500	AK-417	26°48'12.2" N	77°05'46.1" E
		1500	AK-253	26°47'51.2" N	77°08'14.0" E
		1500	AK-308	26°47'56.9" N	77°08'55.6" E
8.	Villages-Belwa Ranaji & Sagat Nagar, Taluka-Shergarh, District-Jodhpur (Rajasthan)	1500	RKB-075	26°30'52.3" N	72°32'22.2" E
		1500	RKB-076	26°30'05.7" N	72°31'06.4" E
9.	Village-Dhundhariya, Taluka-Osiyan, District-Jodhpur (Rajasthan)	1500	OS-48	26°43'57.6" N	72°56'43.1" E
		1500	OS-49	26°43'55.5" N	72°56'59.5" E
10.	Village-Gopalpura, Taluka-	600	PR-01	23°23'26.4"N	74°55'27.1"E

	Ratlam, District-Ratlam (Madhya Pradesh)	600	PR-02	23°23'20.8"N	74°55'23.1"E
		600	PR-03	23°23'14.9"N	74°55'13.4"E
		600	PR-04	23°23'08.1"N	74°55'10.8"E
		600	PR-05	23°23'01.5"N	74°55'07.9"E
		600	PR-06	23°22'44.6"N	74°55'08.1"E
		600	PR-08	23°22'29.6"N	74°55'14.0"E
		600	PR-17	23°22'54.0"N	74°55'12.0"E
		600	PR-19	23°23'18.0"N	74°55'36.6"E
11.	Village-Rampuriya, Taluka-Ratlam, District-Ratlam (Madhya Pradesh)	600	PR-09	23°22'25.6"N	74°55'24.6"E
		600	PR-10	23°21'59.1"N	74°55'34.4"E
		600	PR-11	23°21'25.3"N	74°55'11.9"E
		600	PR-12	23°21'34.5"N	74°55'30.8"E
		600	PR-13	23°21'41.6"N	74°55'31.2"E
		600	PR-14	23°21'47.8"N	74°55'32.0"E
		600	PR-15	23°21'53.8"N	74°55'32.6"E
		600	PR-16	23°21'28.2"N	74°55'29.2"E
		600	PR-18	23°21'21.8"N	74°55'23.6"E

1.10 Conditions Prior to Project Initiation

Pre-project scenario:

Installed capacity for electricity generation in India:

As a result of the impressive growth attained by the Indian Power Sector, the installed capacity has grown from mere 1,713 MW in 1950 to 147,965.41 MW as on 31/03/2009³, consisting of 93,725.24 MW thermal (63%), 36,877.76 MW hydro (25%), 4,120 MW nuclear (3%), and 13,242.41 MW renewable (9%). Sector-wise details of installed capacity are shown below:

Sector-wise installed capacity (MW) as on 31/03/2009

Sector	Hydro	Thermal				Nucl ear	Renew-able	Total
		Coal	Gas	Diesel	Total			
State	27055.76	42537.50	3672.12	602.61	46812.23	0	2247.68	76115.67
Central	8592.00	29620.00	6638.99	0.00	36258.99	4120	0.00	48970.99
Private	1230.00	5491.38	4565.50	597.14	10654.02	0	10994.73	22878.75
All India	36877.76	77648.88	14876.61	1199.75	93725.24	4120	13242.41	147965.41

It is evident from the above table that the installed capacity is predominantly coal based (52%) and therefore, is a major source of carbon dioxide emissions in India. Hence, there exists scope for reducing the CO₂ emissions in the country by way of fuel substitution, increased use of renewable energy sources, and also by improving the thermal efficiency of power generation. Though the current fuel mix shows diversity but coal continues to be the dominant fuel with more than 50% usage. Despite the potential, India could not achieve even 10% renewable power as on 31/03/2009. The Government of India aims to provide "power to all" by 2012. To achieve that promise and to provide availability of over 1000 units of per capita electricity by year 2012, it had been estimated that need based capacity addition of more than 1,00,000 MW would be required during the period 2002-12⁴.

Electricity Demand and Availability Position (April 08 – March 09)⁵:

³ http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver5.pdf page 10

⁴ http://www.cci.in/pdf/surveys_reports/power_energy.pdf page 7

⁵ http://www.cea.nic.in/archives/exec_summary/mar09.pdf page 19

The following table shows the electricity demand and its availability in India in the year 2008-09:

Region	Energy Requirement (MU)	Energy Availability (MU)	Deficit (%)
Northern	224,218	199,928	-10.8%
Western	254,486	213,724	-16%
Southern	204,086	188,865	-7.5%
Eastern	82,127	78,370	-4.6%
North Eastern	9,407	8,134	-13.5%
All India	774,324	689,021	-11%

The project activity is connected to the NEWNE grid. The NEWNE grid comprises the regions – Northern, Eastern, Western, and North-Eastern. All these regions have shortage of electricity as depicted above in the table. There is an urgent need to add more capacity to cope with ever-increasing electricity demand in these regions and the country. Therefore, in the absence of the project activity, the equivalent amount of electricity would have been generated from the connected / new power plants in the grid, which are / will be predominantly based on fossil fuels. The main emission source in the pre-project scenario is the power plants connected to the NEWNE grid and main GHG involved is CO₂.

The project activity harnesses wind energy to generate and supply electricity to the NEWNE grid, regional electricity grid of India. The employed WTGs can only convert wind energy into electrical energy and do not use any other fuel as input for electricity generation. The operation of WTGs is emission free and no GHG emissions are generated during the lifetime of the project activity.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activity is in compliance with the applicable laws, statutes and regulatory requirements as shown below:

- The implementation of the project activity is a voluntary initiative and it is not mandatory or a legal requirement.
- The Indian Electricity Act, 2003 does not restrict or empower any authority to restrict the fuel choice for power generation.
- The applicable environmental regulations do not restrict the use of wind energy for power generation.
- There is no legal requirement on the choice of a particular technology for power generation in India.

1.12 Ownership and Other Programs

1.12.1 Proof of Title

Project Owner: Ruchi Soya Industries Limited (RSIL)

Document(s) demonstrating the ownership of the project:

Purchase Orders placed by RSIL to WTGs supplier
 Invoices placed by WTG suppliers to RSIL
 O&M agreement between RSIL and supplier
 Land documents in favour of RSIL
 Power Purchase / Wheeling Agreement between RSIL and state utilities

1.12.2 Emissions Trading Programs and Other Binding Limits

There is no compliance / binding limit of emission reductions in the host country (India). Therefore, it is not applicable.

1.12.3 Participation under Other GHG Programs

The project activity is under validation for CDM registration. For CDM purpose the project activity has been taken in two projects – 33.60 MW and 10.80 MW separately. The project proponent will withdraw the project activity from VCS on registration under CDM. If the projects are rejected under CDM then the projects will continue under VCS, if registered for the same.

1.12.4 Other Forms of Environmental Credit

The project activity will not be involved in creating another form of GHG-related environmental credit, such as renewable energy certificates.

1.12.5 Projects Rejected by Other GHG Programs

The project activity has not been rejected by any other GHG program.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

The project activity is Non-grouped project. The eligibility of the project activity has been explained below as per the methodology applied.

Leakage Management

The project activity generates electricity using wind energy, therefore, it will not have any leakage as per the applied methodology, ACM0002.

Commercially Sensitive Information

The project activity does not have any commercially sensitive information and nothing has been excluded from the public version of the project description.

Further Information

Contribution of the project activity to sustainable development:

Designated National Authority (DNA) of the host country (India) has stipulated four indicators for sustainable development in the interim approval guidelines for Clean Development Mechanism (CDM) projects in India⁶. The project proponent believes that the project activity has contributed to sustainable development in terms of the four indicators as follows:

⁶ http://www.cdmindia.in/approval_process.php

1. Social well being:

The project activity generates additional employment opportunities that help in alleviation of poverty and removal of social disparity. The project activity has led to the development of supporting infrastructure such as road network etc., in the project locations, that also provide access to the local population. Use of a renewable source of energy reduces the dependence on imported fossil fuels and associated price variation thereby leading increased energy security.

2. Economic well being:

The project activity requires temporary and permanent, skilled and semi-skilled manpower at the wind farms; this will create additional employment opportunities. The investment in the project activity will increase the economic activity of the local area.

3. Environmental well being:

The project activity involves use of renewable energy source for electricity generation instead of fossil fuel based electricity generation which would have emitted gaseous, liquid and/or solid effluents / wastes.

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.

All the above-discussed points are the contributions of the project activity for the sustainable development.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The following approved methodology has been applied to the project activity:

Title of the approved baseline and monitoring methodology:

“Consolidated baseline methodology for grid-connected electricity generation from renewable sources”;

Reference of the methodology applied to the project activity: ACM0002; Version 12.1.0 (EB 58).

<http://cdm.unfccc.int/methodologies/DB/C505B/V9P8V/SNNV3LTK1BP3OR24Y5L>

Title and reference of tools applied to the project activity:

“Tool for the demonstration and assessment of additionality”; Version: 05.2.1 (EB 39)

<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf>

“Tool to calculate the emission factor for an electricity system”; Version: 02.2.1 (EB 63)

<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf>

2.2 Applicability of Methodology

The methodology, ACM0002, version 12.1.0, is applicable to grid-connected renewable power generation project activities that

- (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant);
- (b) involve a capacity addition;
- (c) involve a retrofit of (an) existing plant(s); or
- (d) involve a replacement of (an) existing plant(s).

The project activity satisfies applicability criterion (a) as it involves installations of new wind turbines in such locations where no renewable power plant was operated prior to the implementation of the project activity.

The other applicability conditions of the methodology on the project activity are demonstrated as follows:

Sr. No.	Applicability Conditions as per ACM0002	Applicability to this Project Activity
1.	The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.	The project activity involves installation of new wind power units in different locations. Therefore, the project activity satisfies this applicability criterion.
2.	In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 11 of the methodology 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.	There is no capacity addition, retrofit or replacement in the project activity. Therefore, this condition is not applicable.
3.	In case of hydro power plants: - The project activity is implemented in an existing reservoir, with no change in the volume of reservoir, or - 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 of the methodology, is greater than 4 W/m^2, or - The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section of the methodology, is greater than 4 W/m^2.	This condition is not relevant, as the project activity does not have hydro power plant.

