Voluntary Carbon Standard
Project Description

19 November 2007

[Date of the VCS PD] - 11th February 2010

[Table of Contents]

1 Description of Project:

1.1 Project title:

22.5 MW Wind Power Project by Ruchi Soya Industries Limited at Palsodi, District-Ratlam, Madhya Pradesh
Version: 03
Date: 11/02/2010

1.2 Type/Category of the project:

The project activity falls into Sectoral Category 1, Energy industries (renewable- /non-renewable sources) adopted by CDM Accreditation Panel (CDM-AP), the project activity is grid-connected renewable power generation.

As per the VCS standard, any combination of GHG projects or project categories that meet the requirements of the VCS 2007 can be registered as a grouped project. The present project activity falls under one single category and is therefore not a grouped project.

1.3 Estimated amount of emission reductions over the crediting period including project size:

Crediting period: The project participant has selected the fixed crediting period of 10 years starting from the date of commissioning of first WEG in the project activity i.e. 29/02/2008.

Project size: 46,323 tCO_2-e per year. It falls in the range of 5,000 to 1,000,000 tCO2e per year, therefore, the project activity comes under the group "projects".

Estimated Emission Reductions: The estimated amount of emission reductions over the chosen crediting period are tabulated bellow:

Years	Estimation of annual emission reductions in tonnes of CO_2e
2008-09	42,760
2009-10	46,691
2010-2011	46,691
2011-2012	46,691
2012-2013	46,819
2013-2014	46,691
2014-2015	46,691
2015-2016	46,691
2016-2017	46,819
2017-2018	46,691
Total estimated reductions (tonnes of CO_2e)	463,235
Total number of crediting years	10
Average of annual estimated reductions over the crediting period (tCO_2e)	46,323

1.4 A brief description of the project:

Project activity:
The project activity is promoted by M/s. Ruchi Soya Industries Limited (RSIL).The project activity involves supply, erection, commissioning and operation of 15 x 1.5 MW rated, Make – Suzlon Model S-82, Wind Turbine Generators (WTGs). The total installed capacity is 22.5 MW. The generated electricity will be sold to Madhya Pradesh State Electricity Board (MPSEB), connected with the NEWNE grid [1] at Madhya Pradesh State Electricity Board (MPSEB) - 132 KVA substation at Sailana (Ratlam). All WTGs are located on the same site - "hills of Palsodi village of District Ratlam, Madhya Pradesh, India".

Plant Load Factor:

[1] The Indian electricity system is now divided into two grids, the new Integrated Northern, Eastern, Western, and North-Eastern regional grids (NEWNE) and the Southern Grid

The power production through wind turbines depends on many factors like the speed of wind and the grid availability factor etc., which are external factors to the system. The project participant hired an engineering company to estimate the plant load factor of the project activity. The estimated plant load factor is 25.68%.

Purpose of the project activity:
The purpose of the project activity is to utilize renewable wind energy for generation of electricity. The project activity generates average 50,216.83 MWh electricity per year and consequently replaces anthropogenic emissions of greenhouse gases (GHGs) in to the atmosphere, which is estimated to be 46,323 tonnes of CO2e per year, by displacing the equivalent amount of electricity generation through the operation of existing fuel mix in the grid comprising mainly fossil fuel based power plants and future capacity expansion connected to the grid.

Reduction of GHGs emissions due to the project activity:
The project activity employed 15 WTGs, 1500 kW each, that convert wind energy into electrical energy and do not use any other fuel as input for electricity generation, thus, reduce the consumption of the depleting non-renewable natural resources and associated GHGs emissions. The operation of WTGs is also emission free and hence no emissions are produced during the lifetime of the project activity. The project activity reduces anthropogenic emissions of greenhouse gases (GHGs) in to the atmosphere, which is estimated to be approximately 46,323 tones of CO2e per year, by displacing the equivalent amount of electricity generation through the operation of existing fuel mix in the grid comprising mainly fossil fuel based power plants and future capacity expansion connected to the grid.

As per the methodology the baseline scenario is the grid based electricity system, which is same as that of the pre-project scenario.

1.5 Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project:

The project activity is located in the state of Madhya Pradesh (MP) in India.

Details of location of the WTGs installed are mentioned in Table 1 and Figure 1 below:

TABLE 1: GEOGRAPHICAL DETAILS OF INSTALLED WTGS

S. No.	Machine No.	Latitude	Longitude
1	P 101	23^0 20’22.4” N	74^0 54’55.7” E
2	P 104	23^0 20’33.9” N	74^0 54’40.2” E
3	P 107	23^0 20’36.2” N	74^0 55’18.4” E
4	P 109	23^0 20’45.1” N	74^0 54’57.1” E
5	P 112	23^0 20’53.8” N	74^0 55’23.2” E
6	P 113	23^0 20’54.4” N	74^0 55’41.3” E
7	P 114	23^0 21’00.6” N	74^0 55’05.6” E
8	P 131	23^0 21’15.5” N	74^0 55’17.1” E
9	P 137	23^0 21’37.9” N	74^0 56’02.7” E
10	P 140	23^0 21’49.4” N	74^0 55’51.1” E
11	P 143	23^0 22’07.2” N	74^0 55’47.0” E
12	P 145	23^0 22’15.7” N	74^0 55’25.5” E
13	P 148	23^0 22’09.6” N	74^0 56’06.1” E
14	P 150	23^0 22’22.8” N	74^0 55’51.1” E
15	P 154	23^0 22’37.7” N	74^0 55’58.3” E

WTGS
The project site is located in the hills of Sambharkho range falls in Village-Palsodi, District-Ratlam. The aerial distance from midpoint of the site to the Ratlam city is about 12 km. The site is easily approachable by road vehicles up to the foot of the hill. Nearest airport is at Indore and nearest railway station is at Ratlam. Ratlam is about 150 km away from Indore via road.

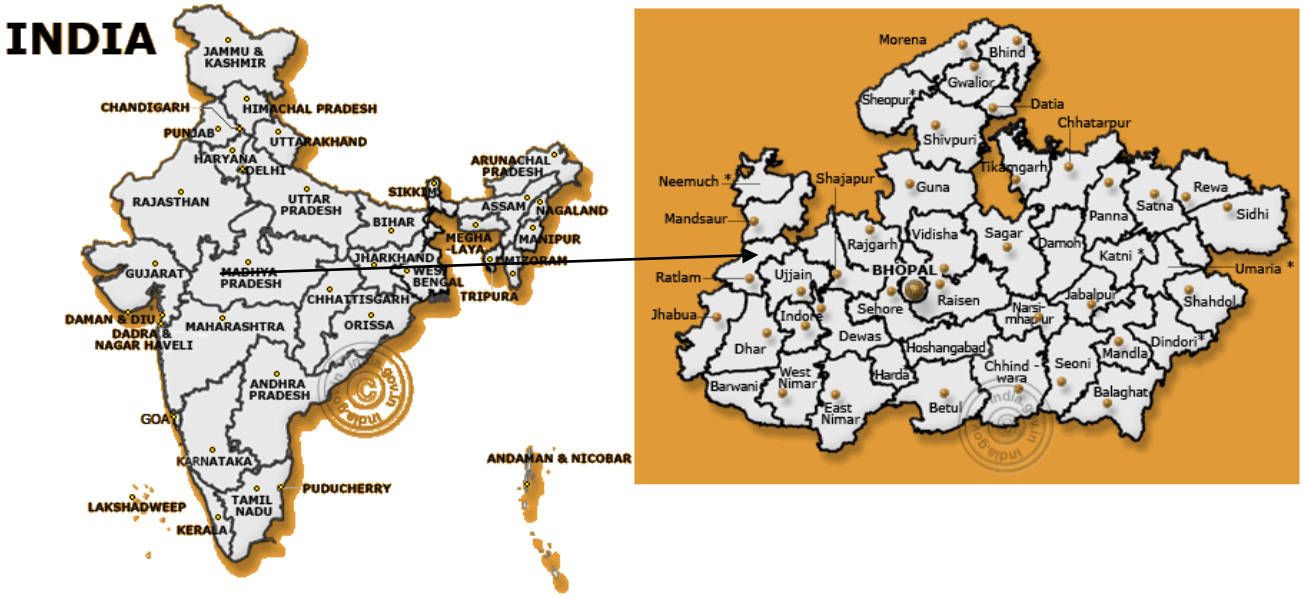


Figure 1: The location of the site in the project activity

1.6 Duration of the project activity/crediting period:

Project Start Date: 29/02/2008 (Date of commissioning of first WEG in the project activity).
Crediting Period Start Date: 29/02/2008.
Duration of the Crediting period: 10 Years (from 29/02/2008 to 28/02/2018).

1.7 Conditions prior to project initiation:

In 2007, the total Indian power generation installed capacity was 138 GW, of which thermal based system constituted 65%, hydro 25%, nuclear 3% and renewable 7%[2]. The government of India has planned to add over 100000 MW of power generation capacity to achieve the promise ***"Power to all by 2012"*** and per capita power to be increased to over 1000 units by 2011-2012. Accordingly, it has planned to add 62000 MW in the XI Five Year Plan (2007-2012) and at least 66500 MW (2012-2017) in the XII Five Year Plan[3]. Though the current fuel mix shows diversity but coal continues to be the dominant fuel with over 50% usage. Despite the potential, India has not done enough in renewable area. The current renewable capacity is little more than 10000 MW, half of which was added in last two years[4].

In spite of significant growth in electricity generation over the years, the shortage of power continues to exist in India primarily on account of growth in demand for power, outstripping the growth in generation and generating capacity addition. Therefore, in the absence of the project activity equal amount of electricity would have been generated from the operation of existing fuel mix in the grid comprising mainly fossil fuels[5] based power plants and future capacity expansion connected to the grid.

1.8 A description of how the project will achieve GHG emission reductions and/or removal enhancements:

[2] Power Scenario At A Glance, CEA Planning Wing, Integrated Resource Planning, December, 2007. www.cea.nic.in
[3] Report of the Working Group on Power for 11th Five Year Plan (2007-12), Ministry of New and Renewable Energy, Government of India, December 2006. www.planningcommission.nic.in/aboutus/committee/wrkgrp11/wg11_power.pdf
[4] Report of the Working Group on New and Renewable Energy for 11th Five Year Plan (2007-12), Ministry of New and Renewable Energy, Government of India, December 2006. www.planningcommission.nic.in/aboutus/committee/wrkgrp11/wg11_renewable.pdf
[5] http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm ,see Baseline Carbon Dioxide Emission Database

Pre-Project Scenario:
The project participant was not involved in generation of power and supplying the electricity to the grid under the pre-project scenario.

Project Scenario:
The project activity is a renewable source of power generation and would supply electricity to the NEWNE grid. The total installed capacity of the project activity is 22.5 MW equipped with 15 sets of WTGs with capacity of 1500 kW each (model S82-1500 kW) made by SUZLON.

Therefore, in the absence of the project activity, equal amount of electricity would have been generated from the operation of existing fuel mix in the grid comprising mainly fossil fuel based power plants and future capacity expansion connected to the NEWNE grid.

1.9 Project technologies, products, services and the expected level of activity:

SUZLON is a well-known supplier of wind turbines from India and so far has installed WTGs of different capacities in various countries. Suzlon Infrastructure Services Limited (SISL), a SUZLON Group company, will provide all operations and maintenance services to the project activity.

Technology: [6]
The use of wind as a renewable energy for generating electricity involves the conversion of wind 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 that is converted to the electrical power.

