Voluntary Carbon Standard
Project Description Template

19 November 2007

Date of the VCS PD: ***5th Nov 2009 (Ver02)***

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1 Description of Project:

1.1 Project title

2.45MW Wind Power Project in Rajasthan, India by Yamuna Power and Infrastructure Ltd.

Version: ***02***

1.2 Type/Category of the project

Project Category: *I.D. "**Grid connected renewable electricity generation" version 14, EB 48***

- According to the categorisation of Appendix B to the simplified modalities and procedures for small scale Clean Development Mechanism (CDM) project activities[1] the project activity under consideration fits into the type and category as mentioned below:
  - Type: *Type I – Renewable Energy Projects*
  - Category: *I.D. 'Grid Connected Renewable Energy Generation'*

  For further details regarding the applicability criteria pertaining to the above-mentioned type and category in the context of the project activity, please refer to section 2.2 of the VCS PD.

- The project is not a grouped project as defined in clause 5.6 of Voluntary Carbon Standard 2007.1 and also clause 5.2 of Voluntary Carbon Standard Program Guidelines 2007.1.

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

- The total capacity of power generation of the project activity under consideration is 2.45 MW and the average annual emission reductions from the project activity are to the tune of 4133 tonnes CO_2 equivalent, as specified in section 1.6 below. As per "Voluntary Carbon Standard 2007" by the VCS Association, the projects are categorized as below:
  - *Micro project*: Less than 5,000 tonnes CO_2 equivalent emissions reductions per year
  - *Projects*: 5,000 – 1,000,000 tCO2-e per year; and
  - *Mega Project*: More than 1,000,000 tonnes CO_2 equivalent emissions reductions per year

  Since the annual GHG reduction potential for the project activity is less than 5,000tCO_2e per year, it falls under "**Micro Project"** category.

1.4 A brief description of the project:

The project activity being considered here uses renewable energy in the form of wind to generate electricity for the North East West Northeast (NEWNE) region grid of India. It consists of a three Wind Turbine Generators (WTGs), 2 X 600 KW and 1 X 1250 KW belonging to Yamuna Power & Infrastructure Ltd. All the three WTGs are located in the state of Rajasthan. Suzlon Energy Ltd and Enercon India Ltd. are the equipment suppliers and the

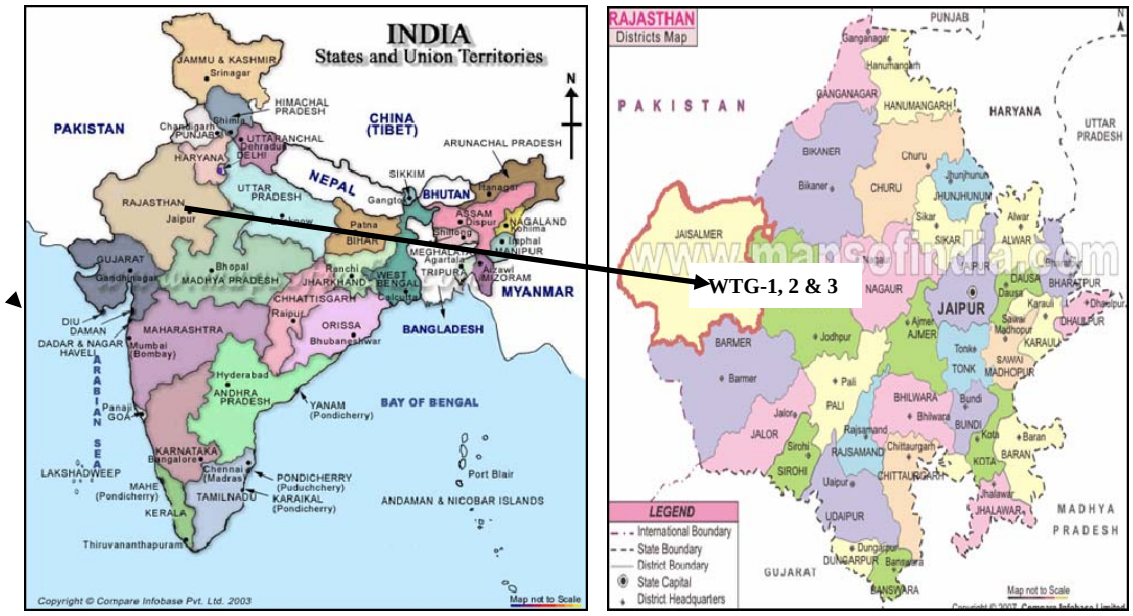
[1] Refer to: http://cdm.unfccc.int/methodologies/SSCmethodologies