The description provided in table above shows that the project activity satisfies the applicable conditions of the methodology, ACM0002, version 12.1.0.

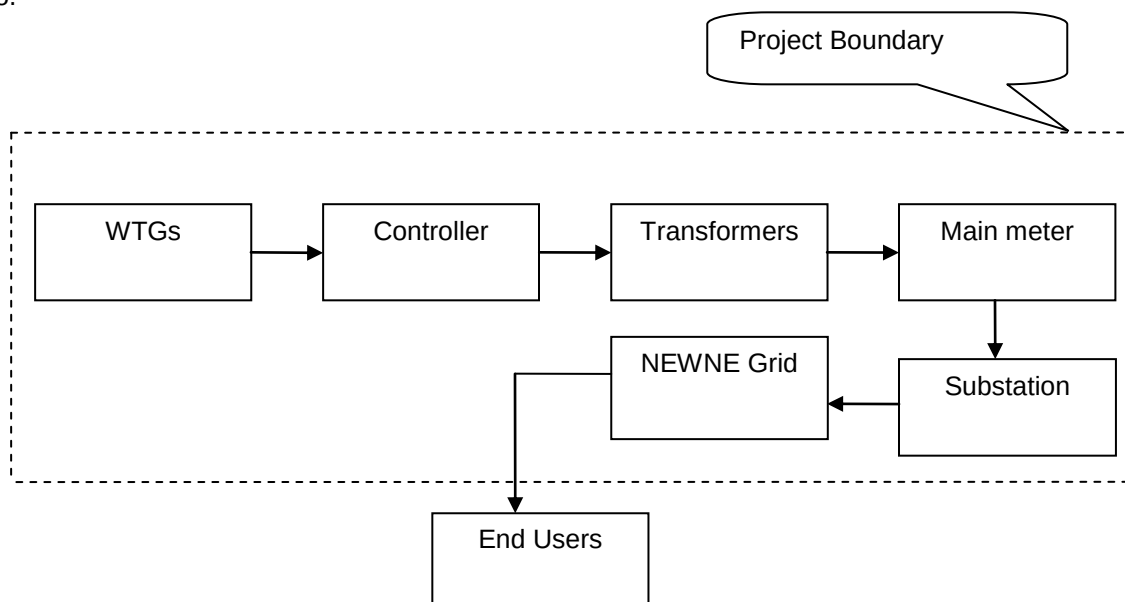
As per the requirement of the applied methodology, ACM0002 for demonstrating and assessing the additionality the latest version 05.2.1 of the “Tool for the demonstration and assessment of additionality” is applied to the project activity.

The project activity supplies the generated electricity to the grid. Hence, the latest version of the Tool “Tool to calculate the emission factor for an electricity system”, version 02.2.1 is applied in order to estimate the OM, BM and/or CM for the purpose of calculating baseline emissions for the project activity.

2.3 Project Boundary

The Project Boundary:

The spatial extent of the project boundary includes the project wind power generation units and all power plants connected physically to NEWNE grid that the project wind power generation units are connected to.



Emission Sources:

The greenhouse gases and emission sources included in or excluded from the project boundary are shown below:

Source		Gas	Included?	Justification/Explanation
Baseline	Combustion emissions from generating grid connected electricity.	CO ₂	Included	Main emission source.
		CH ₄	Excluded	Minor emission source.
		N ₂ O	Excluded	Minor emission source.
		Other	Excluded	Minor emission source.
Project	Emissions from the project activity	CO ₂	Excluded	The project activity generates electricity using wind energy. Therefore, project emissions should not be considered as per applied methodology.
		CH ₄	Excluded	
		N ₂ O	Excluded	
		Other	Excluded	

A GHG sink is any process that removes and stores GHG emissions from the atmosphere. In case of the project activity and its baseline no sink is involved that removes and stores GHG emissions from the atmosphere.

GHG reservoirs in baseline scenario: The fossil fuels being used in the power plants connected to the grid.

The project activity does not have any GHG reservoir.

No leakage is applicable to the project activity as per applied methodology.

2.4 Baseline Scenario

National policies and circumstances relevant to the baseline of the project activity:

The Government of India introduced an Electricity Act⁷ on 26/05/2003 to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalisation of electricity tariff, ensuring transparent policies regarding subsidies, promotion of efficient and environmentally benign policies constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal and for matters connected therewith or incidental thereto.

In compliance of the Electricity Act 2003 the Central Government notified the National Electricity Policy⁸ on 12/02/2005. According to this policy, the generation of electricity from non-conventional sources would be promoted by the State Electricity Regulatory Commissions (SERCs) by providing suitable measures for connectivity with grid and sale of electricity to any person and also by specifying, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee. Such percentage for purchase of power from non-conventional sources should be made applicable for the tariffs to be determined by the SERCs at the earliest. Progressively the share of electricity from non-conventional sources would need to be increased as prescribed by SERCs. Considering the fact that it will take some time before non-conventional technologies compete, in terms of cost, with conventional sources, the Commission may determine an appropriate differential in prices to promote these technologies.

Electricity Act and National Electricity Policy both provide comparative advantage to less emissions intensive technologies or fuels (E-). The impacts of these policies have been excluded in establishing a baseline scenario as these are implemented since the adoption of the Marrakesh Accords (11/11/2001) and not provide perverse incentives to implement this type of project activity.

According to the “Tool to calculate the emission factor for an electricity system (Version 02.2.1)”, if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used.

The electricity generated by the project activity is being supplied to NEWNE grid according to the delineation which is published by the CEA⁹, NEWNE is considered as the “electricity system”, which is defined as a part of the “project boundary” of the project activity. The project activity is the installation of a new grid-connected renewable power plant/unit, and is not a modification/retrofit of an existing plant/unit, the baseline scenario, according to methodology ACM0002 (Version 12.1.0), is the following:

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

⁷ http://www.cea.nic.in/reports/electricity_act2003.pdf

⁸ http://www.cea.nic.in/reports/national_elec_policy.pdf

⁹ http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf Page 4

Calculation of combined margin CO₂ emission factor for the grid:

The calculation of combined margin CO₂ emission factor for the grid has been carried out using the “Tool to calculate the emission factor for an electricity system”¹⁰, version 02.2.1 as follows:

Step 1: Identify the relevant electricity systems:

Historically, the Indian power system was divided into five independent regional grids, namely Northern, Eastern, Western, Southern, and North-Eastern. Each grid covered several states as shown below in the table. Since August 2006, however, all regional grids except the Southern Grid have been integrated and are operating in synchronous mode. Consequently, the Northern, Eastern, Western and North-Eastern grids are treated as a single grid named as NEWNE grid¹¹.

Geographical scope of the two electricity grids

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, Tamil Nadu, Pondicherry, Lakshadweep

CEA considers both Indian electricity systems, NEWNE & Southern, to calculate weighted average emission rate, simple operating margin, build margin, and combined margin CO₂ emission factor.

The WTGs of the project activity are installed in the states of Madhya Pradesh and Rajasthan which are covered by the NEWNE grid of India. All installed WTGs are connected to the NEWNE grid. Therefore, relevant electricity system for the project activity is NEWNE grid.

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

Project proponents may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

Option I corresponds to the procedure contained in earlier versions of this tool. Option II allows the inclusion of off-grid power generation in the grid emission factor. Option II aims to reflect that in some countries off-grid power generation is significant and can partially be displaced by CDM project activities, e.g. if off-grid power plants are operated due to an unreliable and unstable electricity grid. Option II requires collecting data on off-grid power generation and can only be used if the conditions outlined therein are met. Option II may be chosen only for the operating margin emission factor or for both the build margin and the operating margin emission factor but not only for the build margin emission factor.

¹⁰ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf>

¹¹ http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf Page 4

The project proponent selected “Option I: Only grid power plants are included in the calculation” to calculate the operating margin and build margin emission factor.

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

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) can be carried out using 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. 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 percentage share of power generation from low cost / must run power plants for the five most recent years in the Indian grids, NEWNE & Southern, is as follows (CEA database, version 06¹²):

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)					
	2005-06	2006-07	2007-08	2008-09	2009-10
NEWNE	18.0%	18.5%	19.0%	17.4%	15.9%
Southern	27.0%	28.3%	27.1%	22.8%	20.6%
India	20.1%	20.9%	21.0%	18.7%	17.1%

The average percentage of power generation by low cost / must run plants in the NEWNE grid for latest five years is 17.8% that is much below than 50%. Therefore, simple OM method (option a) is used for calculating simple Operating Margin.

For the simple OM the emissions factor can be calculated using either of the two following data vintages:

- *Ex ante* option: If the *ex ante* option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the VCS-PD to the DOE for validation. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the VCS-PD for validation.

- *Ex post* option: If the *ex post* option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y , alternatively the emission factor of the previous year $y-1$ may be used. If the data is usually only available 18 months after the end of year y , the emission factor of the year preceding the previous year $y-2$ may be used. The same data vintage (y , $y-1$ or $y-2$) should be used throughout all crediting periods.

The project proponent has used ex-ante option for calculating simple OM.

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

Selected method: Simple OM method.

¹² http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm version 6.0

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. The simple OM may be calculated:

Option A: Based on the net electricity generation and a CO₂ emission factor of each power unit; or
Option B: 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 can only be used if:

- (a) The necessary data for Option A is not available; and
- (b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
- (c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

CEA used option A. Under option A, 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:

$$EF_{\text{grid, OM simple, } y} = [\sum_m EG_{m,y} \times EF_{EL,m,y}] / \sum_m EG_{m,y} \quad \dots(1)$$

Where

- $EF_{\text{grid,OMsimple},y}$ = 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.

Determination of $EF_{EL,m,y}$: CEA has determined the emission factor of each power unit m using Option A1 as given below:

- **Option A1.** If for a power unit m data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) is determined as follows:

$$EF_{EL,m,y} = [\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}] / EG_{m,y} \quad \dots(2)$$

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)
- $EF_{CO_2,i,y}$ = CO₂ emission factor of fossil fuel type i in year y (tCO₂/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

Determination of $EG_{m,y}$: For grid power plants, $EG_{m,y}$ is determined as per the provisions in the monitoring tables.