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

TECHNICAL SPECIFICATIONS (MEGA WATT SERIES (S-82: 1.50 MW))

Suzlon's Megawatt-series S82 - 1.5 MW wind turbine is specially designed to deliver high-performance in the low-to-medium wind regime prevalent across most of India. The design incorporates Suzlon innovations starting from blades manufactured using state-of-the-art Vacuum Assisted Resin Infusion Molding technology, to a unique Micro Pitch system, advanced controls, and the highest hub-height in its class, all leading to a robust, reliable and efficient product which generates high-quality grid-friendly power with negligible harmonics. The design incorporates advanced features like Micro Pitch technology where blades can achieve 0.1 degree of pitching resolution in a response time of just 30 ms, a flexible, adjustable Flexislip system that offers maximum slip as high as 16%, high performance gearbox, advanced yaw system and many other innovations all coming together to make a wind turbine that delivers high performance with high reliability[7].

Operating Data	
Installed electricity output	1.5 MW
Cut-in wind speed	4 m/s
Rated wind speed	14 m/s
Cut-out wind speed	20 m/s
Survival wind speed	52.5 m/s
Hub height	78.5 m

[6] http://www.ireda.in/homepage1.asp?parent_category=2&sub_category=21&category=78
[7] http://www.suzlon.com/WindTurbines.html?cp=2_3

Variants available	STV/LTV
Generator	
Type Asynchronous 4 poles with slip ring	
Rated Power	1500 kW
Rated Voltage	690 V, 3 phase AC
Rotational speed	1511 rpm
Frequency	50 Hz
Protection	Enclosure (Generator): IP54
Enclosure (Slip ring-unit)	IP 23
Cooling system	Air cooled
Insulation	Class H
Slip control	Unique Macro Slip
Providing slip up to 16%	
Rotor	
Type	3 bladed, horizontal axis
Diameter	82 m
Swept area	5281 m^2
Braking system	
Aerodynamic braking	3 independent systems with blade pitching
Mechanical braking	hydraulic disc brake
Yaw System	
Type	Active electrical
Bearing	Polyamide slide
Gearbox	
Type	3 stage
Ratio	1:95.90
Nominal Load	1650 kW
Certifications	
Design standard	GL/IEC
Quality	ISO 9001

The monitoring equipments and their location in the systems:
Metering equipment, which consists of main meter, having technical standard of 0.5% accuracy class, does primary monitoring. The meters installed at metering point has four quadrants, three phase, and four wire provision for online reading. The metering is done at the 33 kV, metering yard located at site having common main meter, which is connected with WTGs of the project activity. There are two main meters at project site: one each for seven (1500 kW) and eight (1500 kW) machines.

The secondary monitoring, which will provide a backup (fail-safe measure) in case the primary monitoring is not carried out, would be done at the individual WTGs. Each WTG is equipped with an integrated electronic controller. The generation data of individual machine can be monitored as a real-time entity at the controller installed at individual WTG.

The wind turbines have an average lifetime of 20 years as per the industry standards and MPERC recommendations [8] . The windmills constituting the project activity are newly commissioned and the details of the date of commissioning are given in Appendix - 1.

The power production through wind turbines depends on the speed of wind and the grid availability factor, which are external factors to the system. The PLF of the project activity as estimated by the contracted third party is 25.68%.

The baseline scenario is the grid based electricity system, which is same as that of the pre-project scenario. The project activity does not result in any greenhouse gas emissions and it is a clean source of electricity. The power generation from wind is a clean technology as there are no GHG emissions associated with it. Technology is indigenous, available within the country, and environmentally safe and sound.

Expected level of the project activity: 50,615.28 MWh per year.

[8] http://www.mperc.org/windenergy.pdf pp. 14

1.10 Compliance with relevant local laws and regulations related to the project:

The project activity is in compliance with all mandatory applicable legal 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.
- Clearance from MP Urja Vikas Nigam the authorized body for renewable project implementation has been received.
- Commissioning certificates are received for the project activity.

1.11 Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements:

The project developer has taken higher investment risks compared to the alternatives, which are demonstrated below:

- Critical component failures (e.g. gear train/ box, bearings, blades etc).

- Wind resource variability.

- The proponents have to remain dependent on the O&M agency for all issues regarding operations. This factor, coupled with low CUF values being experienced as compared with fossil fuel based power plant, provided a constraint to the proponents for going ahead with the project activity.

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

The primary purpose of the project activity is to generate electricity using renewable wind energy and export the generated electricity to the grid. Hence, the project activity will reduce the GHG emissions.

1.13 Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates).

Ruchi Soya Industries Limited has declared that no other environmental credit has been created from the project activity. It is also declared that the same project activity is also under CDM validation and on registering the project activity with UNFCCC as CDM project the project activity will be withdrawn from VCS.

1.14 Project rejected under other GHG programs (if applicable):

No, the project has not been rejected under any other GHG reduction schemes. However, the project is under CDM validation with the same DOE.

1.15 Project proponents roles and responsibilities, including contact information of the project proponent, other project participants:

Project participant's roles and responsibilities are provided in the monitoring plan in **section 3.4**. The contact information of the project proponent is given below:

Organization:	Ruchi Soya Industries Limited
Street/P.O.Box:	7/5 South Tukoganj, Nath Mandir road
Building:	301, Mahakosh House
City:	Indore
State/Region:	Madhya Pradesh
Postfix/ZIP:	452001
Country:	India
Telephone:	0731-2513281
FAX:	0731-2513285
E-Mail:	vinay_shah@ruchigroup.com
URL:	www.ruchigroup.com
Represented by:	
Title:	Vice President (Banking)
Salutation:	Mr.
Last Name:	Shah
Middle Name:	-
First Name:	Vinay
Department:	Finance
Mobile:	+919826030109
Direct FAX:	+917312529367
Direct tel:	+917312528352; +917314017206
Personal E-Mail:	vinay_shah@ruchigroup.com

1.16 Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and temporal information.):

- **VCS approved GHG programs are as follows:**

UNFCCC Clean Development Mechanism
UNFCCC Joint Implementation
Climate Action Reserve

The project activity falls in UNFCCC Clean Development Mechanism program, hence applicable CDM methodology, ACM 0002, version 10, titled "Consolidated methodology for grid-connected electricity generation from renewable sources", has been applied to the project activity.

- **VCS Program Criteria for GHG Projects:**

The applicability of the principles[9] that must be met by the VCUs under the VCS Program has been demonstrated as follows:

Principle	Description	Applicability to the project activity

[9] http://www.v-c-s.org/docs/Voluntary%20Carbon%20Standard%20Program%20Guidelines%202007_1.pdf

2.2.1 **Real**	All the GHG emission reductions and removals and the projects that generate them must be proven to have genuinely taken place.	All the WTGs involved in the project activity have already been commissioned. The calculations of GHG reductions will be carried as per the electricity generated by them actually. Hence, the project and GHG reductions have genuinely taken place.
2.2.2 **Measurable**	All GHG emission reductions and removals must be quantifiable using recognised measurement tools (including adjustments for uncertainty and leakage) against a credible emissions baseline.	The emission reductions are quantifiable as these are being calculated from the measured data of electricity generated by the project activity. The methodology, ACM 0002, and the associated tools are applied to establish the baseline and to evaluate the baseline emission factor.
2.2.3 **Permanent**	Where GHG emission reductions or removals are generated by projects that carry a risk of reversibility, adequate safeguards must be in place to ensure that the risk of reversal is minimized and that, should any reversal occur, a mechanism is in place that guarantees the reductions or removals will be replaced or compensated.	No GHG emissions take place in generation of the wind power. GHG emission reductions from the project are of permanent nature as reversibility of GHG emission reductions will not take place in this case.
2.2.4 **Additional**	Project-based GHG emission reductions and removals must be additional to what would have happened under a business as usual scenario if the project had not been carried out.	Business as usual scenario is power generation from the power plants connected to the grid. In the absence of the project activity equal amount of electricity would have been generated by the existing / new power plants connected to the grid, most of them are based on fossil fuels. Electricity generated from the project will not emit any GHG emission. Hence, the project will reduce the additional GHG emissions by generating emission free electricity and supplying to the power deficit grid.
2.2.5 **Independently verified**	All GHG emission reductions and removals must be verified to a reasonable level of assurance by an accredited validator/verifier with the expertise necessary in both the country and sector in which the project is taking place.	All GHG emission reductions will be verified to a reasonable level of assurance by the DOE, an accredited validator/verifier, with the expertise necessary in both the country and sector in which the project is taking place.
2.2.6 **Unique**	Each VCU must be unique and should only be associated with a single GHG emission reduction or removal activity. GHG Programs must contain checks to ensure that double counting of reductions and removals – in mandatory or other voluntary markets – does not take place.	The VCUs are unique and associated with a single GHG emission reduction activity, wind power generation. GHG Programs contain checks to ensure that double counting of reductions and removals – in mandatory or other voluntary markets – will not take place.
2.2.7 **Transparent**	Publicly disclose sufficient and appropriate GHG related information to allow intended users to make decisions with reasonable confidence.	A public notice was circulated among the stakeholders of the project activity at the time of conducting the stakeholders' consultation meeting. The complete VCS-PD will also be available to the public after registration for helping them to make

		their decisions with confidence.
2.2.8 **Conservative**	Use conservative assumptions, values and procedures to ensure that the GHG emission reductions or removals are not over-estimated.	The conservative assumption(s), values and procedures are used to ensure that the GHG emission reductions are not over-estimated.

- **Validation Date Deadline**

The validation deadline as per Clause 5.2.1 of the VCS 2007 is as follows[10]:

"VCS 2007 validations shall be completed within two years of the project start date, or shall be completed or contracted before 19 November 2008. In relation to contracts entered into before 19 November 2008, validation shall be completed by 19 November 2009 and proof of contracting prior to 19 November 2008 shall be provided."

As per VCS 2007 validation should be completed within two years of the project start date. Here in this case the project was started on 29/02/2008 and two years will be completing on 28/02/2010. The validation of the project activity is in progress and it is expected that the validation will be completed before the completion of two years.

- **Applicability of Section 5.2.2 of the VCS 2007.1: Double Counting[11]**

Section 5.2.2 of the VCS 2007.1 sets out the requirements to ensure double counting of GHG emission reductions or removals is prevented. Specifically:
"Project proponents of projects that reduce GHG emissions from activities that:
- *are included in an emissions trading program; or*
- *take place in a jurisdiction or sector in which binding limits are established on GHG emissions;*

None of the above mentioned condition is applicable to the project activity. Hence, applicability of Double Counting is not relevant to the project.

- **Baseline & Monitoring Methodologies Requirement(s)**

VCS[12] has approved the use of CDM methodologies for establishing baseline scenario and monitoring. Therefore, PP has used ACM0002, version 10 for the same as follows::

Identification of the baseline scenario:
As the project activity is the installation of a new grid-connected wind power plant, the baseline scenario 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".

Monitoring requirements:
All data collected as part of monitoring will be archived electronically and be kept at least for 2 years after the end of the last crediting period. 100% of the data will be monitored if not indicated otherwise in the tables below in section 3.3. All measurements will be conducted with calibrated measurement equipment according to relevant industry standards.

- **Contribution of the project activity to sustainable development**

[10] http://www.v-c-s.org/100908deadline.html
[11] http://www.v-c-s.org/docs/VCSA%20Policy%20Announcement,%20Applicability%20of%20Section%205-2-2.pdf

[12] http://www.v-c-s.org/methodologies.html

Ministry of Environment and Forests, Govt. of India has stipulated the social well being, economic well being, environmental well being and technological well being as the four indicators for sustainable development in the interim approval guidelines for host country approval of the project activity[13].