operations and maintenance contractors for the Project. The project activity will generate 4560 MWh/year of electricity through wind power resources. The generated electricity will be supplied to NEWNE regional grid of India under a long-term power purchase agreement (PPA) signed with Rajasthan Rajya Vidyut Prasaran Nigam Limited (RVPNL). Thereby the electricity exported from the project to the NEWNE grid will replaces an equivalent amount of power generation at the grid connected power plants which are predominantly fossil fuel based. Therefore the project activity results in estimated emission reduction of 4133 tCO2e/year as per the Grid Emission Factor (0.906tCO2e/MWh) of the NEWNE regional grid of India.

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

S.No.	WEG No.	Capacity (MW)	Technology	Location			Site Coordinates
				Village	District	State	
1	YGCL-01	0.6	Enercon	Gorera	Jaisalmer	Rajasthan	26°44'29"N 70°51'20"E
2	YGCL-02	0.6	Enercon	Gorera	Jaisalmer	Rajasthan	26°44'29"N 70°51'20"E
3	J-215	1.25	Suzlon	Soda Mada	Jaisalmer	Rajasthan	26° 41'15.0" N 70° 53' 23.6" E

Maps depicting the districts and states in which Wind Projects are located are placed below.



1.6 Duration of the project activity/crediting period:

Project start date: (Commissioning Date)

For the project activity, the project start date is the earliest date of the commissioning of any WTG. As evident from the table below, the earliest commissioning date is 03/03/2004 for the WTGs Location No. YGCL 01 and YGCL 02.

Project Proponent	WTG No.	Installed Capacity	Location	Commissioning Date
Yamuna Power & Infrastructure Ltd.	YGCL-01	0.6 MW	Rajasthan	3rd Mar 04
Yamuna Power & Infrastructure Ltd.	YGCL-02	0.6 MW	Rajasthan	3rd Mar 04
Yamuna Power & Infrastructure Ltd.	J-215	1.25 MW	Rajasthan	14th Mar 04

Note: Yamuna Power & Infrastructure Ltd. was earlier known are Yamuna Gases and Chemicals Ltd. and therefore the WTGs are in the name of Yamuna Gases and Chemicals Ltd. The authorization letter for change of name is provided to the Validator.

Crediting period start date:

The Crediting Period start date for the VCS project activity under consideration is 28th Mar 2006 and the length of crediting period would be maximum of 10 years i.e. up to 27th Mar 2016.

The yearly estimation of emission reduction for the project activity for the mentioned crediting period is given in the Table-1:

Table 1: Estimated amount of emission reductions over the chosen crediting period:

Years	Estimation of annual emission reductions in tonnes of CO2 e
2006-2007	4133
2007-2008	4133
2008-2009	4133
2009-2010	4133
2010-2011	4133
2011-2012	4133
2012-2013	4133
2013-2014	4133
2014-2015	4133
2015-2016	4133
Total estimated reductions **(tones of CO_2 e)**	41330

Total number of crediting years	**10**
Annual average of the estimated reductions over the crediting period (tCO2 e)	4133

The Yamuna Power & Infrastructure Ltd has applied this project for CDM and is currently under validation, as detailed in section 1.13. In case the project is registered under CDM, the project proponent shall claim VCUs for these WTGs from 28th March 2006 till the date of CDM registration of these WTGs. At any point of time during the first crediting period, the project proponent will abide by the **"Further Guidance for Projects that are Registered in Two GHG Programs"** dated 19 March, 2008 issued by VCS Association and will claim credits from one GHG program to avoid double counting.

1.7 Conditions prior to project initiation:

The proposed project activity will evacuate approximately 4.56 Million Units of clean electricity per year. According to the CEA report the actual power supply position till Apr-06, evident a deficit of 11.9%[2]. Taking into account energy shortages and current trend of investment in fossil fuel based energy generation in the region, in the absence of the project activity, an equivalent quantum of electricity would have been generated by the fossil-fuel dominated NEWNE Grid of India[3] generation mix as it is evident from section 2.2. The same would in turn result in GHG emissions at the grid end as per the carbon intensity of the grid. The electricity generation from the wind power project will contribute annually GHG reductions estimated at 4133tCO2e (tonnes of carbon dioxide equivalent). This scenario has been identified as the baseline scenario for the project activity under consideration (*please refer to section 2.4 of the VCS PD for further details*).