The project proponent used ex ante option to calculate baseline simple operating margin CO₂ emission factor ($EF_{grid, OM, y}$) as 3-year generation-weighted average, based on the most recent data available at the time of submission of the VCS-PD to the DOE for validation.

The $EF_{grid, OM, y}$ is calculated as latest 3-year generation weighted average using latest CEA database¹³ (Baseline Carbon Dioxide Emission database, Version 6.0) as follows:

Data Available for Simple Operating Margin:

Simple Operating Margin (tCO ₂ /MWh) (incl. Imports)			
	2007-08	2008-09	2009-10
NEWNE	1.00	1.01	0.98

Net Generation in Operating Margin (GWh)			
	2007-08	2008-09	2009-10
NEWNE	4,01,642	4,21,803	4,58,043

Calculated Data:

Net Emissions in operating margin (tCO ₂) (incl. imports)				
	2007-08	2008-09	2009-10	Total Net Emissions
NEWNE	4.016x10 ⁰⁸	4.246x10 ⁰⁸	4.478x10 ⁰⁸	1.274x10 ⁰⁹

Calculated as,

Net Emissions in Operating Margin in year y = Simple Operating Margin in year y x Net Generation in Operating Margin in year y

Total Net Emissions in Operating Margin during last three years, 2007-08, 2008-09, and 2009-10
= 1.274x10⁰⁹ tCO₂

Total Net Generation in Operating Margin during last three years, 2007-08, 2008-09, and 2009-10
= 1.2815x10⁰⁹ MWh

Operating margin CO₂ emission factor ($EF_{grid, OM, y}$):

$$EF_{grid, OM, y} = 1.274 \times 10^9 / 1.2815 \times 10^9 = 0.9941 \text{ tCO}_2/\text{MWh} \quad \dots(3)$$

Step 5: Calculate the build margin (BM) emission factor:

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group *m* at the time of VCS-PD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

¹³ http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm version 6.0

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, *ex post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex ante*, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The project proponent selected Option 1 to calculate the build margin emission factor *ex ante* based on the most recent information available on units already built for sample group *m* at the time of VCS-PD submission to the DOE for validation. The sample group *m* consists of the 20 % of power plants supplying electricity to grid that have been built most recently, since it comprises of larger annual power generation. Further, none of the power plant capacity additions in the sample group have been registered as CDM project activities.

The sample group of power units *m* used to calculate the build margin has been determined by CEA as per the following procedure, consistent with the data vintage selected above:

- (a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET_{5-units}}$, in MWh);
- (b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total} , in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET_{\geq 20\%}}$, in MWh);
- (c) From $SET_{5-units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = [\sum_m EG_{m,y} \times EF_{EL,m,y}] / \sum_m EG_{m,y} \quad(4)$$

Where

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

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) is determined as per the guidance in Step 4 (a) for the simple OM, using options A1, A2 or A3, using for *y* the most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

The value of $EF_{BM, y}$ has been taken from CEA data (Version 6.0) as latest value (2009-10) of build margin for NEWNE grid as follows:

Build margin CO₂ emission factor for NEWNE Grid:

$$EF_{grid, BM, y} = EF_{NEWNE, BM, (2009-10)} = 0.8123 \text{ tCO}_2/\text{MWh} \quad \dots(5)$$

Step 6: Calculate the combined margin emissions factor:

The project proponent has evaluated weighted average combined margin emissions factor as follows:

$$EF_{grid, CM, y} = EF_{grid, OM, y} \times w_{OM} + EF_{grid, BM, y} \times w_{BM} \quad \dots(6)$$

Where

$EF_{grid, CM, y}$	=	Combined margin CO ₂ emission factor in year y (tCO ₂ /MWh)
$EF_{grid, OM, y}$	=	Operating margin CO ₂ emission factor in year y (tCO ₂ /MWh)
$EF_{grid, BM, y}$	=	Build margin CO ₂ emission factor in year y (tCO ₂ /MWh)
w_{OM}	=	Weighting of operating margin emissions factor (%)
w_{BM}	=	Weighting of build margin emissions factor (%)

The following default values can be used for w_{OM} and w_{BM} :

- Wind and solar power generation project activities: $w_{OM} = 0.75$ and $w_{BM} = 0.25$ (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;

- All other projects: $w_{OM} = 0.5$ and $w_{BM} = 0.5$ for the first crediting period, and $w_{OM} = 0.25$ and $w_{BM} = 0.75$ for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

The project activity is a wind power generation project activity. Therefore, $w_{OM} = 0.75$ and $w_{BM} = 0.25$ are used to calculate combined margin.

Combined margin CO₂ emission factor for NEWNE grid:

$$EF_{grid, CM, y} = 0.9941 \times 0.75 + 0.8123 \times 0.25 = 0.745575 + 0.203075 = 0.94865 \text{ tCO}_2/\text{MWh} \quad \dots(7)$$

Combined margin CO₂ emission factor for NEWNE grid ($EF_{grid, CM, y}$) = 0.94865 tCO₂/MWh

The emission factor calculated ex-ante and will remain same throughout the crediting period.

2.5 Additionality

Assessment and demonstration of additionality of the project activity has been carried out using various steps of the Methodological Tool “Tool for the demonstration and assessment of additionality” version 05.2.1 as follows:

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

The baseline scenario for the project activity has been identified according to ACM0002 (version 12.1.0) as follows:

The project activity is the installation of a new grid-connected renewable power plant/unit, hence the baseline scenario is the electricity delivered to the grid by the project activity which 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, ver. 02.2.1”.

As the project activity is not the retrofit or replacement of existing grid-connected renewable power plant/unit(s) at the project site, the step-wise procedure to identify the baseline scenario shall not be applied.

However, the following two realistic and credible alternatives to the project activity are considered:

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

In absence of the project activity plausible and credible alternatives that provide outputs or services comparable to the proposed VCS project activity include:

Alternative 1: Setting up the project activity without VCS benefits:

As per this alternative the project proponent would have undertaken the project activity without VCS benefits.

There will be no GHG emissions through this alternative. This alternative may be a part of the baseline. However, this alternative faces investment barrier as shown by the investment analysis conducted in the subsequent step 2. Hence, it is unlikely to be the most economically attractive option.

Alternative 2: Continuation of the current situation (no project activity or other alternatives undertaken):

In this alternative equivalent amount of electricity would be produced by operation of current grid-connected power generating units and / or new power generating units coming up in the NEWNE grid. This is the most plausible alternative as baseline alternative for the project activity.

Outcome of Step 1a:

Alternatives 1 & 2 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 1 & 2 from occurring in India. Both alternatives are as per national policies as described in section 2.4 above.

Outcome of Step 1b: Identified realistic and credible alternative scenario(s) to the project activity 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.

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

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

The project activity involves installations of the WTGs that produce the electricity by using wind resources. Therefore, the emission reductions of the project activity are equal to the baseline emissions since the project emissions and leakage are zero in the project activity.

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

The project proponent has selected Step 2 (Investment analysis) to proceed.

Step 2: Investment analysis:

The purpose of this step is to determine whether the project activity is economically or financially less attractive than other alternatives without additional funding that may be derived from the VCS project activity. The investment analysis was conducted in the following sub-steps:

Sub-step 2a: Determine appropriate analysis method:

The analysis methods suggested by the tool for the demonstration and assessment of additionality (version 05.2.1) are simple cost analysis (option I), investment comparison analysis (option II) and benchmark analysis (option III). Since the project activity will earn revenues from not only the VCS but also from electricity output, the simple cost analysis method (option I) is not appropriate. The baseline alternative to the project activity is continuation of current scenario i.e. equivalent amount of electricity is supplied through operation of current grid-connected power generating units and / or new power generating units coming up in the NEWNE grid. This alternative does not require capital investment. Hence, investment comparison analysis (option II) cannot be applied. The benchmark analysis (option III) is most appropriate to the project activity as no investment is required in baseline alternative.

Sub-step 2b: Option-III-Apply benchmark analysis:

Internal Rate of Return (IRR) is one of the known financial indicators used by the banks, financial institutions and project developers for making investment decisions. The project activity enjoys tax benefits provided by Govt. of India. Hence, to conduct the investment analysis of the project activity the post tax Project IRR is selected as the financial indicator for the project activity.

Selection of benchmark:

As per para 12 of the “Guidelines on the Assessment of Investment Analysis, Version 05, EB 62, Annex 5¹⁴”, *Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity (ROE) are appropriate benchmarks for equity IRR.*

PLR or Prime Lending Rate is defined as the benchmark rate for all bank loans. Historically, the PLR has been the rate at which banks lend to the best borrower—one who is the safest or the least likely to default on the loan. As per the guidance on assessment of investment analysis, PLR is comparable with project IRR. If the project does not even earn sufficient returns to cover the PLR then investment in the project can be considered financially unattractive.

The project proponent has selected the local commercial lending rates applicable at the time of investment decision as the benchmark to compare Project IRR of the project activity. The project activity has two benchmarks – one for the investment decision taken for 33.60 MW in September 2009 and another for investment decision taken for 10.80 MW in December 2010. The considered benchmarks are evaluated as follows:

Benchmark at the time of investment decision for 33.60 MW:

The prime lending rate at the time of decision making was ranging between 11% and 12%¹⁵. The project proponent has taken lower end PLR (11%) as the benchmark for the project activity of 33.60 MW.