The project proponent believes that the project activity has contributed to sustainable development in following manners:

Social well being

The social well-being is assessed through the contribution of the project activity in improvement of living standards of the local community. The project activity provided / provides job opportunities to some of the local people during erection and operation of the wind farms contributing up to some extent in poverty alleviation of the local tribal community. The company has developed the site and an approach road has been constructed. The company also distributed solar lanterns to the villagers and arranged health awareness program around the project site to create awareness, in which twelve schools and 600 people were beneficiaries. Due to the project activity the company is developing some of the basic amenities, like toilets / bathrooms inside the houses, primary education etc., to the local community at project site, which would not happen if the project activity was not taken up, leading to improvement in living standards. The project activity will also contribute in infrastructure development by improving the availability of the electricity to the grid. Developer in association with NGO/self help groups is implementing sustainability program by implementing plantation, water conservation and self-health awareness program. They are also in process of developing Suzlon clinic where doctor will be available. Thus, the project activity has contributed to social well being.

Economic well being

The wind farms need large area of land. As project Participant / wind energy developer procured land on lease from Department of Forests, M.P., the cost of land of surrounding areas appreciated benefiting the local landowners directly. These lands generally command low prices because most of the land is unfertile. But due to the land demand for wind farms, the land price increased leading to economic well being of the local community. The project activity does not interfere any activity including forestation programme of Department of Forests.

The project activity has created direct and indirect job opportunities to the local community during installation and operation of the WTGs. The investment for the project activity has increased the economic activity of the local area. The project activity also contributes in economic well being of the nation by reducing the consumption of coal and other fossil fuels for equivalent electricity generation.

It shows that the project activity has contributed to the economic well-being of the local community.

Environmental well being

The project activity uses wind energy to produce electricity which otherwise would have been produced through the grid based power plants which are primarily fossil fuel based. The project activity is located in the state of Madhya Pradesh in India, which is predominantly a thermal energy based power generation state. The following environmental benefits are derived from the project activity:

i. Reduction in specific emissions including local and global pollutants.
ii. Produces electricity from a renewable energy source, wind, and contributes to resource conservation.
iii. There is no solid waste from the project activity that generally happens in the case of most of the other sources of power.
iv. Conservation of natural resources.

Thus the project activity causes no negative impact on the surrounding environment contributing to environmental well-being.

Technological well being

There is continuous research and development on the geometry of the wind blades, height of towers, diameters of towers etc., which augurs well for the technological well being. The project activity involves wind turbines with large rotor and a more powerful

[13] http://cdmindia.nic.in/host_approval_criteria.htm

generator enabling them to reach higher generation levels. These turbines have been developed by Suzlon to suit the Indian conditions and have been designed specifically for low and medium wind regimes. The project activity leads to the promotion of WTGs into the region, demonstrating the success of wind turbines, which feed the generated power into the nearest sub-station, thus increasing energy availability and improving quality of power under the service area of the substation. Hence, the project leads to technological well-being.

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

1.17 List of commercially sensitive information (if applicable):

Not Applicable

2 VCS Methodology:

2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices:

Title of the approved baseline and monitoring methodology applied to the project activity:
"Consolidated baseline methodology for grid-connected electricity generation from renewable sources";

Reference of the methodology applied to the project activity:
Reference of the methodology applied to the project activity: ACM0002; Version 10

Title and reference of tool, which the approved consolidated methodology ACM 0002 drawn upon:

1. "Tool for the demonstration and assessment of additionality"; Version: 05.2 (EB 39) http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf
2. "Tool to calculate the emission factor for an electricity system"; Version: 01.1 (EB 35). http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.1.pdf

2.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The justification of the choice of the methodology, ACM0002, and its applicability to the project activity is demonstrated as follows:

Para No.	Applicability Conditions as per ACM 0002	Applicability to this Project Activity
1.	The project activity is the installation or modification/retrofit of a power plant/unit of one of the following types: • Hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir) • Wind power plant/unit, • Geothermal power plant/unit, • Solar power plant/unit, • Wave power plant/unit • Tidal power plant/unit.	The project activity has installed wind power plant. Therefore, the project activity satisfies this applicability criterion.
2.	In the case of capacity additions, retrofits or replacements: the existing plant started commercial operation prior to the start of a minimum historical reference period of	The entire project is new. There is no capacity addition, retrofit or replacement through the project activity. Hence, this condition is not relevant.

	five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity	
3.	In case of hydro power plants: • The project activity is implemented in an existing reservoir, with no change in the volume of reservoir. • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2. • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	This condition is not relevant, as the project activity 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 10.

As per the requirement of the applied methodology, ACM0002 for demonstrating and assessing the additionality the latest version -05.2 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" 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 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

GHG Sources are as follows:

Scenario	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation	CO_2	Yes	The electricity is generated mostly from fossil fuels in Indian grids which are carbon intensive; other gases are not considered by following a conservative approach.
		CH_4	No	
		N_2O	No	
Project Activity	Electricity generation	CO_2	No	No GHG emissions take place by generating electricity from wind energy.
		CH_4	No	
		N_2O	No	
	Leakage due to transfer of energy generating equipment	CO_2	No	The emissions from transportation of WTGs are considered as negligible.
		CH_4	No	
		N_2O	No	
	Emissions through	CO_2	No	Once established, there is no further transportation of
		CH_4	No	

	incremental transportation in the year "y"(tCO2e)	N_2O	No	materials required besides those for repair and maintenance. These however are negligible and hence not accounted for.

No carbon sequestration is taking place in the baseline and project activity. Therefore, no GHG sink is involved.

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

GHG reservoir in the project activity: Wind Energy

2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario:

Baseline scenario is identified as per applied methodology, ACM0002/version 10.

The project activity involves installation, commissioning and operation of 15 no. of WTGs, 1.5 MW each, make-Suzlon, totally contributing 22.5 MW of power to the NEWNE grid. The project activity is the installation of a new grid-connected wind power plant and the generated electricity is being sold to Madhya Pradesh State Electricity Board (MPSEB). Hence, the baseline scenario is the following:

Electricity delivered to the NEWNE 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 subsequent section 4.1 as per the tool to calculate the emission factor for an electricity system.

Description of identified baseline scenario:

Indian Power Sector: Installed Capacity and Electricity Grids [14]

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 144130.17 MW as on 31.03.2008, consisting of 91906.84 MW Thermal, 35908.76 MW Hydro and 4120 MW Nuclear. Sector-wise details of installed capacity are shown in Table 2.

Table 2: Region wise installed capacity (MW) as on 30.11.2007

Region	Hydro	Thermal				Nuclear	Renew-able	Total
		Coal	Gas	Diesel	Total			
State	26086.76	42047.50	3834.22	604.61	46486.33	0.00	2200.04	74773.13
Central	8592.00	29010.00	6638.99	0.00	35648.99	4120.00	0.00	48360.99
Private	1230.00	4991.38	4183.00	597.14	9771.52	0.00	9994.53	20996.05
All India	35908.76	76048.88	14656.21	1201.75	91906.84	4120.00	12194.57	144130.17

It is evident from Table 2 that the installed capacity is predominantly coal based and therefore, is a major source of carbon dioxide emissions in India. Hence, there is scope for reducing the CO_2 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.

Earlier, the Indian power system was divided into five independent regional grids, namely Northern, Eastern, Western, Southern, and North-Eastern. Each grid covered several states (see Table 3). Since August 2006, however, all regional grids except the Southern Grid have been integrated and are operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids will be

[14] . http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf

treated as a single grid and is being named as NEWNE grid from FY 2007-08 onwards for the purpose of the CO_2 Baseline Database. The Southern grid has also been planned to be synchronously operated with rest of all Indian Grids by early 12th Plan (2012-2017). Presently Southern grid is connected with Western and Eastern grid through HVDC link and HVDC back-to-back systems.

Regional Load Dispatch Centre (RLDC) manages power generation and supply within the regional grid. The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Each state meets its demand with its own generation facilities and also with allocation from power plants owned by the central sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the central sector power plants. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. Moreover, there are also electricity transfers between regional grids, and small exchanges in the form of cross border imports and exports (e.g. from Bhutan).

Table 3: 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

The baseline emissions and the emission reductions from the project activity are estimated based on the quantum of electricity to be exported by the project activity to the NEWNE grid and the baseline emission factor of the NEWNE grid calculated in section 4.1 as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors.

2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality):

In addition to using 'Tool for the demonstration and assessment of additionality, version 05' as per required of ACM0002; the project proponent used Test 1 (The Project Test) to demonstrate the additionality.

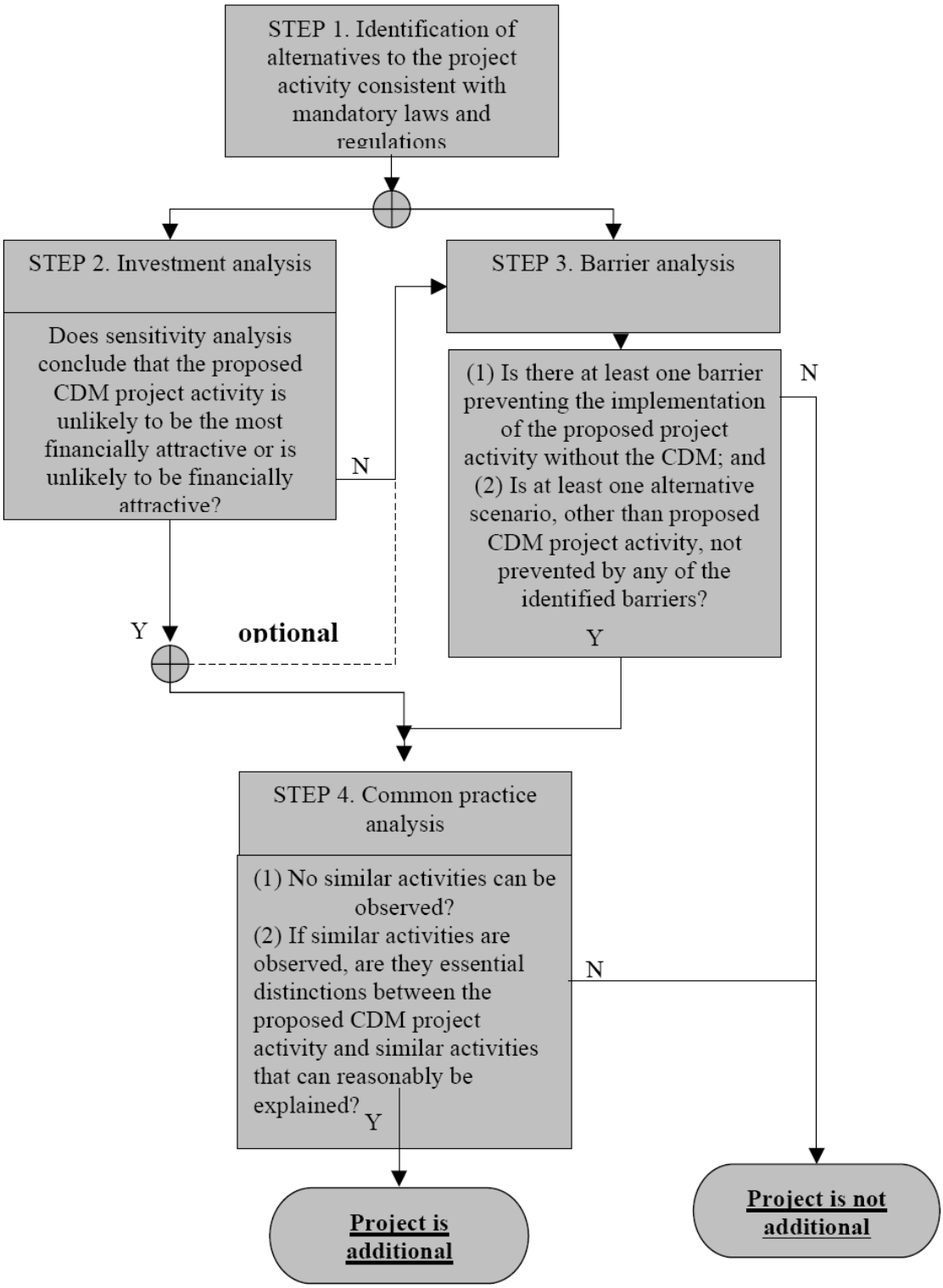


Figure 2: Flow diagram of Tool for the demonstration and assessment of additionality

Demonstration of Additionality for the project activity as required in ACM0002:

The additionality of the project activity is demonstrated and assessed by adopting the steps as given above in Figure 2 as per the Tool for the demonstration and assessment of additionality, version 05.2:

Additionality has been demonstrated and assessed using the latest version of the *"Tool for the demonstration and assessment of additionality"*.