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

The Project is wind based renewable energy source, zero emission power project connected to the Rajasthan state grid, which forms part of the NEWNE electricity grid. The project is expected to generate and export of 4.56 Million Units (approx) to the NEWNE Regional Grid of India resulting in the reduction of anthropogenic Greenhouse Gas emission.

As per the combined margin carbon intensity of the 0.906 tCO2/MWh for the NEWNE grid, the project activity would there by result in total CO_2 emission reduction of 4133 tons/year for the Ist crediting period of 10 years. For detailed calculation procedure and sample calculation tables of the GHG emission reduction quantum from the project activity, please refer to Sections 4.2, 4.3 and 4.4 of the VCS PD.

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

The technology adopted for the project activity is a standard and widely accepted practice for power generation using renewable sources. No technology transfer is involved for the project and know-how for the project technology is well established. This project is a clear renewable

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[2] http://www.cea.nic.in/cea-archive/body/Reports/Executive%20Summary/2006/2006_04/20-21.pdf

[3] The Indian power grid system (or the National Grid) is divided into two regional grids namely Northern Eastern Western North Eastern (NEWNE) Regional Grid and Southern Regional Grid. These regional grids have independent state Load Dispatch Centres (LDCs) that manage flow of power in their jurisdiction. Power generated by state owned generation units and private owned generation units is consumed by the respective states. Power generated by central sector plants is shared by all states forming part of the grid in a fixed proportion.

energy project that uses wind energy for generation of electricity with available proper conversion technology. The important components of a windmill are as follows:

- Main Tower
- Blades
- Nacelle
- Hub
- Main Shaft
- Gear Box, Bearing and Housing
- Brake
- Generator

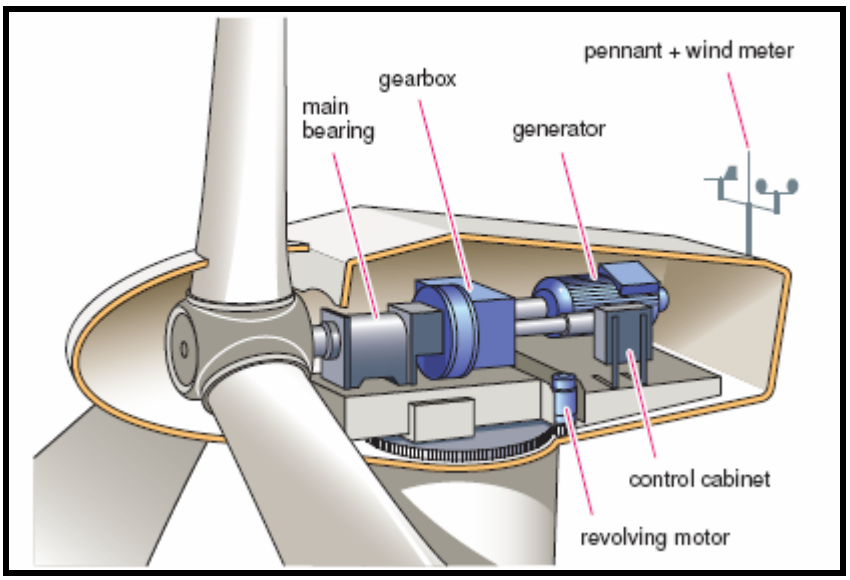


Fig: Cross-section of a wind turbine nacelle

The various WTG models employed by the project activity are shown below:

Name of the project participant	WTG Location No.	WTG Model No.
Yamuna Power & Infrastructure Ltd.	YGCL-01	E-40
Yamuna Power & Infrastructure Ltd.	YGCL-02	E-40
Yamuna Power & Infrastructure Ltd.	J-215	S-66

Furthermore the specifications of the various WTG model (S-66) employed by the project activity are presented below:

Technical Specification for Suzlon make (1250 KW and 600 KW) WTGs.