Benchmark at the time of investment decision for 10.80 MW:

On July 1, 2010 RBI started a policy to control lending base rates and accordingly started publishing base rates in place of BPLR. Therefore, BPLR data for different banks was not available on RBI website at the time of investment decision for 10.8 MW project. PP sourced the BPLR data of different public sector banks from other available sources. The benchmark prime lending rate (BPLR) of different major public sector banks in India was as follows at the time of investment decision:

¹⁴ http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

¹⁵ <http://www.rbi.org.in/scripts/WSSView.aspx?Id=13976>

Bank	BPLR	Reference
Punjab National Bank	12.50% w.e.f. 08/12/2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=bafd9e83-d2ef-4700-95a5-ff22c3f98a98&param1=1
Corporation Bank	13% w.e.f. 13/12/2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=38994047-578c-4449-aa7d-bdd2146a4e69&param1=1
State Bank of India	12.50% w.e.f. 21/10/2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=ba021c2f-6e56-4d95-b0c9-aa76293e185c&param1=1
Bank of Baroda	13.25% w.e.f. 13/12/2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=82a06e26-2c6b-4398-8f43-b93709a336c2&param1=1
Bank of India	13.25% w.e.f. 15/12/2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=fe6bda95-ed52-4128-aaf0-8a1b66c81d51&param1=1
Dena Bank	13.75% w.e.f. 15/12/2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=225835b3-7d5d-4cc6-bda1-6b2118160f11&param1=1
Allahabad Bank	13.25% w.e.f. 14/12/2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=7206917f-5e23-4172-b808-6fa7f7db58b5&param1=1
Andhra Bank	13% w.e.f. 13/12/2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=99459413-0093-43cd-95bf-327ab20bbb0&param1=1

BPLR of different public sector banks was ranging from 12.50% to 13.75% at the time of investment decision. The project proponent has taken lower value of BPLR of 12.50% as benchmark for the project activity of capacity 10.80 MW.

Sub-step 2c: Calculation and comparison of financial indicators:

A. The project proponent has taken following assumptions for investment analysis as per information available at the time of investment decision for 33.60 MW project along with related references:

For the WTGs ordered in the year 2009-10:

Particulars	Phase-IA	Phase-IB	Phase-II	Phase-III	Reference
Rated Capacity (kW)	600	600	1500	1500	Offer letters
No. of machines	3	13	6	4	
Installed capacity (MW)	1.80	7.80	9.0	6.0	
PLF	23.70%	23.70%	23.36%	22.73%	Third party report
Project cost (INR Mn.)	116.81	506.18	573.81	382.54	Offer letters
Debt (INR Mn.)	68.19	295.50	334.98	223.32	ECB-I-58.38% ¹⁶
Equity (INR Mn.)	48.62	210.69	238.83	159.22	Calculated
Rate of Interest	2.85%	2.85%	2.85%	2.85%	ECB-I
Loan Tenure (Years)	6	6	6	6	--do--
Moratorium (Year)	2	2	2	2	--do--
Insurance Charges (% of project cost)	0.10%	0.10%	0.10%	0.10%	Assumed
O&M Charges (INR Mn.)	2.32	10.04	10.59	7.06	Offer letters

¹⁶ ECB-I loan document; IR=3-Month LBOR+2.60

Power Purchase Rate (INR/kWh)	3.15	-	-	-	MPERC Order ¹⁷
Tariff (INR/kWh)	-	4.03	4.28	4.28	MPERC ¹⁸ / RERC ¹⁹ orders
Wheeling charges	2%	-	-	-	GERC/ MPERC

* 1st Year-Nil, 2nd Year – INR 1.60 Mn. / WTG + taxes, 3rd year onwards – 5% escalation per year.

** 1st Year-Nil, 2nd Year – INR 0.70 Mn. / WTG + taxes, 3rd year onwards – 5% escalation per year.

Inter-Bank Foreign Exchange forward premium (three months) = 2.93% per year²⁰

For the WTGs ordered in the year 2010-11:

Particulars	Phase-IV	Phase-V	Reference
Rated Capacity (kW)	600	1500	Offer letters
No. of machines	10	2	
Installed capacity (MW)	6.0	3.0	
PLF	23.70%	23.36%	Third party report
Project cost (INR Mn.)	389.37	191.27	Offer letter
Debt (INR Mn.)	277.39	136.26	ECB-II-71.24% ²¹
Equity (INR Mn.)	111.98	55.01	Calculated
Rate of Interest	2.54%	2.54%	ECB-II Loan
Loan Tenure (Years)	5	5	--do--
Moratorium (Year)	2	2	--do--
Insurance Charges (% of project cost)	0.10%	0.10%	Assumed
O&M Charges (INR Mn.)	7.72	3.53	Offer letters
Tariff (INR/kWh)	4.03	4.28	MPERC ²² /RERC ²³

* 1st Year-Nil, 2nd Year – INR 1.60 Mn. / WTG + taxes, 3rd year onwards – 5% escalation per year.

** 1st Year-Nil, 2nd Year – INR 0.70 Mn. / WTG + taxes, 3rd year onwards – 5% escalation per year.

Inter-Bank Foreign Exchange forward premium (three months) = 6.48% per year²⁴

The following Govt. Tax incentives and tax rates are applied on the project activity as applicable at the time of decision making in the year 2009-10:

Accelerated depreciation on WTGs, Tower, etc. in Tax calculations	80%	IT Act
Accelerated depreciation on other assets in Tax calculations	15%	IT Act
Income tax exemption for 10 consecutive years out of first 15 years	100%	IT Act
Book depreciation (SLM)	4.75%	Companies Act.
Salvage value	10%	SERCs Tariff Orders
Corporate tax rate	33.99%	IT Act

The calculated values of Project IRR for 20-year cash flow with and without VCS benefits are given below along with the benchmark:

¹⁷ <http://www.mperc.nic.in/290709-Tariff-FY09-10-HV-FINAL-29-07-09.pdf> page 7

¹⁸ <http://www.mperc.org/Wind-tariff-order-21-11-07.pdf>

¹⁹ http://www.erc.gov.in/Tenders_for_Works.pdf

²⁰ <http://www.rbi.org.in/scripts/WSSView.aspx?Id=14530>

²¹ ECB loan document

²² <http://www.mperc.org/Wind-tariff-order-21-11-07.pdf>

²³ http://www.erc.gov.in/Tenders_for_Works.pdf

²⁴ <http://www.rbi.org.in/scripts/WSSView.aspx?Id=15496>

Project IRR without VCS	8.31%
Project IRR with VCS	9.84%
Benchmark	11%

It is evident from the table that Project IRR (for 33.60 MW project) without VCS revenue is less than the benchmark. The Project IRR improves when VCS revenue is included. Hence, it is clear that VCS revenue is very important for the project activity of capacity 33.60 MW.

B. The project proponent has taken following assumptions for investment analysis as per information available at the time of investment decision for 10.80 MW project along with related references:

Particulars	Phase-VI	Phase-VII	Reference
Rated Capacity (kW)	600	600	Offer letter
No. of machines	10	8	
Installed capacity (MW)	6.0	4.8	
PLF	23.54%	23.54%	Third party report
Project cost (INR Mn.)	382.69	306.15	Offer letter
Debt (INR Mn.)	272.63	218.10	ECB-II-71.24% ²⁵
Equity (INR Mn.)	110.06	88.05	Calculated
Rate of Interest	2.54%	2.54%	ECB-II
Loan Tenure (Years)	5	5	--do--
Moratorium (Year)	2	2	--do--
Insurance Charges (% of project cost)	0.10%	0.10%	Assumed
O&M Charges (INR Mn.)	7.72	6.18	Offer letters
Tariff (INR/kWh)	4.35	4.35	MPERC ²⁶

Inter-Bank Foreign Exchange forward premium (three months) = 6.48% per year²⁷

The following Govt. Tax incentives and tax rates are applied on the project activity as applicable at the time of decision making in the year 2010-11:

Accelerated depreciation on WTGs, Tower, etc. in Tax calculations	80%	IT Act
Accelerated depreciation on other assets in Tax calculations	15%	IT Act
Income tax exemption for 10 consecutive years out of first 15 years	100%	IT Act
Book depreciation (SLM)	4.75%	Companies Act.
Salvage value	10%	SERCs Tariff Orders
Corporate tax rate	33.22%	IT Act

The calculated values of Project IRR for 20-year cash flow with and without VCS benefits are given below along with the benchmark:

Project IRR without VCS	9.92%
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²⁵ ECB loan

²⁶ <http://www.mperc.org/14052010-Wind-tariff-order-May-2010.pdf>

²⁷ <http://www.rbi.org.in/scripts/WSSView.aspx?Id=15496>

Project IRR with VCS	11.21%
Benchmark	12.50%

It is evident from the table that Project IRR (for 10.80 MW project) without VCS revenue is less than the benchmark 12.50%. The Project IRR improves when VCS revenue is included. Hence, it is clear that VCS revenue is very important for the project activity of capacity 10.80 MW.

Sub-step 2d: Sensitivity analysis:

The following sensitivity analysis has been conducted on Project IRR to check the robustness of the financial attractiveness of the project without VCS revenue by using "Guidelines on the Assessment of Investment Analysis, Version 05, EB 62, Annex 5²⁸"

The project cost is affected by the following cost parameters more than 20%:

- Cost of WTGs, etc.
- O&M Charges

The project proponent has considered the project cost as per offer letters from the supplier of the WTGs. Hence, variation in project cost is possible as generally cost comes down during the negotiations. Therefore, variation of $\pm 10\%$ in project cost is considered for the sensitivity analysis.

The supplier of the WTGs also provides O&M services but sign the agreement just for first 5-6 years. Therefore, O&M cost may also vary. The project proponent considered variations of -15% & $+10\%$ in O&M charges for sensitivity analysis.

The project revenue is mainly affected by following parameters:

- Plant Load Factor (PLF)
- Tariff

PLF is a sensitive parameter for the project activity and it is beyond the control of the PPs. Therefore, variation of -10% & $+10\%$ in PLF is considered for the sensitivity analysis.

In case of project activity of 33.60 MW a part of the electricity from the project activity is being used captive and remaining is being sold as per applicable tariff decided by the concerned state electricity regulatory commission. In case of captive use the tariff may vary as regulatory authorities change the tariff time to time for the each type of the consumers. In case of electricity selling tariff remains same for the life time of the project activity as per power purchase agreement. However, the project proponent considered variation of $\pm 10\%$ in the tariff in both the cases-captive and selling, for the sensitivity analysis for project activity of 33.60 MW capacity.

In case of project activity of capacity 10.80 MW entire electricity is being sold as per tariff decided by MPERC. The tariff remains unchanged for the entire life time period. Hence, no variation is considered in tariff for the project activity of capacity 10.80 MW.