Steps	**Additionality Requirements**	**Status of Additionality Check**
Step 1: Identification of alternatives to the project activity consistent with current laws and regulations		
Sub-step (1a): Define alternatives to the project activity	RSIL has set up a 22.5 MW wind power project to generate electricity and sold to the MPSEB. The following alternatives were available with the project participant to meet the same objective: • Setting up the project activity without CDM benefits: As per this alternative the project participant would have gone ahead with the implementation of the project activity, generating renewable electricity and exporting the same to the grid under the power purchase agreement thereby displacing equivalent amount of electricity generated by the currently running power plants in the grid. No emissions of greenhouse gases to atmosphere 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. • Continuation of current scenario i.e. additional power is supplied by current power generating units and / or new power generating units coming up in the NEWNE grid: India is seeing tremendous growth of about 8-9% per year and there is an increasing demand of power to sustain this growth. The grids in India are running on deficit and it requires to install more power generating units. New capacity additions may come from a number of sources like fossil fuels, biomass, hydro etc. The probable sources of power are discussed below: a. Coal based power plant: Coal is an obvious choice of generating power in India as it is available in abundance. The conventional coal based power plant could be a possible alternative to the project activity. Due to simplicity, higher reliability, better cost utilization and low technology risk, it is and would continue to be the most plausible baseline scenario for the project activity. b. Gas based power plant: Gas is another choice of fuel in India for power generation. However, use of gas carry various uncertainties like price and availability, specially in Madhya Pradesh. c. Renewable energy based power plant: Renewable energy sources are an important	The additionality check has crossed Step 1, and may proceed to Step 2 (Investment Analysis) or Step 3 (Barrier Analysis). In the present case, Step 2 has been used for additionality check.

element of India's power policy aimed to maximally develop domestic supply options as well as to diversify the energy sources. The renewable energy sources other than the wind can be solar, hydro and biomass.

Solar:
Solar energy[16] has a large potential in the country. This can be exploited by many direct thermal applications such as cooking, heating etc. It can also be exploited to generate electricity using photovoltaic cells that directly convert sunlight to electricity. The present conversion efficiency of commercially available photovoltaic cells is less than 15 percent. With this efficiency the cost of electricity generation exceeds Rs.20/kWh at present. Hence, the project participant also not considered this option for electricity generation and selling.

Hydro:
India is endowed with rich hydropower potential; it ranks fifth in the world in terms of usable potential. This is distributed across six major river systems (49 basins), namely, the Indus, Brahmaputra, Ganga, the central Indian river systems, and the east and west flowing river systems of south India. The Indus, Brahmaputra and Ganga together account for nearly 80% of the total potential. The total hydro power potential available in the western region (where the project activity located) is relatively limited constituting about 6.76% (5679 MW) of the total potential in India [15] . There is balance potential of hydropower is just 39.53%. Further the hydro potential of this region is from the peninsular rivers, which have more than 80% flows during monsoon and requiring construction of storage reservoirs for economic hydropower generation. The hydro development scenario in the western region indicates that the future growing needs of this region would have to be met from other power sources. In addition, development of small hydro (up to 25 MW) often suffer due to inaccessibility of the sites, lack of power evacuation infrastructure, investigation and construction difficulties, land acquisition and financing difficulties, inadequacies in institutional support and in some cases law and order problems. The hydropower projects[16] also face the problems of environment and ecology, and the problems of resettlement of affected people. These problems delay the implementation of hydro projects. Seeing these difficulties it can be concluded that the hydropower project would not be a feasible and attractive option to the project activity.

Biomass:
Power plants using renewable biomass are generally installed in small scale category. And moreover, in India biomass based power

[15] http://www.adb.org/Documents/Reports/Hydropower-Devt-India/Chapter-IV.pdf

	project would also face the financial constraints due to huge capital investment and high unit generation cost. It also faces problems of collection and storage. Thus, the biomass based power generation will not be a financially attractive option to the project activity. Hence, it is not a viable baseline option. d. Nuclear power plant: Nuclear power projects[16] are facing the problems of fuel supply and the environmental problems of solid waste, liquid effluent, thermal impact on receiving water, environment and ecology, and the social problems of resettlement of project-affected people. Simultaneously this sector has not been opened to the private players by the Government of India. Hence it cannot be a feasible alternative to PP. The following is the possible baseline option to the project activity as per ACM0002: Continuation of current scenario i.e. additional power is supplied by current power generating units and / or new power generating units coming up in the NEWNE grid.	
*Sub-step (1b): Consistency with m*andatory laws and regulation	The above mentioned alternatives are in compliance with all mandatory applicable legal 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.	
Step 2. Investment analysis		
Sub-step (2a): Determine appropriate analysis method	The project activity generates revenue by selling electricity to MPSEB. Thus, simple cost analysis (option I) cannot be applied to the proposed CDM project activity. The alternative to the project activity is continuation of current situation, i.e. no project activity and equivalent amount of energy would have been produced by the grid electricity system. This alternative will not require capital investment. Hence, investment comparison analysis (option II) cannot be applied. In this case the benchmark analysis (option III) is most appropriate as no investment is required in baseline alternative and the baseline, grid, is outside of direct control of PP.	The additionality check has crossed Step 2(a), and may proceed to Step 2(b) – Option III.

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td>Sub-step (2b): Option-III: Apply benchmark analysis</td><td>Internal Rate of Return (IRR) is one of the known financial indicators used by banks, financial institutions and project developers for making investment decisions. Hence, to conduct the investment analysis of the project activity the post tax project internal rate of return (Project – IRR) is selected as the financial indicator.

As per para 11 of 'Guidance on the assessment of investment analysis, (EB 41, Annex 45)' Prime Lending Rate (PLR) can be taken as an appropriate benchmark for project 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 weighted average benchmark prime lending rate (BPLR) of different types of banks in India was as follows in July 2007[16]:

Public sector banks: 13.1%
Private sector banks:14.9%
Foreign banks: 13.9%

The project participant has taken lowest weighted average prime lending rate (conservative), 13.1%, as benchmark for the project activity.</td><td>The additionality check has crossed Step 2(b), and may proceed to Step 2(c)</td></tr>
<tr><td>Sub-step (2c): Calculation and comparison of financial indicators</td><td>The project participant has taken following assumptions for investment analysis as per information available at the time of decision making:

<table>
<tr><td>Capacity of the wind project</td><td>22.5 MW</td></tr>
<tr><td>No. of machines</td><td>15 machines</td></tr>
<tr><td>Capacity of machines</td><td>1.5 MW each</td></tr>
<tr><td>Plant load factor</td><td>25.68 %</td></tr>
<tr><td colspan="2">Reference: Third party contracted by the PP</td></tr>
<tr><td>Project cost</td><td>INR 1320.36 Million</td></tr>
<tr><td colspan="2">Reference: PO data is used as 'final negotiated value of the supplier's offer'</td></tr>
<tr><td>Debt (75%)
Equity (25%)</td><td>INR 950 Million
INR 370.36 Million</td></tr>
<tr><td colspan="2">Reference:
Loan sanction letter</td></tr>
<tr><td>Deprecation rate</td><td>4.5% (SLM)</td></tr>
<tr><td>Max. Depreciation</td><td>90%</td></tr>
<tr><td colspan="2">Reference:
http://www.mperc.org/windenergy.pdf</td></tr>
<tr><td>Salvage Value</td><td>10%</td></tr>
<tr><td>Interest rate on debt
Tenure
Moratorium</td><td>11.00 %
6 Years
1 Year</td></tr>
</table>
</td><td>The additionality check has crossed Step 2(c), and may proceed to Step 2(d)</td></tr>
</table>

[16] Page 1381, Reserve Bank of India Monthly Bulletin – August 2007
http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/79250.pdf

<table>
<tr><td></td><td>
<table>
<tr><td colspan="2">Reference:
Loan sanction letter.</td></tr>
<tr><td>Insurance Charges (INR Mn.)</td><td>1.05</td></tr>
<tr><td colspan="2">Reference: As applicable at the time of decision making (can be verified from actual insurance cost)</td></tr>
<tr><td>O&M charges (first year)
O&M Charges (2nd year onwards)</td><td>Nil
'INR 1.4 Million/WTG +service tax of 12.36%' for 2nd year & 5% escalation afterwards</td></tr>
<tr><td colspan="2">Reference: PO data is used as 'final negotiated value of the supplier's offer'</td></tr>
<tr><td>Power tariff (as per MPERC) per kWh</td><td>1st Year: INR 3.97
2nd Year: INR 3.80
3rd Year: INR 3.63
4th Year: INR 3.46
5-20th Years: INR 3.30</td></tr>
<tr><td colspan="2">Reference:
http://www.mperc.org/windenergy.pdf</td></tr>
</table>
</td><td></td></tr>
<tr><td></td><td>The post tax project IRR without VCS revenue for 20 years of cash flow comes out 10.86% and improves to 11.94% when VCS revenue is considered.

(Assumptions in this case are:
1.VCU Price- 5 Euro/VCU; (Assumed)
2. Exchange Rate- 1Euro=INR 56
Reference:
http://www.x-rates.com/d/INR/EUR/hist2007.html

Project IRR without VCS revenue, 10.86%, is much less than the selected benchmark of 13.10%.</td><td></td></tr>
<tr><td>Sub-step (2d): Sensitivity analysis</td><td>The following sensitivity analysis has been conducted on project IRR to check the robustness of the financial attractiveness of the project without CDM revenue by using Guidance on the Assessment of Investment Analysis, version-02, Annex-45, EB 41.

The total cost associated with the following cost parameters affect the total project cost more than 20%:
• Cost of WTGs
• Interest Rate
• O&M Charges
Cost of WTGs is decided initially and will remain unchanged during whole crediting period. Interest rate may vary as it depends on PLR. Even O&M cost is decided at the time of investment decision for initial period of 10 years but after that it will be mutually decided hence this parameter may also be considered as a variable. Therefore, variations of ±10% in interest rate and O&M charges have been considered for the sensitivity analysis. Other cost parameters like insurance and loan processing fee have very less impact on total cost of the project. Therefore, these parameters were not considered for conducting sensitivity analysis.

The project revenue is mainly affected by following parameters:
• Plant Load Factor (PLF)
• Tariff</td><td>The additionality check has crossed Step 2(d), and may proceed to Step 4 directly</td></tr>
</table>

PLF and Tariff are very important parameters to see the financial viability of the project. Hence, variations in PLF and tariff by ±10% are considered for the sensitivity analysis.

The following scenarios are developed without taking VCS revenue into account for sensitivity analysis:

Scenarios	Project IRR (20-year cash flow) without VCS revenue		
Variation	-10%	0%	+10%
On varying the O&M charges	11.19%	10.86%	10.53%
On varying the interest rate	10.76%	10.86%	10.97%
On varying the tariff rate	8.71%	10.86%	13.08%
On varying the PLF	8.98%	10.86%	12.82%

Project IRRs (20-years cash flow) fall in the range of 8.71% -13.08% in all the scenarios and could not cross the selected benchmark of 13.10% in any scenario.