S/No	Particulars	Suzlon S-66 WTG
	Rotor	
1.	Rotor diameter	66 m
2.	Hub Height	65 m
3.	Installed electrical output	1250 kW
4.	Rotor swept area	3421.19 m^2
5.	Rotational speed	13.9 / 20.8 rpm
6.	Rotor material	GRP (Glass Reinforced Epoxy)
7.	Regulation	Pitch

	Operational Data	
8.	Cut-in wind speed	3.0 m/s
9.	Rated wind speed	13.0 m/s
10.	Cut-out wind speed	25.0 m/s
	Generator	
11.	Type	Asynchronous Generator
12.	Poles	4/6 poles
13.	Rated output	250/1250 kW
14.	Rotational speed	1010/1515 rpm
15.	Operating voltage	690 V
16.	Frequency	50 Hz
17.	Insulation class	Class H
18.	Protection	IP 56
19.	Cooling system	Air cooled
	Gear Box	
20.	Type	Integrated 3-stage gearbox
21.	Gear Types	1 planetary & 2 helical.
22.	Manufacturer	Flender
23.	Gear ratio	1.74.917
24.	Nominal load	1390 kW
25.	Type of cooling	Oil cooling system
	Yaw Drive	
26.	Motor	4 Active Electrical Yaw Motors
27.	Yaw bearing	Polyamide slide bearing
	Safety System	
28.	Aerodynamic Brake	3 Independent systems with blade Pitching
29.	Mechanical Brake	Spring Powered Disc Brake, Hydraulically Released
	Tower	
30.	Type	Free Standing; Lattice tower; Hot dip galvanised
31.	Erection	With Crane
32.	Design Standard	GL Special Class

Technical Specification for Enercon make (600 KW) WTG.

The Wind Energy convertor E-40 features variable speed and active pitch control. The generator is flanged directly to the hub.

S/No	Particulars	Enercon E-40 WTG
1.	Rated Power	600 KW
2.	Rotor Diameter	44 m
3.	Hub Height	56.85 m
4.	Turbine Type	Gearless horizontal axis wind turbine with variable rotor speed
5.	Power Regulation	Independent electromechanical pitch system for each blade
6.	Design Lifetime	20 years
7.	Cut-in Wind Speed	3.0 m/s
8.	Rated Wind Speed	11.6 m/s

9.	Cut-out Wind Speed	25.0 m/s
10.	Extreme Wind Speed	57.6 m/s
11.	Rated Rotational Speed	32.5 rpm
12.	Operating Range Rotational Speed	18.0-33.0 rpm
13.	Orientation	Upwind
14.	No. of Blades	3
15.	Blade Material	Glass Fibre Reinforced Epoxy
16.	Gear box Type	Gear less
17.	Generator Type	Synchronous Generator
18.	Braking	Aero dynamical
19.	Output Voltage	400 V
20.	Yaw System	Active yawing with 4 electrical yaw drives with brake motor and friction bearing.
21.	Tower	56 m in 5 Sections.

The expected level of performance of the project activity is provided below:

Sl. No.	Company	Installed Capacity (MW)	Electricity Generation per annum (MWh)	GHG Abatement per annum (ton CO2e)
1	Yamuna Power & Infrastructure Ltd.	2.45	4560	4133

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

The project activity under consideration complies with the applicable regional and national level and regulatory requirements for installation and operation of wind-farms. The same is listed as follows:

SL. No	Compliance/ Law	YP (1.25 MW)	YP (1.20 MW)
1	No objection Certificate (Commissioning certificate) from the Rajasthan Rajya Vidyut Prasaran Nigam Ltd. (RVPN) for each wind turbine	Y	Y
2	Environmental Impact Assessment *(kindly refer section no. 8)*	Not Applicable	Not Applicable
3	Power Purchase Agreement with the RVPN	Y	Y

The documents related to relevant statutory clearances for each component of the project activity would be made available during Project Validation.