The results of sensitivity analysis are as follows:

Scenario	Project IRR without VCS Revenue (33.60 MW)	Project IRR without VCS Revenue (10.80 MW)
Project cost (-10%)	9.98%	11.68%

²⁸ http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

Project cost (+10%)	6.90%	8.43%
O&M Charges (-15%)	8.86%	10.45%
O&M Charges (+10%)	7.93%	9.56%
Tariff (-10%)	6.23%	Not Applicable
Tariff (+10%)	10.25%	
PLF (-10%)	6.34%	7.89%
PLF (+10%)	10.16%	11.84%

The sensitivity analysis clearly shows that the Project IRRs (without VCS revenue) for project activity of 33.60 MW and 10.80 MW are less than the respective benchmarks in all the scenarios. Therefore, it can be concluded that the project activity is definitely financially unattractive without VCS revenue and the VCS revenue is must for the project activity.

Step 3. Barrier analysis:

Barrier analysis has not been adopted for the project activity by the project proponent.

Step 4. Common practice analysis:

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

As per the "Tool for the demonstration and assessment of additionality" (Version 05.2), the common practice analysis is carried out on the similar projects in the same region and taking place in a comparable environment with regards to regulatory framework, investment climate etc. The project activity is a 44.40 MW wind power project set up by Ruchi Soya Industries Limited in the states of Madhya Pradesh, and Rajasthan to generate and supply electricity to the NEWNE grid. The project is a large scale CDM activity.

- The similar project activities should be defined as the power projects in the states-Madhya Pradesh, and Rajasthan (the same region), relying on wind power technology (similar technology), and with a similar scale (large scale with installed capacity >15MW) by single project participant.
- The project activities should be implemented after 2003. The wider power sector reforms happened in India since 2003, which led to diversification in the ownership of power generation. As a result, new generation, including wind power, was expected to compete under more commercial conditions. Moreover, the Indian Government launched the Wind Concession Program in 2003, which was designed to bring wind power development in India onto a new commercial footing.

Accordingly, all wind power projects of greater than 15 MW capacity set by single project proponent in the states of Madhya Pradesh, and Rajasthan, have been analyzed. There are 107 single project participants who have installed large scale wind power projects in India²⁹ as on 31/03/2009. Out of these 107 large scale wind power projects the installations in the states of Madhya Pradesh, and Rajasthan were respectively three, and fifteen. The details of these large scale wind power projects in the states of Madhya Pradesh, and Rajasthan are provided in the following tables:

(i) Large scale wind power projects in Madhya Pradesh:

S. No.	Project Participant	Project start date	Installed capacity (MW)
M-1.	22.5 MW Wind Power Project by Ruchi Soya Industries Limited at Palsodi, District-Ratlam, Madhya Pradesh	20/11/2007	22.50
M-2.	15.2 MW wind energy project in Madhya Pradesh by Manganese Ore (India) Limited.	14 /06/2007	15.20
M-3.	27.2 MW Wind Power Project in Madhya Pradesh	23/07/2007	27.20

²⁹ http://www.windpowerindia.com/index.php?option=com_content&view=article&id=21&Itemid=26

Web links showing current status of the projects mentioned above:

S. No.	Web link
M-1.	http://cdm.unfccc.int/Projects/DB/RWTUV1285157251.43/view
M-2.	http://cdm.unfccc.int/Projects/Validation/DB/FNWJ43FT490VWXBLQ7MJ8F5DWW2PBX/view.html
M-3.	http://cdm.unfccc.int/Projects/Validation/DB/IFMQZ4IITK8Z46XGQFT6L8LDM6TJJ4/view.html

(ii) Large scale wind power projects in Rajasthan:

S. No.	Project Participant	Project start date	Installed capacity (MW)
R-1.	Maharana Pratap Power Project in Rajasthan	01/01/2007	100
R-2.	33.25 MW wind electricity generation project at Jaisalmer in Rajasthan	30/03/2003	33.25
R-3.	31.5 MW bundled wind power project in Rajasthan by Gujarat Fluorochemicals Limited (GFL)	04/01/2008	31.5
R-4.	Bundled Wind power project in Jaisalmer (Rajasthan in India) managed by Enercon (India) Ltd	10/07/2003	58.2
R-5.	Bundled wind energy power projects (2004 policy) in Rajasthan	24/11/2005	24.8
R-6.	Enercon Wind Farm (Hindustan) Ltd in Rajasthan	10/03/2006	60
R-7.	22.5 MW grid connected wind farm project by RSMML in Jaisalmer, India.	15/12/2005	22.5
R-8.	15MW Grid connected renewable energy generation by RSMML	23/05/2007	15
R-9.	MRMPL Wind Power Project	19/08/2008	20
R-10.	Wind Power based electricity generation project in India by DLF Home Developers Limited	12/06/2008	88.5
R-11.	Bundled wind energy power projects (2003 policy) in Rajasthan	30/04/2003	30.59
R-12.	25 MW Grid Connected Wind Farm project by RRECL in Jaisalmer, India.	28/06/2004	25
R-13.	"22.5 MW grid connected Wind Energy Project of RSMML" of Rajasthan State Mines and Minerals Limited in Jaisalmer District, Rajasthan State, India	18/11/2007	22.5
R-14.	16.5 MW Grid-connected, Bundled Wind Power Project, Jodhpur, Rajasthan, India.	14/01/2009	16.5
R-15.	19.5 MW wind power project in Ossiya, Rajasthan by Gujarat Fluorochemicals Limited (GFL)	04/01/2008	19.5

Web links showing current status of the projects mentioned above:

S. No.	Web link
R-1.	http://cdm.unfccc.int/Projects/Validation/DB/PCJIT7PAL4J6YNVIKGGN9XVJP6UZHA/view.html
R-2.	http://cdm.unfccc.int/Projects/Validation/DB/VQM5TF4DSH43SCWUJ90TK4W040VHT2/view.html
R-3.	http://cdm.unfccc.int/Projects/Validation/DB/784NCQNUUMQ6P7RWRH9A6G3C6MEYGL/view.html
R-4.	http://cdm.unfccc.int/Projects/DB/DNV-CUK1143050217.74
R-5.	http://cdm.unfccc.int/Projects/Validation/DB/3KTKZVNJ1N859T3S5F0KQ711Z5QXZX/view.html
R-6.	http://cdm.unfccc.int/Projects/DB/SGS-UKL1181742063.57/view
R-7.	http://cdm.unfccc.int/Projects/DB/BVQI1201770524.09/view

R-8	http://cdm.unfccc.int/Projects/DB/DNV-CUK1243661243.16
R-9	https://cdm.unfccc.int/Projects/Validation/DB/AERX8YCUI2RBEAK41JC7IF8SN67G1P/view.html
R-10	http://cdm.unfccc.int/Projects/Validation/DB/9YLS582SWXX4SAZD8P7ZC75KKJMV4Y/view.html
R-11	http://cdm.unfccc.int/Projects/DB/SGS-UKL1181738388.43/view
R-12	http://cdm.unfccc.int/Projects/Validation/DB/Y8W0UMSG3DAI1VHPT2U3Y4IF9N7S4G/view.html
R-13	http://cdm.unfccc.int/Projects/Validation/DB/Y3O8IX2VXOH6L1WCZP48IC1UM74CU3/view.html
R-14	http://cdm.unfccc.int/Projects/Validation/DB/0ZA7KVFUNQKYLYLN68HG930I241HJ9T/view.html
R-15	https://cdm.unfccc.int/Projects/Validation/DB/2PRTXEX2D3L8N6SMULG87OVB1WWJPG/view.html

It is clear from the above mentioned tables containing web links of the large scale wind power projects in the states of Madhya Pradesh and Rajasthan that all project participants have installed their large scale wind power projects in these states as CDM projects. Therefore, all similar project activities, having installed capacity of more than 15 MW, are CDM project activities.

Hence, it can be concluded that similar project activities are not widely observed or commonly carried out.

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

From sub-step 4a it is clear that all similar project activities not widely observed or commonly carried out. Therefore, Sub-step 4b is not applicable.

Hence, it can be concluded that the project activity is additional.

2.6 Methodology Deviations

There is no methodology deviation in the project activity.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 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:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

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, ver. 02.2.1" (tCO₂/MWh)

Calculation of $EG_{PJ,y}$:

The project activity involves Greenfield renewable energy power plant/units. The calculation of $EG_{PJ,y}$ has been carried out as per follows:

Greenfield renewable energy power plants:

The WTGs installed in the project activity are the installation of new grid-connected renewable power units at a site where no renewable power plant was operated prior to the implementation of the project activity, hence

$$EG_{PJ,y} = EG_{facility,y}$$

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 net electricity supplied to the grid ($EG_{PJ,y}$) is calculated as follows:

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

Where

$EG_{export,y}$ = Electricity exported to the grid by the project activity in year y (MWh)

$EG_{import,y}$ = Electricity imported by the project activity from the grid in year y (MWh)

At each site main electronic meter is located at the common metering point and owned by the concerned state electricity board. The main meter records import, export and RKVAH consumption of electricity. The net electricity supplied to the NEWNE grid will displace an equivalent amount of electricity that would be generated by the NEWNE grid mix. In absence of the project activity, the same energy load would have been taken up by power plants of the project electricity system and equivalent CO_2 emissions would have been occurred due to combustion of fossil fuels. The net electricity supplied to the grid is considered for estimation of emission reductions.