The above investment analysis is based on PLF as estimated by the third party, an engineering company contracted by the PP, while the risk of lower generation compared to the estimated generation is always inherent in such projects. Thus, overall investment analysis clearly indicates that the project is definitely financially unattractive without VCS revenue. VCS benefits are decisive factor in the project activity as VCS revenue makes the project activity financially viable when higher PLF is considered. Therefore, it can be concluded that the project activity needs VCS revenue to become financially viable.

Step 4. Common practice analysis

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

Wind energy is not a popular energy resource for power generation in the country and also in the state. Even with several promotional offers by the central and state Governments, the penetration level of wind power source could not reach even 1% in Madhya Pradesh, which is much lower than that of in other major states like Maharashtra (8.02%) and Karnataka (10.5%) as on 31/3/2007 and shown below[17,18]:

State	Installed capacity (MW)		%age of wind penetration
	Wind	Total	
Andhra Pradesh	121.34	11483.56	1.05
Gujarat	674.36	10490.79	6.5
Karnataka	845.02	8039.80	10.5
Maharashtra	1480.3	18440.65	8.02
Madhya Pradesh	56.59	6648.32	0.85

Since Step 4 is satisfied, the project activity is not a baseline scenario, and hence is additional

[17] http://www.cea.nic.in/power_sec_reports/Executive_Summary/2007_03/22-28.pdf
[18] For wind installed capacity: http://www.windpowerindia.com/statyear.html#top

Sub-step 4b. Discuss any similar options that are occurring.	There is gross potential of 5500 MW and technical potential of 1200 MW wind power in the state of Madhya Pradesh. The promotional policies adopted by the Madhya Pradesh Government during the last few years encouraged the investors to invest in the wind energy. However, only 70.39 MW wind projects have been commissioned in the state as on August, 2007 [19]. It shows that the wind power is not a common practice in the state. The table below shows the wind power installed capacity (MW) in Madhya Pradesh for last seven years as on March 31, 2007 [20]: **Year** / **Installed Wind Power Capacity (MW)** 2000-01: 0 2001-02: 0 2002-03: 0 2003-04: 0 2004-05: 6.3 2005-06: 11.4 2006-07: 17.4 It is clear from the table that wind energy projects in the state of Madhya Pradesh have shown very little progress in the past years despite the policy initiatives from Govt. of India and the state government. It is to be noted that India had signed the Kyoto Protocol in the year 2002 and subsequently there was the introduction of Electricity Act 2003. Installed wind power capacity in Madhya Pradesh is improving but very slowly from the year 2004-05 when Kyoto Protocol was implemented and CDM revenue was really possible. It reflects that CDM revenue is encouraging the investors to invest in wind power projects in the state of Madhya Pradesh. Only few WTGs have come up in the state and they have also considered CDM revenue [21]. The other wind power projects in Madhya Pradesh are in various stages [22], [23], [24] of CDM development. Therefore, wind power project development is substantially dependent on CDM and thus is not a common practice being followed in the region of Madhya Pradesh. Due to the unattractive returns associated with wind power projects the investors were not taking interests in such projects. The recent ascending trend in wind power installations in Madhya Pradesh is due to the CDM revenue that makes the wind project financially viable up to some extent. The project activity involves Suzlon made 1.5 MW WTGs, which were not installed earlier in the state of Madhya Pradesh where wind availability and wind power density is relatively low [25]. This is supported by the fact that the prevailing practice in the state has	

[19] http://www.mprenewable.org/index.php?show=energywind
[20] http://www.windpowerindia.com/statyear.html
[21] http://cdm.unfccc.int/Projects/DB/RWTUV1135356510.37/view.html , Project ID: 0112, Nagda Hills Wind Energy Project (India)
[22] http://cdm.unfccc.int/Projects/Validation/DB/JZSZQ3OKNOL0OD9CY1CP090A0B37XS/view.html
[23] http://cdm.unfccc.int/Projects/Validation/DB/1DVUPGS1N7QJ1VN327TM9QTSVTO4B8/view.html
[24] http://cdm.unfccc.int/Projects/Validation/DB/15A4TY6PW66FJIEWBZRR9PJMQN9QZJ/view.html
[25] http://www.windpowerindia.com/statwind2.html

	been the installation of small to medium capacity wind turbines. These large capacity turbines have been sold mainly in such states where the wind availability and wind power density is higher in India. These machines are installed first time in the state of M.P. Therefore, installation of 1.5 MW WTGs is not the common practice in the state.	

Test 1 - The project test:

Step 1: Regulatory Surplus
The project activity is in compliance with all mandatory applicable legal 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.

Step 2: Implementation Barriers
Proved above in Step 2 (Investment analysis)

Step 3: Common Practice
The common practice analysis has been carried out as per the GHG protocol for project accounting, chapter-7[26] referred by VCS guidelines for common practice under step 3.

The project activity produces the grid connected electricity. The baseline candidates to produce the grid connected electricity are:

Thermal power plants (coal / gas / diesel)
Nuclear power plants
Hydro power plants (large scale)
Renewable Energy based power plants like small hydro power plants, biogas plants, biomass based power plants, power plants using urban and industrial waste as fuel, and wind power plants.

All India installed capacity (MW) of electricity power generation as on 31/03/2008 (from thermal, nuclear and hydro sources,[27] renewable energy sources[28]) is summarised in the table below:

Fuel Source	**Install Capacity (MW)**	**% share**
Thermal (Coal)	76048.88	52.76
Thermal (Gas)	14656.21	10.17
Thermal (Diesel)	1201.75	0.83
Nuclear	4120	2.86
Hydro	35908.76	24.91
Renewable Energy Sources (RES)*	12194.57	8.46
Total Power Generation	**144130.2**	

*Renewable energy sources include small hydro power plants, biogas plants, biomass power, urban and industrial waste power and wind energy.

[26] Section 7.4.2 http://www.ghgprotocol.org/files/ghg_project_protocol.pdf
[27] http://www.cea.nic.in/power_sec_reports/executive_summary/2008_03/8.pdf
[28] http://www.cea.nic.in/power_sec_reports/executive_summary/2008_06/8.pdf

It is clear from the table that the common practice to produce the grid connected power is thermal power plants and large hydro power plants connected to the grid.

The power generated from renewable energy sources including wind contributes just 8.46% in the total power generation. The total installed wind power capacity in India is 8697.925 MW[29] as on 31/03/2008 against the gross potential of 45195 MW[30]. Hence, the contribution of wind power in Indian power generation comes out 6.03% only. It shows that wind power generation is not a common practice in India. The same can also be supported by the fact that out of gross potential of 45195 MW of wind power in India only 8697.925 MW (19.25%) could be installed by 31/03/2008 even with several promotional offers by the central and state Governments. GHG emissions are much more in common practice of producing the electricity through thermal power plants while no GHG emission takes place when it is produced through the project activity i.e. wind power.

The Kyoto protocol has been ratified by India in the year 2002 and the Electricity Act has been introduced in the year 2003, thus the data pertaining to the duration from 2002-03 to 2006-07 has been considered for the common practice analysis. After introducing provisions of Kyoto protocol and Electricity Act the installation of WTGs has been triggered off suddenly in the country.

The installed capacity of WTGs in different states of India during the years 2001 to 2007 is given in the table below:

Growth of Wind Power Installed Capacity
(As on 31.03.2008)

Sl. No.	State	Year-wise Installed Capacity Addition (MW)						
		Upto Mar'01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	Andhra Pradesh	91.790	1.500	-	6.000	25.850	0.900	0.800
2	Gujarat	164.905	8.650	7.150	29.275	51.175	84.600	328.950
3	Karnataka	50.650	22.500	52.460	81.430	200.400	170.930	264.750
4	Kerala	2.350	-	-	-	-	-	-
5	Madhya Pradesh	21.690	-	-	-	6.250	11.200	17.450
6	Maharasthra	198.060	196.545	2.000	6.250	48.750	545.100	483.600
7	Rajasthan	9.110	8.380	44.440	129.580	93.860	74.525	111.750
8	Tamil Nadu	806.860	46.960	132.905	355.145	688.330	860.655	564.960
9	West Bengal	1.000	-	-	-	-	0.250	0.500
10	Others	1.300	-	-	-	-	-	-
	TOTAL (MW)	1347.715	284.535	238.955	607.680	1114.615	1748.160	1772.760

Source: http://www.windpowerindia.com/statyear.html

The total installed capacity of WTGs during 2002-03 to 2006-07 in the state of Madhya Pradesh is 34.9 MW. Out of which WTGs of capacity 30.05 MW are in different stages of CDM process. Hence, it can be concluded that wind power project is not a common practice without CDM consideration in state of Madhya Pradesh.

(Source for UNFCCC: – http://cdm.unfccc.int/Projects/registered.html
http://cdm.unfccc.int/Projects/validation.index.html)
(The detailed list is provided to DOE)

It can be seen from the above table that a majority of the wind power projects which have started after the year 2003 have been structured as CDM projects.

From the above analysis it can be seen that similar activities are not widely observed and commonly carried out without VCS/CDM consideration.

[29] http://www.windpowerindia.com/statyear.html
[30] http://www.windpowerindia.com/statest.html

3 Monitoring:

3.1 Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices:

Title of the approved baseline and monitoring methodology applied to the project activity:

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

Reference of the methodology applied to the project activity:
ACM0002; Version: 10).

Title and reference of tools, which the approved consolidated methodology ACM0002 drawn upon:

1. "Tool for the demonstration and assessment of additionality"; Version: 05.2 (EB 39)
   http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

2. "Tool to calculate the emission factor for an electricity system"; Version: 01.1 (EB 35)
   http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.1.pdf

The explanation of the choice of the methodology, ACM0002, and its applicability to the project activity has been demonstrated in section 2.2 above.

3.2 Monitoring, including estimation, modelling, measurement or calculation approaches:

A. Purpose of monitoring

- To ensure efficient day to day operations.
- For proper maintenance and calibration of the equipments.
- Lead to successful implementation of the project and maximization of the benefits.
- To record the electricity generation in a proper and systematic way this is very important for emission reduction calculations.

B. Types of data and information to be reported, including units of measurement

Data to be monitored:

- $EG_{TOTAL, y}$: Total electricity generation by the wind mills during the year y
  MWh: Unit of measurement

- EG_{export}: Electricity exported to the grid by the project activity in year y
  MWh: Unit of measurement

- EG_{import}: Electricity imported (consumed) by the project activity in year y.
  MWh: Unit of measurement

Data to be calculated:

- EG_y: Net Electricity exported to the grid by the project activity in year y
  MWh: Unit of measurement

C. Origin of the data

EG_{export} / EG_{import} will be measured by the main meters (MPSEB meters) installed at common metering points.
Net electricity exported (EG_y) to grid is calculated from EG_{export} and EG_{import} as (EG_{export} – EG_{import}).

D.Monitoring Information

The Project participant 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. So the authority and responsibility of project management lies with the contractor.

Metering:

The metering arrangement is done at site as per the provisions of the Government of M.P. incentive policy notified on 17.10.06. Billing of the metered energy is being carried out on the monthly basis. The meter reading shall be carried out by the Parties (MP Pashchim Kshetra Vidyut Vitaran Company Limited (hereinafter called "MPPKVV CO. LTD.") and Contractor (SISL)).

Metering Equipment and Calibration:

Controller:

The controller installed on the WTG records total generation and import of the electricity by the 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 meters:

-Two main meters are installed-one for seven WTGs and second for eight WTGs. These meters record export, import and reactive electrical energy. The main meters are installed and owned by MPPKVV CO. LTD. Main meters shall be tested, checked for accuracy once in a year in the presence of the parties and also be calibrated and adjusted once in a year.