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

The amount of GHG emission reductions that the project activity would result in directly depends on the quantity of electricity generated by the wind-mills which are exported to the NEWNE regional grid. The various factors that might contribute to a substantial variation in the GHG emission reduction quantum from the project as compared to that predicted in the VCS PD are summarised below:

- Substantial variation in the wind availability/ plant load factor as compared to the values predicted on the basis of the generation that has been estimated/guaranteed by the equipment supplier in the Purchase Order for the WTG.
- Plant stoppages and loss of generation due to
  - Equipment or component failure associated with the WTGs
  - Evacuation problems associated with the local grid failures
- Physical damages to equipment and erected structures caused by natural calamities or other factors not under the control of the project promoter.
- Most wind turbine casualties are caused at night, during twilight or in bad weather situations.

The factors mentioned above pose risks to the project performance and hence the GHG abatement quantum of the project.

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 project activity involves power generation by installation of WTGs in districts of Jaisalmer in Rajasthan, India. The process of wind power generation does not involve fossil fuel combustion or any other direct or indirect emission of GHGs. Also the GHG emissions caused due to the transportation and installation of wind turbines during the construction stage are negligible as compared to the GHG emission reductions over the lifetime through displacement of equivalent electricity generation by thermal power intensive grid. As mentioned above, there are no GHG emissions attributable to the project activity and thus removal or destruction of the same is not possible. This confirms that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

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

The Project proponent had opted for Clean Development Mechanism (CDM) under GHG abatement program by Kyoto Protocol. Below is the status for the project:

Project Promoting Company	WTG Location No	Other GHG Program	Web Link	CDM Status
Yamuna Power & Infrastructure Ltd.	YGCL 01 & YGCL 02	CDM	http://cdm.unfccc.int/UserManagement/FileStorage/5BPSL3Y5058AAXKH2LOJGO5UQMSZUS	Under Validation The projects were considered in the name of Yamuna Gases and Chemicals Ltd.
Yamuna Power & Infrastructure Ltd.	J-215	CDM	http://cdm.unfccc.int/UserManagement/FileStorage/EAWTE8L6W1OGZ9FP3VGDDQHS9BJ4KT	

The Yamuna Power & Infrastructure Ltd has applied this project for CDM and is currently under validation. In case the project is registered under CDM, the project proponent shall claim VCUs for these WTGs from 28th March 2006 till the date of CDM registration of these WTGs. At any point of time during the first crediting period, the project proponent will abide by the **"Further Guidance for Projects that are Registered in Two GHG Programs"** dated 19 March, 2008 issued by VCS Association and will claim credits from one GHG program to avoid double counting.

The project proponent has also provided a written undertaking in this regard for avoidance of double counting.

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

Not Applicable.

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

The project activity involves commissioning and operation of three WTG's in Jaisalmer district of Rajasthan. Underneath is the information for the project proponent.

Yamuna Power & Infrastructure Ltd.
Formerly Yamuna Gases and Chemicals Ltd.

Organization:	Yamuna Power & Infrastructure Ltd. (*Formerly Yamuna Gases and Chemicals Ltd.)*
Roles & Responsibilities:	Project Participant
Street/P.O.Box:	23 Barakhamba Road
Building:	909 Naram Manzil
City:	New Delhi
State/Region:	Delhi
Country:	India
Telephone:	
Fax:	
E-Mail:	
URL:	
Represented by:	
Title:	Advisory Head
Salutation:	Mr
Last Name:	Chawla
Middle Name:	
First Name:	G. S
Mobile:	+919810530109
Direct Fax:	
Direct tel:	
Personal E-Mail:	gschawla@Yamunapower.com

1.15 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.:

Purpose:

The purpose of the wind-mills set up by the project activity is as follows:

- Generating clean power by utilising the renewable natural resource i.e., wind power and exporting the electricity generated to the grid. Hence the project activity does not cause emissions of greenhouse gases (GHGs) that would have otherwise been caused by power generation by the combustion of non-renewable sources of energy.

- Harnessing the wind power potential existing in India for power generation that has not been exploited to its full potential till date.
- Contribution to the industrial development of India by providing support in terms of enhanced power availability.
- Contribution to the causes of fossil-fuel conservation and climate change mitigation.
- Contribution to nation towards energy security through independency on fossil fuels and saving in national revenue by avoiding import of fossil fuels.

Contribution of the Project Activity to Sustainable Development:

The contribution of the project activity to the sustainable development of the host country 'India' is evident from the following:

Social well being:
Activities such as site preparation, construction, building, operation and maintenance etc required significant amount of skilled and unskilled manpower. This has (and still is) resulted in significant employment generation. Furthermore, as the locations of some of the WTGs incorporated in the project activity are in the remotest areas, it is a great opportunity for people in the interiors to come face to face with modern technologies. This will surely lead to capacity building in terms of technical knowledge and long-term skills.