Estimation of net electricity generation and baseline emissions:

$$\text{NEWNE grid emission factor } (EF_{grid,CM,y}) = 0.94865 \text{ tCO}_2 / \text{MWh}$$

Estimated Net Electricity Supplied to the Grid ($EG_{PJ,y}$) = Electricity exported to the grid by the project activity in year y - Electricity imported by the project activity from the grid in year y

Assumptions:

- Electricity exported to the grid by the project activity in year y = Installed Capacity (MW) * Operating Hours (h) * PLF (%)
- Electricity imported by the project activity from the grid in year y = 0

$$\text{Baseline emissions } (BE_y) = EG_{PJ,y} \times EF_{grid,CM,y}$$

Year Start Date				26-02-2010	01-01-2011	01-01-2012	01-01-2013
Year End Date				31-12-2010	31-12-2011	31-12-2012	31-12-2013
Site	DOC	Installed Capacity (MW)	PLF	EG (MWh)	EG (MWh)	EG (MWh)	EG (MWh)
Osiyan	26-02-2010	3	22.64%	5036.95	5949.79	5966.09	5949.79
RKB	08-03-2010	3	22.81%	4910.54	5994.47	6010.89	5994.47
Akal	26-03-2010	9	23.36%	14178.59	18417.02	18467.48	18417.02

Jaora	27-03-2010	6.6	23.70%	10511.42	13702.39	13739.93	13702.39
Jaora	30-03-2010	1.2	23.70%	1890.69	2491.34	2498.17	2491.34
Jaora	31-05-2010	1.8	23.70%	2201.26	3737.02	3747.25	3737.02
Akal	24-01-2011	1.5	23.36%	0.00	2876.08	3077.91	3069.50
Akal	15-02-2011	1.5	23.36%	0.00	2691.07	3077.91	3069.50
Jaora	29-03-2011	4.2	23.70%	0.00	6641.31	8743.59	8719.70
Jaora	30-03-2011	1.8	23.70%	0.00	2836.04	3747.25	3737.02
Palsodi	30-03-2011	6	23.54%	0.00	9389.64	12406.52	12372.62
Palsodi	04-06-2011	3.6	23.54%	0.00	4291.44	7443.91	7423.57
Palsodi	17-06-2011	1.2	23.54%	0.00	1342.34	2481.30	2474.52
Total		44.4		38729.44	80359.95	91408.24	91158.49
BE (tCO₂)				36740	76233	86714	86477

Year Start Date	01-01-2014	01-01-2015	01-01-2016	01-01-2017	01-01-2018	01-01-2019	01-01-2020
Year End Date	31-12-2014	31-12-2015	31-12-2016	31-12-2017	31-12-2018	31-12-2019	25-02-2020
Site	EG (MWh)	EG (MWh)	EG (MWh)	EG (MWh)	EG (MWh)	EG (MWh)	EG (MWh)
Osiyan	5949.79	5949.79	5966.09	5949.79	5949.79	5949.79	912.84
RKB	5994.47	5994.47	6010.89	5994.47	5994.47	5994.47	919.70
Akal	18417.02	18417.02	18467.48	18417.02	18417.02	18417.02	2825.63
Jaora	13702.39	13702.39	13739.93	13702.39	13702.39	13702.39	2102.28
Jaora	2491.34	2491.34	2498.17	2491.34	2491.34	2491.34	382.23
Jaora	3737.02	3737.02	3747.25	3737.02	3737.02	3737.02	573.35
Akal	3069.50	3069.50	3077.91	3069.50	3069.50	3069.50	470.94
Akal	3069.50	3069.50	3077.91	3069.50	3069.50	3069.50	470.94
Jaora	8719.70	8719.70	8743.59	8719.70	8719.70	8719.70	1337.82
Jaora	3737.02	3737.02	3747.25	3737.02	3737.02	3737.02	573.35
Palsodi	12372.62	12372.62	12406.52	12372.62	12372.62	12372.62	1898.27
Palsodi	7423.57	7423.57	7443.91	7423.57	7423.57	7423.57	1138.96
Palsodi	2474.52	2474.52	2481.30	2474.52	2474.52	2474.52	379.65
Total	91158.49	91158.49	91408.24	91158.49	91158.49	91158.49	13985.96
BE (tCO₂)	86477	86477	86714	86477	86477	86477	13267

3.2 Project Emissions

The project activity is based on renewable wind energy, therefore, project emissions should not be considered as per methodology ACM0002, $PE_y = 0$

3.3 Leakage

According to the applied methodology, ACM0002, no leakage is considered for the project activity. Therefore, $LE_y = 0$

3.4 Summary of GHG Emission Reductions and Removals

Years	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
26-02-2010 to 31-12-2010	36,740	0	0	36,740
01-01-2011 to 31-12-2011	76,233	0	0	76,233
01-01-2012 to 31-12-2012	86,714	0	0	86,714
01-01-2013 to 31-12-2013	86,477	0	0	86,477
01-01-2014 to 31-12-2014	86,477	0	0	86,477
01-01-2015 to 31-12-2015	86,477	0	0	86,477
01-01-2016 to 31-12-2016	86,714	0	0	86,714
01-01-2017 to 31-12-2017	86,477	0	0	86,477
01-01-2018 to 31-12-2018	86,477	0	0	86,477
01-01-2019 to 31-12-2019	86,477	0	0	86,477
01-01-2020 to 25-02-2020	13,267	0	0	13,267
Total	818,530	0	0	818,530

Emission reductions for the year 2010 are calculated from crediting period start date 26/02/2010 to 31/12/2010 and for the year 2020 emission reductions are calculated till crediting period end date 25/02/2020 keeping crediting period of 10 years i.e. from 26/02/2010 to 25/02/2020.

4 MONITORING

4.1 Data and Parameters Available at Validation

Data Unit / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO ₂ /MWh
Description:	Operating margin CO ₂ emission factor for NEWNE grid in the year y
Source of data:	"Baseline Carbon Dioxide Emission Database" ³⁰ Version 6.0" published by the Central Electricity Authority, Ministry of Power, Government of India.
Value applied:	0.9941 tCO ₂ /MWh
Justification of choice of data or description of measurement methods and procedures applied:	Calculated as per ACM0002 using "Tool to calculate the emission factor for an electricity system, version 02.2.1" as 3-year generation-weighted average of latest three years, 2007-2008, 2008-2009, 2009-2010, data obtained from "CO ₂ Baseline Database for Indian Power Sector" version 6.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Any comment:	Computed once during VCS-PD finalization (ex-ante).

Data Unit / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO ₂ /MWh
Description:	Build margin CO ₂ emission factor for NEWNE grid in the year y
Source of data:	"Baseline Carbon Dioxide Emission Database Version 6.0" published by the Central Electricity Authority, Ministry of Power, Government of India.
Value applied:	0.8123 tCO ₂ /MWh
Justification of choice of data or description of measurement methods and procedures applied:	Calculated ex ante as per "Tool to calculate the emission factor for an electricity system, ver. 02.2.1" based on the most recent year (2009-10) data available on "Baseline Carbon Dioxide Emission Database Version 6.0".
Any comment:	Computed once during VCS-PD finalization (ex-ante).

Data Unit / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO ₂ /MWh
Description:	Combined margin CO ₂ emission factor for NEWNE grid in the year y
Source of data:	Calculated weighted average combined margin using equation – $EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$ The default values for w_{OM} and w_{BM} are taken as applicable to wind power generation project activities as $w_{OM} = 0.75$ and $w_{BM} = 0.25$. Reference: Page 18 of "Tool to calculate the emission factor for an electricity system", Version 02.2.1³¹.

³⁰ http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm version 6.0

³¹ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf>

Value applied:	0.94865 tCO ₂ /MWh
Justification of choice of data or description of measurement methods and procedures applied:	Calculated ex ante as per “Tool to calculate the emission factor for an electricity system, ver. 02.2.1” as follows: $EF_{grid,CM,y} = 0.75 \times EF_{grid,OM,y} + 0.25 \times EF_{grid,BM,y}$
Any comment:	Computed once during VCS-PD finalization (ex-ante) and will remain same throughout the crediting period.

4.2 Data and Parameters Monitored

Data Unit / Parameter:	EG _{export, y}
Data unit:	MWh
Description:	Electricity exported to the grid by the project activity in year y
Source of data:	The main meter located at common metering point at each project location.
Description of measurement methods and procedures to be applied:	The main meter installed at each of the common metering point will measure the export of electricity on continuous basis. Main meter reading will be taken and verified, once in a month, jointly by the representatives of the state utility and the contractor (SISL).
Frequency of monitoring/recording:	Continuous measurement and monthly recording
Value applied:	86,284
Monitoring equipment:	Energy Meter (Main Meter)
QA/QC procedures to be applied:	<i>Calibration:</i> Once in a year. <i>Accuracy:</i> 0.5% (Main meter)
Calculation method:	Not applicable
Any comment:	The data will be archived for the crediting period + 2 years

Data Unit / Parameter:	EG _{import, y}
Data unit:	MWh
Description:	Electricity imported by the project activity from the grid in year y
Source of data:	The main meter located at common metering point at each project location.
Description of measurement methods and procedures to be applied:	The main meter installed at each of the common metering point will measure the import of electricity on continuous basis. Main meter reading will be taken and verified, once in a month, jointly by the representatives of the state utility and the contractor (SISL).
Frequency of monitoring/recording:	Continuous measurement and monthly recording
Value applied:	0

Monitoring equipment:	Energy Meter (Main Meter)
QA/QC procedures to be applied:	<i>Calibration:</i> Once in a year. <i>Accuracy:</i> 0.5% (Main meter)
Calculation method:	Not applicable
Any comment:	The data will be archived for the crediting period + 2 years

Data Unit / Parameter:	$EG_{PJ, y}$
Data unit:	MWh
Description:	Quantity of net electricity supplied to the grid as a result of the implementation of the project activity in year y
Source of data:	Joint meter reading report / Credit report (Madhya Pradesh & Rajasthan)
Description of measurement methods and procedures to be applied:	The main meter installed at each of the common metering point measures the export and import of electricity on continuous basis. Main meter readings are taken and verified, once in a month, jointly by the representatives of the state utility and the contractor (SISL). The net electricity supplied to the grid is calculated by subtracting the import of the electricity from the export of the electricity.
Frequency of monitoring/recording:	Monthly
Value applied:	86,284
Monitoring equipment:	Energy Meter (Main Meter)
QA/QC procedures to be applied:	The data is cross-checked with the invoices raised in case sale of the electricity and electricity bills in case of captive use.
Calculation method:	Net electricity fed to the grid is calculated as $EG_{PJ, y} = EG_{\text{export}, y} - EG_{\text{import}, y}$
Any comment:	The data will be archived for the crediting period + 2 years

4.3 Description of the Monitoring Plan

Monitoring of emission reductions will be carried as per the applied methodology in the project activity i.e. ACM0002, version 12.1.0, which requires monitoring of the following relevant parameters:

- $EF_{\text{grid}, \text{CM}, y}$: Combined margin CO_2 emission factor for NEWNE grid in the year y
- $EG_{PJ, y}$: Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y

Since the project proponent has chosen *ex-ante* determination of CO_2 emission factor for the grid, 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. Hence, the sole parameter for monitoring is the electricity produced and supplied to the grid by the project activity.