-The meters shall be deemed to have been working satisfactorily if the errors as determined in the tests are within the permissible limit as allowed in the relevant IS specification applicable to high precision energy meters.

-All the tests on main meters shall be conducted by the meter relay testing staff of the MPPKVV CO. LTD. jointly with the staff of the company and results and corrections so arrived at mutually shall be applicable and binding on both the parties.

Meter Readings:

A monthly reading of power supplied to the grid at the common metering point shall be jointly undertaken by the representatives of MPPKVV CO. LTD. and the authorized representative of the contractor (SISL). As per the applicable provisions mentioned in the power purchase agreement the main meter readings will be taken in the middle of each calendar month for pervious one month as far as possible. Both representatives of MPPKVV CO. LTD. and authorized representative of the contractor (SISL) will jointly certify the meter readings.

At controller entire day generation is recorded by the end of day (00:00). This generation is then uploaded on customer (project participant) portal, which remains there for three years. All WTGs are connected to a central monitoring system (CMS) located at project site, from where any connected WTG is accessible from single point.

Secondary Monitoring and Contingency Plan:

The secondary monitoring, which will provide a backup (fail-safe measure) in case the primary monitoring is not carried out, would be done at the individual WTGs. Each WTG is equipped with an integrated electronic controller. The generation data of individual machine can be monitored as a real-time entity at the controller installed at individual WTG. The generation data is also available online through facility provided by the contractor. This generation will be kept as a record both in electronic as well as printed (paper) form.

Operational and organizational structure for monitoring

Monitoring responsibility (contractor (SISL))

-Daily meter readings of controller on the WTGs and main meters are maintained on the proper log books by site operator.

-Compilation of daily reports for monthly monitoring will be done by site in-charge.

-Site in-charge/site engineer will do necessary documentation and will present at the time of monthly main meter reading by the representative of the MPPKVV CO. LTD. also they will be authorized representative to jointly certify the meter reading.
-Site in-charge will communicate all meter readings to the project participant.
-O&M team at site will be responsible for preventive maintenance and trouble free operation of WTGs under the overall responsibility of site in-charge. He/she will insure preventive maintenance of the WTGs and all meters.

Monitoring responsibility (Project Participants)
Overall project management responsibility, which includes responsibility for VCS/CDM implementation, lies with Vice President (VP). Under his guidance, officer account will arrange for:

- Daily monitoring the project and record keeping- i.e., checking generation on customer portal provided by the contractor (SISL), any deviation from terms of PO and /or O&M agreement is reported to VP and actions are taken accordingly.
- Collect credit reports issued by MPPKVV CO. LTD. with the help of O&M developer. This job is done and updated on monthly basis.
- Raising invoices, sending copy of this invoice to accounts department and making sure that payment is as per invoice, any deviation reported to VP and actions are taken accordingly.

3.3 Data and parameters monitored / Selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals:

Data / Parameter:	**$EF_{grid,OM,y}$**
Data unit:	tCO_2/MWh
Description:	Operating Margin emission factor for NEWNE grid in the year y
Source of data to be used:	"CO_2 Baseline Database for Indian Power Sector" version 5.0, published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
Value of data applied for the purpose of calculating expected emission reductions	1.004919 tCO_2/MWh
Description of measurement methods and procedures to be applied:	Calculated as weighted average of last three years vintage (2006-2007, 2007-2008, 2008-2009) data obtained from "CO_2 Baseline Database for Indian Power Sector" version 5.0, published by the Central Electricity Authority, Ministry of Power, Government of India,which is based on new tool "Tool to calculate the emission factors for an electricity system" published by CDM Executive Board .
QA/QC procedures to be applied:	-

Any comment:	It is calculated *ex ante* basis and will remain same throughout the crediting period.

Data / Parameter:	**$EF_{grid,BM,y}$**
Data unit:	tCO_2/MWh
Description:	Build Margin emission factor for NEWNE grid in the year y
Source of data to be used:	"CO_2 Baseline Database for Indian Power Sector" version 5.0, published by the Central Electricity Authority, Ministry of Power, Government of India. The "Baseline Carbon Dioxide Emission Database Version 5.0 for Indian Power Sector" is available at http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
Value of data applied for the purpose of calculating expected emission reductions	0.675181 tCO_2/MWh
Description of measurement methods and procedures to be applied:	Calculated as per ACM0002 with vintage (2008-2009) data obtained from "CO_2 Baseline Database for Indian Power Sector" version 5.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on new tool "Tool to calculate the emission factors for an electricity system" published by CDM Executive Board.
QA/QC procedures to be applied:	-
Any comment:	It is calculated *ex ante* basis and will remain same throughout the crediting period.

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Combined margin CO_2 emission factor for NEWNE grid connected power generation in year *y* calculated using the "Tool to calculate the emission factor for an electricity system", version 01.1, EB 35.
Source of data to be used:	Estimated figure evaluated as 75% of OM plus 25% of BM values using data obtained from "CO_2 Baseline Database for Indian Power Sector" version 5.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on tool "Tool to calculate the emission factors for an electricity system" published by CDM Executive Board. http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm
Value of data applied for the purpose of calculating expected emission reductions	0.92248 tCO_2/MWh

Description of measurement methods and procedures to be applied:	Combined Margin is taken as 75% of operating +25% of build margin as suggested for wind projects by latest tool "Tool to calculate the emission factors for an electricity system"
QA/QC procedures to be applied:	-
Any comment:	It is calculated *ex ante* basis and will remain same throughout the crediting period.
Data / Parameter:	$EG_{TOTAL, y}$
Data unit:	MWh (Mega-watt hour)
Description:	Total electricity generation by the wind mills during the year y
Source of data to be used:	Controller attached with each WTG
Value of data applied for the purpose of calculating expected emission reductions	50,615.28
Description of measurement methods and procedures to be applied:	Data is measured continuously at Central Monitoring System (CMS) through controller attached with each WTG. Site operators on daily basis will record the generation of each WTG at CMS. For details please refer to section – 3.2
QA/QC procedures to be applied:	For detail please refer to section – 3.2
Any comment:	The data (Total electricity generation by the wind mills) will be archived on electronic media as well as on paper. The data will be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later -Not used for emission reduction calculation

Data / Parameter:	EG_{export}
Data unit:	MWh (Mega-watt hour)
Description:	Electricity exported to the grid by the project activity in year y
Source of data to be used:	Two Main meters (MPSEB Meters) located at common metering points (one for 7 WTGs and second for 8 WTGs) and owned by MPPKVV CO. LTD.
Value of data applied for the purpose of calculating expected emission reductions	50,615.28 MWh
Description of measurement methods and procedures to be applied:	The export of electricity will be measured continuously by the main meters. Main meters' readings will be recorded and verified, once in a month, jointly by the representatives of MPPKVV CO. LTD. and the authorized representative of the SISL as per the applicable provisions mentioned in the Power Purchase Agreement. Site operators will also record main meters readings daily. For details please refer to section – 3.2
QA/QC procedures to be applied:	*Calibration:* with actual load comparing to standard reference meter which itself will be calibrated once in a year at the approved laboratory of

	Govt. of India or Govt. of M.P. as per terms and conditions of supply. *Accuracy:*0.5% (Main meter), 0.2% (standard reference meter)
Any comment:	-The data will be archived in logbooks. The data will be kept for two years after the end of the crediting period or the last issuance of VCUs for this project activity, whichever occurs later.

Data / Parameter:	EG_{import}
Data unit:	MWh (Mega-watt hour)
Description:	Electricity imported (consumed) by the project activity in year y.
Source of data to be used:	Two Main meters (MPSEB Meters) located at common metering points (one for 7 WTGs and second for 8 WTGs) and owned by MPPKVV CO. LTD.
Value of data applied for the purpose of calculating expected emission reductions	0 MWh(assumed)
Description of measurement methods and procedures to be applied:	The import of electricity will be measured continuously by the main meters installed at common metering points. Main meters' readings will be recorded jointly and verified, once in a month, by the representatives of MPPKVV CO. LTD. and the authorized representative of the SISL as per the applicable provisions mentioned in the Power Purchase Agreement. Site operators on daily basis will also record Main meters readings. For detail please refer to Section- 3.2
QA/QC procedures to be applied:	*Calibration:* with actual load comparing to standard reference meter which itself will be calibrated once in a year at the approved laboratory of Govt. of India or Govt. of M.P. as per terms and conditions of supply. *Accuracy:*0.5% (Main meters), 0.2% (standard reference meter)
Any comment:	-The data will be archived in logbooks. The data will be kept for two years after the end of the crediting period or the last issuance of VCUs for this project activity, whichever occurs later.

Data / Parameter:	EG_y
Data unit:	MWh (Mega-watt hour)
Description:	Net Electricity exported to the grid by the project activity in year y
Source of data to be used:	Calculated from EG_{export} and EG_{import} as (EG_{export} – EG_{import})
Value of data applied for the purpose of calculating expected emission reductions	50,615.28 MWh
Description of measurement methods and procedures to be applied:	Net electricity supplied to grid will be calculated by subtracting the EG_{import} from EG_{export}.
QA/QC procedures to be applied:	Sell of energy provided by office of executive engineer O&M Divn. MPPKVV CO. Ltd.
Any comment:	-The data (net electricity supplied to the grid) will be archived on

	electronic media as well as on paper. The data will be kept for two years after the end of the crediting period or the last issuance of VCUs for this project activity, whichever occurs later.

3.4 Description of the monitoring plan

The project participant, RSIL, has entered into a contract with Suzlon Infrastructure Services Limited for operating and maintenance of the wind mills installed in the project activity at Site I and Site II. As per the agreement, Suzlon Infrastructure Services Limited (SISL) will prepare and submit a monthly operating status report. Please refer to Annex 4 for further details on monitoring.

The daily production report shall also be made available containing the following:

- Daily production for each WTG
- Accumulated production for each WTG
- Daily WTG and grid availability
- Details of stoppages
- Main metering report

Daily reports are also available on online. The project participant has also entered into a power purchase agreement with MPSEB and the operating records would be maintained as per the agreement.