Economic well being:
The renewable energy project will supply electricity to the grid thereby not only reducing the load on an already deficit electricity grid but also result in an indirect saving of non-renewable fossil fuels such as coal that are consumed by thermal power stations. In addition, the generation of employment opportunities also promotes the Economic well-being of the region. Lastly, the development of infrastructure of the region is imminent as such WTGs, riding on their success will invite more investments for the region.

Technological well being
This project activity incorporates WTGs that have rated outputs ranging from 600 KW to 1.25 MW. Moreover, although the technology for each of them is more or less similar, these WTGs are placed in different locations. Since, the parameters such as Wind densities, wind speeds and 'swept-areas' of rotors are different in each case, the project activity will also yield very useful data in terms of plant load factors (PLFs) achieved in each case. These data will be very useful to technology providers, project participants, developers, wind power enthusiasts and students etc., the analysis of which may help in bringing about further improvements in technology.

Environmental well being
This is the fundamental intent behind the project activity. All the participants of the project activity had desired to produce electrical power, by using renewable resources, the utilisation or consumption of which would not create environmental pollution. As such, not only does the project avoid any GHG emissions, but also avoids any form of pollution.

1.16 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:

Project Type: I – Renewable Energy Projects

Project Category: AMS I.D. – Grid connected renewable electricity generation (Version 14, EB 48)

Reference of the Approved Baseline Methodology: Category I.D - Renewable Energy Projects: Approved Small Scale Methodology AMS –I.D. / Version 14 of the Appendix B of Simplified Modalities and Procedures (M & P) of Small Scale CDM Project Activities.

PD also refers to:-

Tool to calculate the emission factor for an electricity system (Version 01.1, EB 35)

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

The project activity involves the setting up of wind farms, *i.e.*, renewable generating units of cumulative generation capacity 2.45 MW to harness a renewable source of energy (wind power potential) and export the generated electricity to the fossil fuel dominated electricity generation and distribution system, i.e. the NEWNE Regional Electricity Grid of India. In the process, an equivalent quantum of electricity that would have been generated by the grid in line with the grid electricity generation mix is displaced by the project activity. The carbon intensity of the fossil-fuel dominated generation mix of the grid is evident from the following break-up of various types of energy sources constituting the grid-mix contributing electricity to the Indian Grid system as shown in the table (as on June 06).

Sl. No	Source of electricity generation (NEWNE)	Percentage Share
1	Coal	54.32 %
2	Diesel	0.95 %
3	Hydro	10.77 %
4	Nuclear	4.91 %
5	RES (MNRE)**	25.95 %
6	Natural Gas	3.09 %

[4](Source : CEA report, power scenario; Renewable Energy Sources (RES) includes SHP, BG, BP, U &I, and wind energy; (**) Based on data as on June 06 as furnished by MNRE.)

The applicability criteria of the methodology AMS-I.D. and their relevance with respect to the project activity under consideration are addressed as follows:

Methodology	Proposed Project Activity	Justification
"This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal / wave, wind, geothermal and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution	The project activity is electricity generation using wind which is a renewable energy source, which supplies to the state electricity board/or is connected to the state grid.	The project activity involves renewable energy generation unit that supply electricity to an electricity distribution system (NEWNE Regional Grid) that is mainly supplied by at least one fossil fuel fired

[4] http://www.cea.nic.in/cea-archive/body/Reports/Executive%20Summary/2006/2006_06/8.pdf

system that is or would have been supplied by at least one fossil fuel fired generating unit."		generating unit, hence this applicability condition is satisfied.
"If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW".	The gross wind power generation capacity of the project activity is 2.45 MW.	Since the installed capacity of the project activity is less than the 15 MW, hence this applicability condition is satisfied.
"Combined heat and power (co-generation) systems are not eligible under this category"	In this project activity only power generation is involved.	Since no cogeneration is involved in the project activity, this condition is not applicable to the project activity.
"In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units."	This is a new project activity and does not involve addition to any existing facility.	Since the project activity does not involve addition to any existing renewable power generation facility, this applicability condition is not relevant.
"Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category. To qualify as a small scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW"	All the project activities are newly constructed set up and do not involve retrofitting or modification of any existing facility for renewable energy generation.	Since there is no existing facility hence this condition is not applicable to the project activity.