The general conditions set out for metering, recording, meter readings, meter inspections, test & checking and communication shall be as per the Power Purchase/ Wheeling Agreement signed by the project proponent with the respective state electricity utility.

The project proponent has undertaken maintenance and services agreement with Suzlon Infrastructure Services Limited (SISL), the contractor. The performance of the WTGs, safety in operation and scheduled / breakdown maintenances are organized and monitored by the contractor. Hence the authority and responsibility of project management lies with the contractor.

Monitoring Plan:

Metering arrangement:

Measuring and metering arrangement has been done as per Power Purchase / Wheeling Agreement signed by the project proponent with the respective state electricity utility. The main meter installed at each site is connected with several WTGs of that site. The main meter readings are taken monthly by the representatives of the state electricity utility and the Contractor (SISL).

Metering Equipment:

The project activity has the following metering systems:

Controller:

The controller installed on each WTG records export of the electricity by that WTG. Its primary use is to gather data from the anemometer (weather station) located on the top of the wind turbine. With the collected data the controller points the turbine in the most desired direction with respect to wind direction. It controls the operations of the WTG to optimize working of the WTG through Central Monitoring System (CMS). The controller does not require calibration as it operates with the software.

Main and check meters:

The main and check meters are connected with several WTGs installed at each site of the project activity.

Monitoring of power generation at the WTGs:

Power generated by the WTGs is monitored continuously and measured hourly at the Central Monitoring Station (CMS) of the technology supplier-Suzlon. The controller/CMS records the electricity generation daily at end of the day 00.00 hrs. This generation is then uploaded on the portal of the project proponent, which remains there for three years. All WTGs are connected to the CMS located at the project site from where every connected WTG is accessible. Monthly data are compiled and stored electronically.

Monitoring of electricity supplied to the grid by the WTGs:

The electricity supplied to the grid by the WTGs connected to the main / check meter is recorded monthly. The main/ check meter reading is taken and certified jointly by the representatives of the respective state utility and the contractor (SISL). The main meter readings are noted by the authorities of the state utility and sent to its office. Individual statements are generated by the office after apportioning and sent to the each of the project proponent and concerning regional accounts officer in form of electricity credit report. The project proponent generates the invoice as per credit report for the electricity sold. The regional accounts officer after deducting the wheeling charges provides the credit of the electricity in the electricity bill of the plant where the wheeling takes place. The main meter readings as mentioned in the joint meter reading report (Madhya Pradesh & Rajasthan) and/ or invoices / adjusted in the electricity bills (before deducting wheeling charges) shall form the basis of estimation of emission reductions in the project activity.

The main meter readings can be cross-checked with the invoices raised / electricity adjusted in the electricity bills before deducting wheeling charges by the state electricity utility.

Apportioning Procedure to calculate net electricity supplied to the grid by individual WTG:

Several WTGs are connected to the main / check meter which is capable to recording import, export and RKVAH consumption of electricity. Net electricity exported to the grid is calculated as follows:

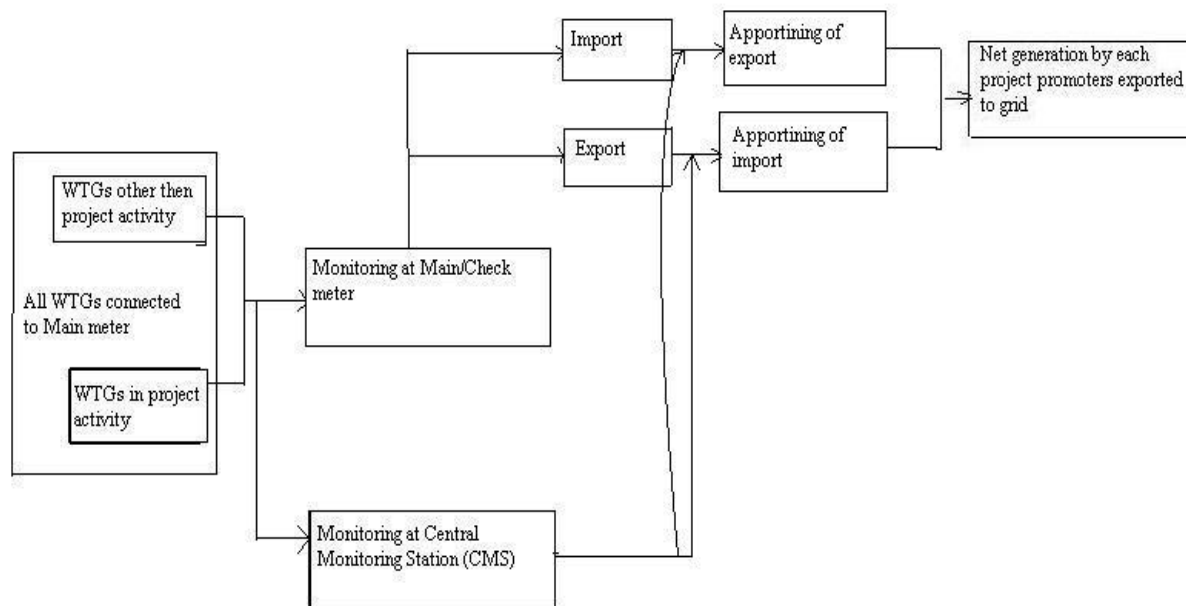


Figure: Metering arrangement of WTGs

Procedure to calculate export of electricity by individual WTG

$EG_{\text{export}i}$ = Electricity exported to the grid from i^{th} WTG (share of main meter reading)

EG_{export} = Electricity exported to the grid by all WTGs as recorded at the main meter.

$EG_{1,i}$ = Electricity exported by i^{th} WTG as recorded at the controller

(Note: Electricity generated by WTG at the controller is monitored at the Central Monitoring Station (CMS) and recorded daily in electronic form)

$EG_{1,\text{sum}}$ = Sum of the electricity exported by all WTGs connected to the main meter as recorded at their controllers

Calculation of Multiplication Factor for export of electricity to the grid by individual WTG:

The export multiplying factor is calculated as the ratio of electricity exported by all WTGs connected to the main meter as recorded at the main meter to the sum of individual export by all the WTGs connected to the billing meter as recorded on their controllers. Thus,

Export multiplying factor (M_i) = $EG_{\text{export}} / EG_{1,\text{sum}}$

Electricity exported to the grid from i^{th} WTG is evaluated as:

$EG_{\text{export}i} = M_i \times EG_{1,i}$

Procedure to calculate multiplying factor for import of electricity from the grid by individual WTG

$EG_{\text{import}i}$ = Import of electricity by i^{th} WTG at main meter

EG_{import} = Electricity imported (consumed) by all WTGs from the grid as recorded at the main meter

Calculation of Multiplication Factor for import:

The controller meter does not record import. Therefore, apportioning for energy imported by each WTG is also done on the basis of electricity exported and recorded at controller of each WTG and the total electricity imported by all WTGs as recorded at the main meter. The import multiplication factor is calculated as the ratio of electricity imported (consumed) by all WTGs from the grid as recorded at the main meter to the sum of individual export by all the WTGs connected to the main meter as recorded on their controllers. Thus,

Import multiplying factor (mi) = $EG_{import} / EG_{1,sum}$

Electricity imported from the grid by i^{th} WTG is evaluated as:

$$EG_{import_i} = mi \times EG_{1,i}$$

Net electricity exported to grid by i^{th} WTG ($EG_{y,i}$) = $EG_{export_i} - EG_{import_i}$

Procedure for apportioning of electricity supplied to the grid where dates of monitoring period are not matching with dates of joint meter reading reports:

There are instances when the claim of emission reductions will be in middle of any month and apportioning will have to be done to arrive at electricity supplied reading for that certain period. The following apportioning procedure will be followed, if the crediting period date of the project activity falls in between the meter reading cycles:

The apportioning will be done as per the ratio of net electricity generated at controllers by the WTGs of the project activity to all WTGs connected with the main meter. The daily net electricity generated at controller / CMS is measured by the contractor and sent to the project participant. In case of any problem related to the controller, the WTG will automatically get shut down and the controller will be replaced by a new controller immediately. Any change happening in controller will be reported in the concerned monitoring report during verification. Data will be used for deriving a ratio for apportioning.

Example: Let us assume,

X = Sum of the net electricity generation at controller of the WTG(s) of the project activity during the partial period (kWh). WTG(s) controller data would be used to estimate the same.

Y = Sum of the net electricity generation at controller of the WTG(s) of the project activity for the monthly billing period (kWh). WTG(s) controller data would be used to estimate the same.

Therefore, ratio of the net electricity generation during the partial period (Z) = X/Y

If G = Net electricity supplied by the WTG(s) of the project activity to the grid during the corresponding full period of main meter reading as per credit notes (kWh). Main energy meter reading would be used for the same.

Then net electricity supplied by the WTG(s) of the project activity to the grid during the partial period (for calculating emission reduction for partial period) = $G*Z$ (kWh).

Troubleshooting Contingency Plan:

-If electricity readings at the main meter in any month differs from the readings of the check meter by more than $\pm 0.5\%$ both the meters shall be tested. If on such testing the main meter error is found to exceed the permissible limit but check meter reading error found within the limit, the check meter reading will be used in calculating the electricity supplied. If error in both main and check meters are found beyond permissible limits, the main and the check meters shall be immediately repaired and recalibrated and correction will be applied, as agreed between the parties, to the monthly main meter readings to arrive at the correct energy for billing purpose for the period of the month up to the time of such test repair and recalibration. The correction factor means the percentage of error between standard check meter and main meter. The meters will be used only after calibration.

-If both main and check meter fail to record energy due to any reason whatsoever, the energy net exported during the period of outage will be calculated by apportioning the net export of the electricity recorded at the energy meter, owned by the state electricity utility and located at the grid sub-station as follows:

*Net supply of the electricity by i^{th} WTG = (Total net supply of the electricity by entire wind farm as recorded at energy meter installed at the grid sub-station) * (Net generation of the electricity by i^{th} WTG as*

recorded on its controller / Sum of net generation by all WTGs of the wind farm as recorded on their controllers).