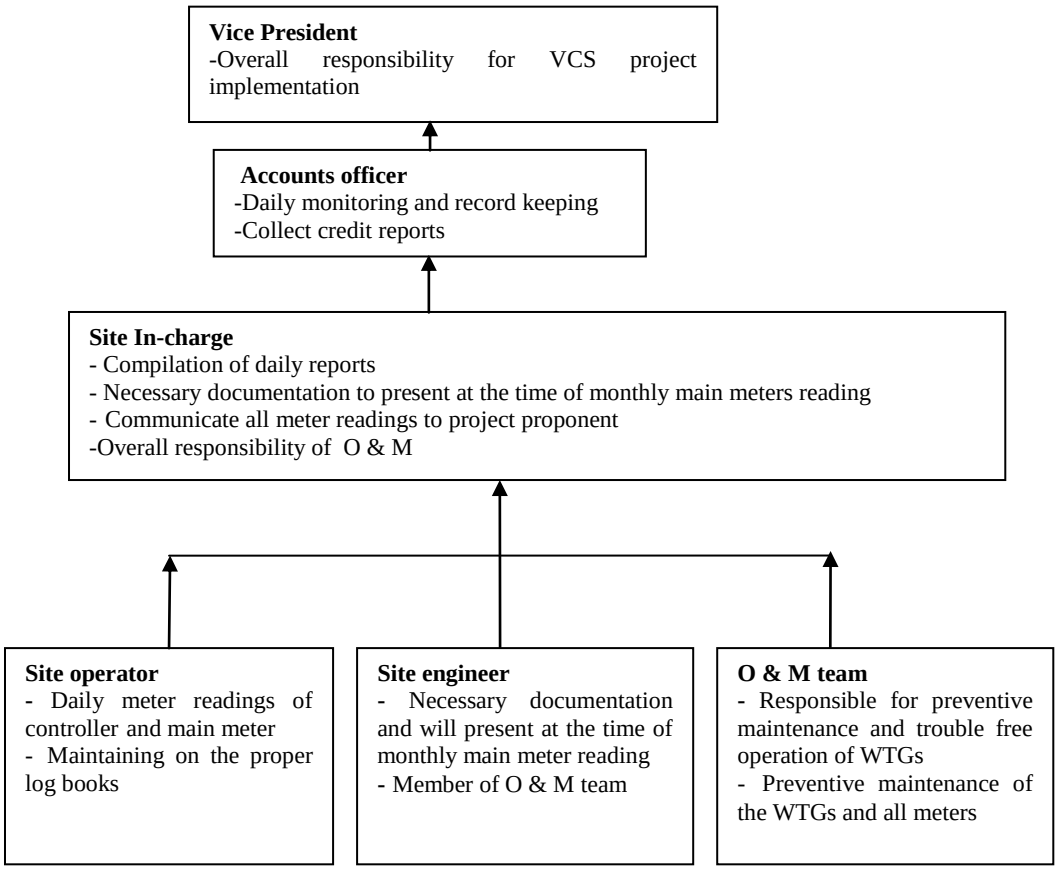
Net export of electricity from each WTG is evaluated with the following formula:

Net electricity exported by a WTG = [(Electricity generated by that WTG at the controller)*(Total electricity exported to the grid calculated from joint meter readings)] / (Total electricity generated at controller by all the WTGs connected to the joint meter)

Individual Credit Report for WTGs connected to the Joint Meter is developed on the basis of net export of the electricity calculated as above.

Operational and organizational chart for monitoring:

Monitoring responsibility – Project participant (RSIL) & O&M contractor (SISL)



4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

Applied methodology: ACM0002/version 10/ sectoral scope 1/
In the absence of the project activity, equal amount of electricity would have been generated from the plants connected to the grid that gets power from most of the fossil fuel based plants. Hence, displacing the grid power by wind power is actually saving equivalent amount of GHGs emissions that can be estimated based on the grid emission factor.

The emission reductions from the project activity will occur directly from exports of electricity to the grid. Electricity is generated from wind energy, which is the cleanest renewable source of energy. A renewable source of energy is one, which gets replenished and does not undergo depletion due to its use. Electricity generation from project activity does not lead to any GHG emissions.

The energy supplied by project activity to the state grid would reduce anthropogenic GHG emissions as per the combined margin carbon intensity of the NEWNE grid, which is mainly dominated by fossil fuel based power plants.

Baseline emissions due to displacement of electricity by the project activity:

Baseline emissions in the year y (in tCO_2), BEy, due to displacement of grid-electricity are the product of the baseline grid emission factor for the year y, $EF_{grid,y}$ (in tCO_2/MWh) and the net electricity supplied by the project activity to the grid in the year y, EGy, (in MWh), over the crediting period as given below:

$BEy = EGy*EF_{grid,y}$

Where:
BEy = Baseline emissions of the project activity in the year y (tCO_2)
EGy = Net electricity supplied to grid in year y (MWh)
$EF_{grid,y}$ = Baseline emission factor of the grid in the year y (tCO_2/MWh)

The project activity is located in states of Madhya Pradesh falls under NEWNE grid.

Baseline emission factor is calculated as combined margin, consisting of a combination of operating margin (OM) and build margin (BM) factors according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system'. Calculation of Combined Margin (CM) is done in accordance with the following three steps:

Step 1: Calculating the Operating Margin emission factor ($EF_{OM,y}$)
The tool 'Tool to calculate the emission factor for an electricity system' provides four options for calculating the operating margin, and guidance for how to choose which options for the corresponding project activity. The options are:

a) Simple OM, or
b) Simple adjusted OM, or
c) Dispatch Data Analysis OM, or
d) Average OM.

The simple adjusted OM and dispatch data analysis OM cannot be currently applied in India due to lack of necessary data[31]. The choice of other options for calculating the operating margin emission factor depends on the generation of electricity from low cost/must run sources. In the context of the methodology low cost/must run resources typically include hydro, geothermal, wind, low cost biomass, nuclear and solar generation.

The percentage share of power generation from low cost / must run power plants for the latest three years in the NEWNE is as follows[32]:

Share of power generation from low cost/must run resources (% of Net Generation)			
	2005-06	2006-07	2007-08
NEWNE	18.0%	18.5%	19.0%
India	20.1%	20.9%	21.0%

The average percentage of power generation by low cost / must run plants in the NEWNE grid for latest three years is just 18.48%. As low cost / must run resources constitute less than 50% of total power generation the average OM method cannot be applied and the Simple OM option can be used for the proposed project activity. The Simple OM emission factor can be calculated using either of the two following data vintages for year (s) *y*:

- *Ex ante* option: 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, without requirement to monitor and recalculate the emissions factor during the crediting period,
or
- *Ex post* option: 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 proceeding 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.

For the proposed project activity the Simple OM emission factor has been calculated as *ex-ante* based on the full generation-weighted average for the most recent 3 years for which data are available at the time of VCS-PD submission to DOE for validation.

[31] http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf
[32] http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Simple OM: The simple OM emission factor ($EF_{OM,y}$) is calculated as the generation weighted average emissions per electricity unit (tCO2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

$$EF_{OM,simple,y} = \frac{\Sigma_{i,j} FC_{i,j,y} * NCV_{i,y} * EF_{co2,i,y}}{\Sigma_j EG_{j,y}}$$

Where:

$EF_{OM,simple,y}$	= Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,j,y}$	= Amount of fossil fuel type i consumed by power plant / unit j in year y (mass or volume unit)
$NCV_{i,y}$	= Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,i,y}$	= CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{j,y}$	= Net electricity generated and delivered to the grid by power plant / Unit j in year y (MWh)
i	= All fossil fuel types combusted in power plant / unit j in year y
j	= All power plants / units serving the grid in year y except low-cost / must-run power plants / units
y	= Three most recent years for which data is available at the time of submission of the VCS-PD to the DOE for validation (*ex ante* option)

The Simple OM emission factor ($EF_{OM,simple,y}$) is calculated separately for the most recent three years and an average value has been considered as the OM emission factor for the baseline ($EF_{OM,y}$).

Step 2: Calculating the build margin ($EF_{BM,y}$)

The sample group of power unit's j used to calculate the build margin consists of either:

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

Project participants should use the set of power units that comprises the larger annual generation. In India, the latter approach generally yields the larger sample and hence followed[33].

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

$$EF_{BM,,y} = \frac{\Sigma_j EG_{j,y} * EF_{EL,,j,y}}{\Sigma_j EG_{j,y}}$$

Where:

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

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 j 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

[33] http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf (page 42)

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.

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.

As project participant can use any of above two options, here option 1 has been adopted. The BM emission factor will be calculated *ex-ante*, for whole crediting period, based on the most recent information available on plants already built for sample group j of NEWNE grid at the time of PD submission. The sample group j 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/VCS project activities.

Step 3: Determining the combined margin
As per the "Tool to calculate the emission factor for an electricity system" version 01.1, EB 35, the combined margin is calculated based on the weighted average of the operating margin emission factor and the build margin emission factor as follows:

$$EF_{CM,y} = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$

Where:
$EF_{CM,y}$ = The combined margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{OM,y}$ = Operating 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 project activity is the wind power generation; therefore, default values of w_{OM} and w_{BM} are taken as 0.75 and 0.25 respectively (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.

$EF_{OM,y}$ Operating margins of the NEWNE is calculated *ex-ante* using three years vintage data (2005-2006, 2006-2007, 2007-2008) obtained from CEA database on CO_2 baseline for Indian Power Sector. $EF_{BM,y}$ Build margin of the NEWNE Grid is calculated *ex ante* using NEWNE grid contributing 20% of grid generation during 2007-2008 obtained from CEA database on CO_2 baseline for Indian Power Sector.

The CEA has calculated the baseline emission factors using the tool "Tool to calculate the emission factors for an electricity system", for the regional grids (NEWNE and Southern) in India. As this is the most authentic information available in the public domain, the baseline emission factor used in the calculation of baseline emissions for the project activity is being calculated from the same for transparency and accuracy[34].

To evaluate the emission factors for NEWNE Grid the equations mentioned above are used as follows:

$$EF_{CM,y} = w_{OM} * EF_{OM,y} + w_{BM} * EF_{BM,y}$$
$$EF_{CM,y} = 0.75*EF_{OM,y} + 0.25*EF_{BM,y}$$

The $EF_{OM,y}$ is calculated as average of latest three years values of OM emissions factors for the NEWNE Grid as follows based on latest CEA data[35] (Baseline Carbon Dioxide Emission database, Version 5):

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

Operating margin Emission Factor for NEWNE Grid:

Simple Operating Margin (including imports) in the year 2006-07 = 1.008479 tCO_2/MWh
Simple Operating Margin (including imports) in the year 2007-08 = 0.999902 tCO_2/MWh
Simple Operating Margin (including imports) in the year 2008-09 = 1.006553 tCO_2/MWh

Net generation in operating margin in the year 2006-07 = 465,361,323.46 MWh
Net generation in operating margin in the year 2007-08 = 496,119,033.47 MWh
Net generation in operating margin in the year 2008-09 = 509,775,578.19 MWh

Total generation in operating margin during last three years, 2006-07, 2007-08 & 2008-09 = 1,471,255,935.12 MWh

Net Emissions in operating margin in the year 2006-07
= 1.008479 x 465,361,323.46 = 469,307,060.89 tCO_2

Net Emissions in operating margin in the year 2007-08
= 0.999902 x 496,119,033.47 = 496,070,249.90 tCO_2

Net Emissions in operating margin in the year 2008-09
= 1.006553 x 509,775,578.19 = 513,116,128.41 tCO_2

Total Emissions in operating margin during last three years, 2006-07, 2007-08 & 2008-09 = 1,478,493,439.20 tCO_2

Operating Margin Emission Factor ($EF_{OM,Y}$) = 1,478,493,439.20 / 1,471,255,935.12
= 1.004919 tCO_2/MWh

The value of $EF_{BM,y}$ has been taken from CEA data (Version 5) as latest value (2008-09) of build margin for NEWNE Grids as follows:

Build margin for NEWNE Grid
$EF_{BM,\ y} = EF_{BM,\ (2008-09)} = 0.675181\ tCO_2/MWh$

Now,
Combined margin for NEWNE grid
$EF_{CM,y} = 0.75 * 1.004919 + 0.25 * 0.675181 = 0.753689 + 0.168795 = 0.92248\ tCO_2/MWh$

The grid emission factor, $EF_{grid,\ y} = 0.92248\ tCO_2/MWh$

The emission factors calculated *ex-ante* will remain same throughout the crediting period.

Net electricity supply to grid is calculated as:

$EG_y = EG_{export} - EG_{import}$

Where:
EG_{export} = Electricity exported to the grid by the project activity in year y (MWh)
EG_{import} = Electricity imported (consumed) by the project activity in year y (MWh)

The total power generated by the project activity is based on the wind speed, turbine blade diameter and the operating days of power generation from the project activity in each year. Two electronic main meters, located at common metering point separately for seven and eight WTGs and owned by SEB, are capable to recording import, export and RKVAH consumption of electricity.

This generated electrical energy will displace an equivalent amount of electricity that would be generated by the NEWNE grid mix. Without 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 fossil fuel combustion. The net electricity exported to the grid is considered for estimation of emission reductions.

Project Emissions:
As per the ACM0002/version 10, there are no project related emissions, therefore, PE_y = 0.