Thus, the project activity fulfills all the applicability criteria of the simplified small scale methodology AMS-I.D./ Version 14.

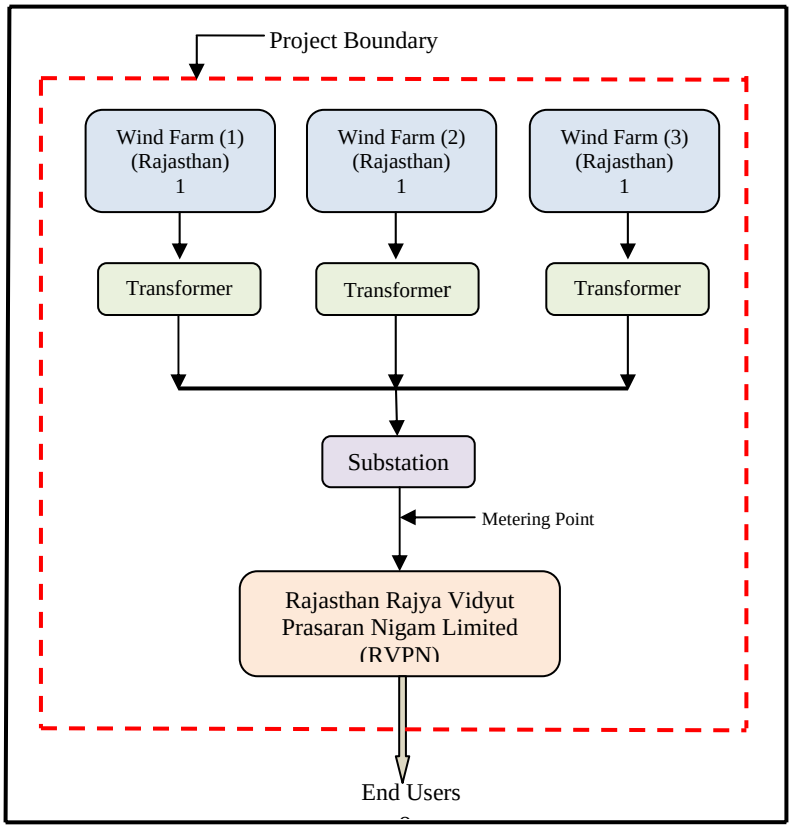
2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

The various GHG emission sources, sinks and reservoirs are identified for any GHG abatement project within its project boundary. The project boundary for the project activity under consideration encompassing various GHG emission sources for the baseline as well sink and reservoirs is identified as follows:

	Source	**Gas**	**Included**	**Justification / Explanation**
Baseline	Electricity generation from	CO_2	Included	Main Emission Source

	coal based power plants in Western & Northern Region of Integrated NEWNE Grid of India.	CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project Activity	Electricity generation from the project.	CO_2	Excluded	Excluded. As Wind energy generation does not have any direct GHG emissions.
		CH_4	Excluded	
		N_2O	Excluded	

The project boundary as identified above is demonstrated by the following block diagram.



However, as per the methodology followed for the purpose of determining baseline emissions, project emissions and emission reductions for the project activity under consideration (AMS-I.D.), identification of the GHG emission sources, sinks and reservoirs for the baseline and project scenarios of the project activity is not necessary.

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

As per the applicable methodology, AMS ID, Version 14, the baseline emissions are the product of electrical energy baseline EGBL,y expressed in kWh of electricity produced by the renewable generating unit multiplied by an emission factor "

$$BE_y = EG_{BL,y} * EF_{CO2}$$

Where

BE_y is Baseline Emissions in year y; tCO_2
$EG_{BL,y}$ is the Energy baseline in Year y, kWh
EF_{CO2} is the CO2 emission factor in year y; tCO_2e/kWh

The emission factor can be calculated in a transparent and conservative manner as follows

(a) A combined margin (CM)[5], consisting of the combination of operating margin (OM)[6] and build margin (BM)[7] according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system'. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM calculations must be considered.

OR

(b) The weighted average emissions (in kg CO2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Calculations must be based on data from an official source (where available) and made publicly available."