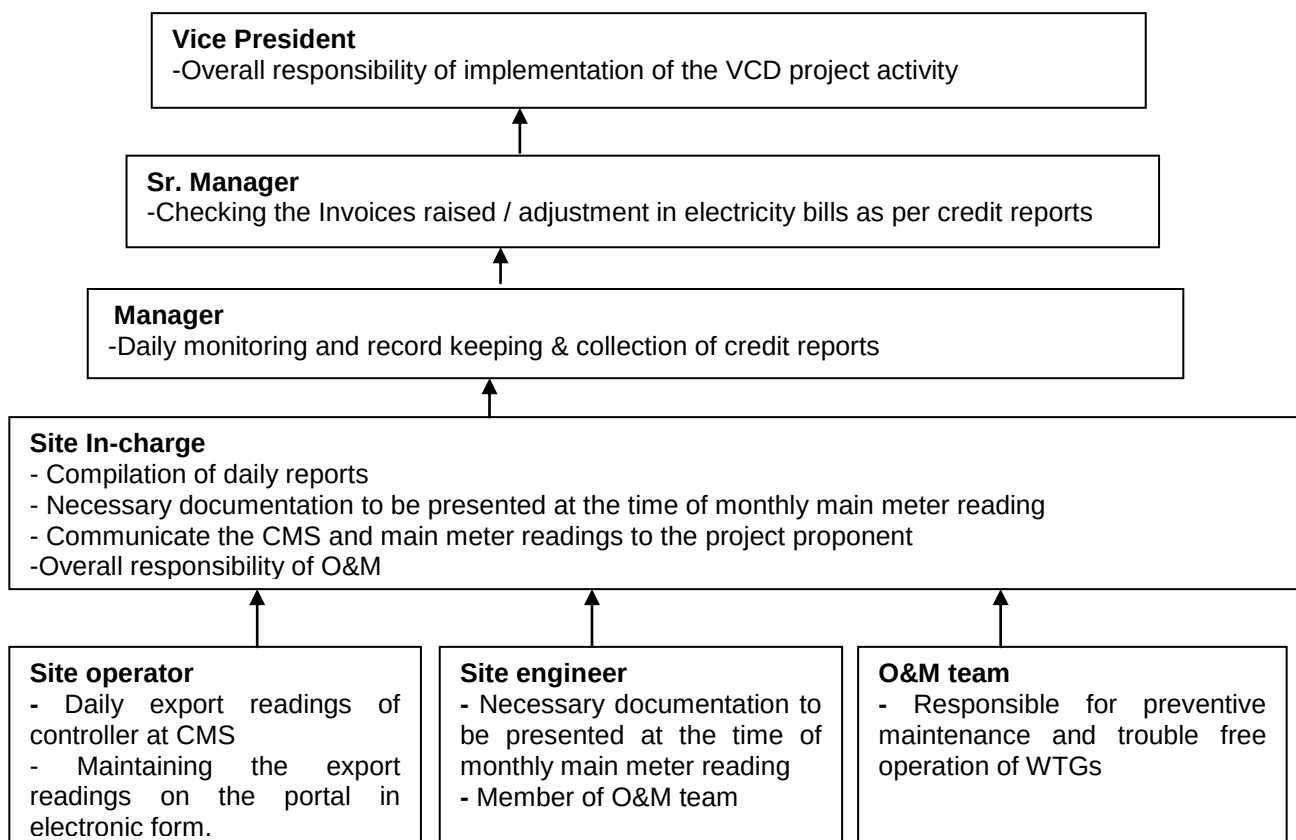
QA/QC procedures:

The energy main/ check meter installed at the project site is having the accuracy class of 0.5%. The main/ check meter shall be jointly inspected and sealed by the utility and shall not be interfered by either utility or project proponent except in the presence of the accredited representatives of both utility and SISL. The meters are calibrated by the state electricity utility once in a year.

Data archiving:

Monthly data shall be archived and stored for the entire crediting period plus two years.

Operational and organizational chart for monitoring:



5 ENVIRONMENTAL IMPACT

As per the Schedule 1 of the EIA notification dated 27 January 1994 and further modified on 14th September 2006³², given by the Ministry of Environment and Forests (Government of India) under the Environment (Protection) Act 1986, EIA is not a regulatory requirement in India for wind energy projects. Thus the project activity doesn't fall under the list of activities requiring EIA. The project activity will not involve any negative environmental impacts, as the WTGs are installed for generation of power using wind which is a clean source of energy.

³² <http://envfor.nic.in/legis/eia/eia-2006.htm>

6 STAKEHOLDER COMMENTS

Local stakeholders' consultation meetings were conducted to get the comments and suggestions of the local stakeholders on the project activity. The following local stakeholders were identified for the project activity:

- Local Community
- Non Government Organizations
- Village Panchayat members and villagers
- Wind Farm Developer (Suzlon Energy Limited)

The details of the conducted local stakeholders' consultation meetings are as follows:

1. Date of Public Notice published in local newspaper: 10/01/2010
Date & Time of the meeting: 23/01/2010; 11.30 a.m.
Venue: Suzlon office, Village-Barakheda, Tehsil: Jaora, Distt. Ratlam (Madhya Pradesh)
Stakeholders present: No. 45; including local villagers, NGO, students, employees of Suzlon, and RSIL.
2. Date of Public Notice published in local newspaper: 04/03/2010
Date & Time of the meeting: 16/03/2010; 11.30 a.m.
Venue: Primary school, village-Govindpura, Tehsil-Osiyan, District-Jodhpur (Rajasthan)
Stakeholders present: No. 24; including local villagers, employees of Suzlon, and RSIL.
3. Date of Public Notice published in local newspaper: 04/03/2010
Date & Time of the meeting: 17/03/2010; 11.30 a.m.
Venue: Secondary school, village-Bhalu Ratangarh, Tehsil-Balesar, District-Jodhpur (Rajasthan)
Stakeholders present: No. 39; including local villagers, employees of Suzlon, and project participants including RSIL.
4. Date of Public Notice published in local newspaper: 04/03/2010
Date & Time of the meeting: 18/03/2010; 11.30 a.m.
Venue: Community hall, village-Akal, Tehsil-Jaisalmer, District-Jaisalmer (Rajasthan)
Stakeholders present: No. 18; including local villagers, employees of Suzlon, and RSIL.
5. Date of Public Notice distributed: 16/05/2011
Date & Time of the meeting: 30/05/2011; 10.00 a.m.
Venue: Suzlon office, Village-Palsodi, Taluka: Palsodi, Distt. Ratlam (Madhya Pradesh)
Stakeholders present: No. 37; including local villagers, members of local gram panchayat, employees of Suzlon, and RSIL.

The local stakeholders were invited in the meetings through public notice either published in local daily (ies) or distributed personally. The project proponent made all the necessary arrangements for the meetings like arrangement for sitting, putting banners, photography, provision of refreshments etc. The chairperson was elected for each of the meeting from among the present stakeholders in that meeting. The presentations were made on Kyoto Protocol, Clean Development Mechanism, role of the project activity in mitigating the GHGs emissions etc. in the local language.

The representatives of RSIL presented the salient features of their project activity including the environmental and social impacts of the project activity, sustainable benefits to come from the project activity, and the role of emission reduction programmes to mitigate the GHG emissions from the environment. This was followed by a brief session on question and answer in which the local villagers raised their queries regarding the project activity and answered by the representatives of RSIL/ consultant/ Suzlon in local language. In the end, the stakeholders were requested to make their comments (if any) regarding the project activity.

The minutes of the meetings were written and signed by the chairperson. The minutes of the meetings will be made available to the DOE at the time of validation of the project activity.

The following comments were made by the stakeholders:

1. Comment (Mr. Amarchand Kumavat, Madhya Pradesh): Local shopkeepers and suppliers are benefited from the project activity.
2. Comment (Mr. Hari Singh, Rajasthan): The initiatives taken up by the project participants in investing in wind power projects are welcomed as they provided job opportunities to the local people.
3. Comment (Mr. Sukh Ram, Madhya Pradesh): The wind power projects provided job opportunities for the local people.
4. Comment (Mr. Ram Chandra Damar): The wind power projects are developed on waste lands and helpful in infrastructure development.

The local stakeholders overall appreciated the project activity as it generates environment friendly electricity and conserves the very scarce natural resources, and also provides the employment opportunities to the local people. All the stakeholders were happy in knowing that the project activity in their locality will be contributing to a global cause and they supported the management of RSIL for their initiatives in the areas of climate change and sustainable development.

The local stakeholders in each project location supported the project activity. No adverse comment was received in any of the stakeholders' consultation meeting; hence no account of comments was taken and no need to modify the project activity was felt.

Appendix-1

DATES OF COMMISSIONING

S. No.	Site	Location Nos.	Date of Commissioning	Installed Capacity
1.	Osiyan	OS-48, OS-49	26/02/2010	3.00 MW
2.	RKB	RKB-075, RKB-076	08/03/2010	3.00 MW
3.	Akal	AK-400, AK-401, AK-414, AK-415, AK-416, AK-417	26/03/2010	9.00 MW
4.	Jaora	NL-01, NL-02, NL-03, NL-04, NL-05, NL-06, NL-07, NL-08, NL-09, NL-10, JO-19	27/03/2010	6.60 MW
5.	Jaora	JO-10, JO-12	30/03/2010	1.20 MW
6.	Jaora	JO-13, JO-14, JO-15	31/05/2010	1.80 MW
7.	Akal	AK-253	24/01/2011	1.50 MW
8.	Akal	AK-308	15/02/2011	1.50 MW
9.	Jaora	JO-08, JO-16, JO-17, JO-18, JO-20, JO-21, JO-22	29/03/2011	4.20 MW
10.	Jaora	JO-03, JO-04, JO-05,	30/03/2011	1.80 MW
11.	Palsodi	PR-01, PR-02, PR-03, PR-04, PR-05, PR-06, PR-08, PR-09, PR-17, PR-19	30/03/2011	6.00 MW
12.	Palsodi	PR-10, PR-12, PR-13, PR-15, PR-16, PR-18	04/06/2011	3.60 MW
13.	Palsodi	PR-11, PR-14	17/06/2011	1.20 MW
Total Installed Capacity				44.40 MW