Leakage:
As per the ACM0002/version 10, the main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects). The methodology specifies that the project participants do not need to consider these emission sources as leakage in applying this methodology. Therefore, the leakage is considered as zero, $L_y = 0$. Similarly, the project activity does not claim any credit for the project activity on account of reducing these emissions below the level of the baseline scenario.

Emission Reductions:
The project activity reduces carbon dioxide emissions through displacement of grid electricity generation with fossil fuel based power plants by renewable electricity. The emission reduction ER_y due to project activity during a given year y is estimated as the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), as per the formulae given below:

$ER_y = BE_y - PE_y - L_y$

Where,
BE_y = Baseline emissions in the year y in tCO_2
PE_y = Project emissions in the year y.
L_y = Emissions due to leakage in the year y.

Here,
$PE_y = 0$ for the project activity as per the methodology.
$L_y = 0$ for the project activity.

Therefore, **$ER_y = BE_y$**

4.2 Quantifying GHG emissions and/or removals for the baseline scenario:

To evaluate the emission reductions the equations mentioned in section 4.1 are used as follows:

$ER_y = BE_y$
$BE_y = EG_y * EF_{grid,\ y}$
$EF_{grid,y} = EF_{CM,y}$

Estimation of net electricity generation from 1.5 MW WTGs:

Capacity of each WTG = 1.5 MW
No. of WTGs = 15
Total capacity of 1.5 MW WTGs = 15*1.5 = 22.50 MW
Plant Load Factor (PLF) = 25.68 %
Total no. of operating hours annually = 24*365 = 8760 Hours

Net generation from all 15 WTGs (1.5 MW each)

= 22.5*0.2568*8760 **= 50615.28 MWh**

Estimated value of EG_y = 50615.28 MWh

Therefore, baseline emissions (BEy) = $EG_y * EF_{grid,\ y}$ = 50,615.28 * 0.92248 = 46,691 tCO_2 (approx)

Project emissions = 0
Leakage = 0

Therefore, $ER_y = BE_y$,

Estimated emission reductions per year = 46,691 tCO_2

(Detailed calculations for power generation and VCUs are available in attached MS-excel files).

4.3 Quantifying GHG emissions and/or removals for the project:

Project Emissions:
As per the ACM0002/version 10, there are no project related emissions, therefore, $PE_y = 0$.

Leakage:
As per the ACM0002/version 10, the main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects). The methodology specifies that the project participants do not need to consider these emission sources as leakage in applying this methodology. Therefore, the leakage is considered as zero, $L_y = 0$. Similarly, the project activity does not claim any credit for the project activity on account of reducing these emissions below the level of the baseline scenario.

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project:

Emission Reductions:
The project activity reduces carbon dioxide emissions through displacement of grid electricity generation with predominantly fossil fuel based power plants[36] by renewable electricity. The emission reduction ER_y due to project activity during a given year y is estimated as the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), as per the formula given below:

$$ER_y = BE_y - PE_y - L_y$$

Where,
BE_y = Baseline emissions in the year y in tCO_2
PE_y = Project emissions in the year y in tCO_2
L_y = Emissions due to leakage in the year y in tCO_2

Here,
$PE_y = 0$ for the project activity as per the methodology.
$L_y = 0$ for the project activity.

Therefore, $ERy = BE_y$

Years	BE_y	PE_y	L_y	ER_y
2008-09	42,760	0	0	42,760
2009-2010	46,691	0	0	46,691
2010-2011	46,691	0	0	46,691
2011-2012	46,691	0	0	46,691
2012-2013	46,819	0	0	46,819
2013-2014	46,691	0	0	46,691
2014-2015	46,691	0	0	46,691
2015-2016	46,691	0	0	46,691
2016-2017	46,819	0	0	46,819
2017-2018	46,691	0	0	46,691
Total estimated reductions (tonnes of CO_2e)	463,235	0	0	463,235
Annual average of the estimated reductions over the crediting period (tCO_2e)	46,323	0	0	46,323

5 Environmental Impact:

Wind power is one of the cleanest sources of renewable energy, with no associated emissions and waste products. As per the Schedule 1 of notification issued by Ministry

[36] http://www.cea.nic.in/power_sec_reports/general_review/0304/tables.pdf

of Environment and Forests (MoEF), Government of India on September 14, 2006, thirty-nine activities are required to undertake environmental impact assessment studies[37]. The proposed project activity does not fall under the list of activities requiring EIA as it will not involve any negative environmental impacts. Thus, no detailed EIA study was conducted. However, an in-house environmental impact assessment was conducted and summarized below –

During construction phase
The construction phase involved erection of WTGs at the project activity site. Although movement of materials for erection produced some dust pollution, the impacts were negligible and do not have any significant impact on the local environment.

The project area does not have any housing structures/dwelling units hence Rehabilitation and Resettlement would not be an issue. The project has provided job opportunities by way of casual labour, skilled labor and office staff not only during the construction but also during the operation of project activity. Adverse impact on the health and culture of local residents is not anticipated.

No Historical and Cultural Monuments have been affected due to project location as there is no archaeological monument located as per the Archaeological Survey of India. The project site and immediate neighborhood areas with pleasing architectural design that blends with the landscape does have a positive impact on the aesthetics of the present surrounding of the site.

During operation phase

Impact on Air
There are absolutely no negative impacts on air due to the project activity, as it will not emit any local and global pollutant in the atmosphere.

Impact on Noise
Even though the project activity creates noise when WTGs rotate but the noise level remains well within the limit and do not disturb the local people.

Impact on water
No water is consumed for the project activity and no effluent is discharged from the project activity and hence, there is no impact on water due to the project activity.

Impact on bio-diversity
The installation of a wind farm does not cause negative impact on biodiversity. It does not affect flora and fauna in any way.

Other impacts
The operation of the WTGs has brought certain changes in the socio-economic and cultural environment by providing certain employment and livelihood opportunities improved the quality of life of the people in the surrounding habitations and also by providing cleaner environment and better health conditions to the people in the neighboring villages.

The generation of electricity from such clean process would contribute towards meeting the state's deficit in electricity requirements.

It shows that the proposed project activity does not have any significant negative impact on local and global environment.

6 Stakeholders' comments:

Brief description how comments by local stakeholders have been invited and compiled:
RSIL conducted a stakeholder's consultation meeting on 13th May, 2008 at the project activity site, Village – Palsodi (Ratlam), to get the comments and suggestions of the local stakeholders on the project activity. Following are the stakeholders identified for the project activity:

- Local Community

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

- Non Government Organizations
- Village Panchayat
- Wind Farm Developers (Suzlon)
- Consultants

Formal invitation letters were sent to different stakeholders well in advance for the stakeholder's consultation meeting for the VCS/CDM project activity. The stakeholders present in the meeting were local villagers, deputy sarpanch (village chief), ex sarpanch (village chief), teachers from local school, Gram Panchayat (Local Governing Body of a Village) members, employees of Suzlon etc. The list of the persons attended the stakeholders' consultation meeting is available with the project participant. The project participant made all the necessary arrangements for the meeting like arrangement for sitting, putting a banner, photography, provision of refreshments etc. The chairperson was elected for the meeting among the present stakeholders. The presentations were made on Kyoto Protocol, Clean Development Mechanism, role of the project activity in mitigating the GHGs emissions etc. in local language. The chairperson invited the comments from the persons present in the meeting and the concerned persons made responses.

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

Summary of the comments received:
The project activity is situated in the tribal area. The tribal people were happy with the project activity as it generated jobs to some of local persons and developed the site, approach road etc. The company in participation with local tribal people has provided amenities like solar lanterns, toilets / bathrooms inside the house, basic education etc. They were also interested to know the ways to mitigate the GHG emissions at local village level.

The meeting was very cordial and ended on a positive note. No adverse comments were received. It would be appropriate to state at this point that the stakeholders, particularly the local people / representatives left the meeting with a clear understanding of the background of the project activity and its relevance under the Clean Development Mechanism on Climate Change. They were strongly supporting the project activity and were happy due to the potential benefits to their local area.

Report on how due account was taken of any comments received:
Only positive comments were received. The project is welcomed by all the stakeholders because it is environmentally clean, generates income and jobs, supports the development of the nearby rural areas and the state, reduces dependence on imported fuels, etc.

No corrective actions were recorded due to the absence of negative comments established. The list of people attended the meeting and the minutes of the meeting are available with the project Participants and will be made available to the validator at the time of validation.

7 Schedule:

Schedule of events in the project activity is given below:

i.	Proposal for WTGs from SUZLON:	08/08/2007
ii.	Date of meeting of Board of Directors:	30/09/2007
iii.	Appointment of CDM/VCS consultant:	04/10/2007
iv.	*Date of purchase order:*	*20/11/2007*
v.	*Commissioning of WTGs:*	*29/02/2008 to 30/05/2008*
vi.	*Project start date:*	*29/02/2008*
	(the date of commissioning of first WTG in the project activity)	
vii.	*Project termination date:*	*28/02/2028*
	(as per 20 years life time of the WTGs)	
viii.	*Crediting period start date:*	*29/02/2008*
	(the project start date on which first WTG was commissioned)	
ix.	*Duration of crediting period:*	*10 years (29/02/2008 to 28/02/2018)*
x.	*Date of stakeholders consultation meeting:*	*13/05/2008*
xi.	*Date of signing the power purchase agreement:*	*11/08/2008*
xii.	*Date of meeting at MOEF for DNA approval:*	*24/12/2008*

xiii. Date of appointing DOE for VCS validation and verification: 14/04/2009

Monitoring of project will start from date of commissioning of each WTG. The frequency of monitoring and reporting of monitoring has been explained in section 3.2 and 3.3.

8 Ownership:

8.1 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
- O&M agreement between RSIL and supplier
- Land documents
- Power Purchase Agreement

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program (if applicable):

There are no compliance/binding limits of emission reductions in the host country so the point is not applicable.

Appendix 1

Dates of Commissioning

P143	RSIL	1500	29.02.08
P145	RSIL	1500	29.02.08
P148	RSIL	1500	29.02.08
P150	RSIL	1500	29.02.08
P154	RSIL	1500	29.02.08
P113	RSIL	1500	29.03.08
P114	RSIL	1500	29.03.08
P109	RSIL	1500	29.03.08
P112	RSIL	1500	29.03.08
P131	RSIL	1500	29.03.08
P137	RSIL	1500	29.03.08
P140	RSIL	1500	29.03.08
P107	RSIL	1500	30.05.08
P101	RSIL	1500	30.05.08
P104	RSIL	1500	30.05.08

Appendix 2

List of Abbreviations

Abbreviation	Expanded Form
BPLR	Benchmark Prime Lending Rate
CEA	Central Electricity Authority
CM	Combined Margin
CMS	Central Monitoring System
CUF	Capacity Utilisation Factor
LTV	Long Term Variability
MoEF	Ministry of Environment and Forest
MP	Madhya Pradesh
MPERC	Madhya Pradesh Electricity Regulatory Commission
MPPKVV	Madhya Pradesh Paschim Kshetra Vidyut Vitaran
MPSEB	Madhya Pradesh State Electricity Board
NEWNE	Northern Eastern Western& North-Eastern
NGO	Non Government Organizations
NHPC	National Hydel Power Corporation
NTPC	National Thermal Power Corporation
O&M	Operation and Maintenance
PLF	Plant Load Factor
PLR	Prime Lending Rate
PO	Purchase Order
PP	Project Proponent
RES	Renewable Energy Sources
RLDC	Regional Load Dispatch Centre
RPCs	Regional Power Committees
RPM	Revolutions Per Minute
RSIL	Ruchi Soya Industries Limited
SISL	Suzlon Infrastructure Services Limited
SLM	Straight Line Method
STV	Short Term Variability
WTG	Wind Turbine Generator