Accordingly, Option-A "combined margin" approach has been considered to calculate the emission factor applicable to the project activity, as detailed in section 4. The value of the emission factor is 0.906tCO2e/MWh.

Following information is used for baseline determination:

Sr. No.	Key information/data used for baseline	Source of data/information
1.	Electricity generated	Actual electricity sale invoices.
2	Grid emission factor (NEWNE and Southern Regional Grid)	CO2 Baseline Database –Version 4, October 2008 by Central Electricity Authority. http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

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):

The project activity has not been implemented as part of any law or regulatory requirement for the project proponent. It has been implemented voluntarily by the project proponent.

Barriers (As per the UNFCCC/CDM Additionality guidance for small scale CDM projects)
As per Voluntary Carbon Standard 2007.1, "A project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered project activity". The additionality aspects of the project are discussed below in accordance with Attachment A[8] to appendix B of the simplified

[5] The project activity will have an effect on the both the operating margin and build margin.
[6] Present power generation sources of the grid, weighted according to their actual participation in the grid mix (all generating sources participating in the grid except hydro, geothermal, wind, low cost biomass, nuclear, and solar power)
[7] Weighted average emissions of recent capacity additions (most recent 20% or the 5 most recent plants)
[8] http://cdm.unfccc.int/methodologies/SSCmethodologies/AppB_SSC_AttachmentA.pdf

Modalities & Procedures for small scale CDM project activities and are in line with the additionality requirements in section 5.8 of Voluntary Carbon Standard 2007.

Attachment A to Appendix B of the simplified Modalities and Procedures for small scale CDM project activities recommends that the project participants provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

1) Investment Barrier
2) Technological Barrier
3) Barrier due to prevailing practice
4) Other Barriers

The Investment Barrier route is adopted here where the barrier is demonstrated through the investment analysis as described in "Tool for the demonstration and assessment of additionality" (version 05.2). The EB 41- "Guidance on the assessment of investment analysis" (version 02) has also been applied in the investment analysis.

As per the "Tool for the demonstration and assessment of additionality" wind power projects fall under the Sub-step 2b Option III-Benchmark analysis. Further, as per the tool, the financial/ economic indicator IRR is applied as most suitable for the project type and decision context.

Investment Additionality:

Investment analysis was carried out with the Project Internal Rate of Return (IRR) as the financial indicator at the project conception stage. Project IRR is used as financial indicator by banks, financial institutions and project developers for financial evaluation of project feasibility during investment making decisions. At the time of investment, the Project Internal rate of return (IRR) for the wind project is calculated and compared with the "Benchmark". The expected Return on Project identified as "Benchmark Project IRR" has been arrived based on the average Reserve Bank of India (RBI) "Benchmark Prime Lending Rates (BPLR)" for the period during which the decision to implement the project is taken by the project proponent i.e. Year 2003-04. Accordingly, the 10.5 %[9] has been considered as "Benchmark" for the project activity.

The project IRR has been calculated based on the values and assumptions that are conservative as per the guidelines, as below.

1. **Debt Equity:** The debt and equity ratio has been considered as 70%:30% based on the Rajasthan State Policy April 2003 Tariff order. Payment term is considered for 7 years with one year of moratorium
   Plant Load Factor: As per the "Govt. of Rajasthan" policy 2000 for promoting the renewable energy projects (including wind projects) there was a mention of demonstration wind project installed by RERC during the year 1999. The PLF generated by the demo wind project was about 18.5%[10] and the same was considered as PLF for the project activity. However as per the April 2003 policy, the PLF for Rajasthan was considered as 22.37% for working the tariff rates (as substantiated in the Rajasthan Electricity Regulatory Commission (RERC) tariff Orders dated 29th Sep 2006). Therefore the PLF of 22.37 % (with 5 % transmission losses) is considered for IRR calculation to maintain the conservativeness.
2. **Interest Rates:** The actual interest rate at which the PP has availed the debt i.e 9%.

[9] http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/40728.pdf

[10] http://www.rrecl.com/wind.htm

3. **Tariff:** The project proponent has signed a "Power Purchased Agreement" with with Jaipur Vidyut Vitaran Nigam[11], which is valid for 20 years. Accordingly tariff is 3.32/kWh for 2003-04, escalating 2% per annum till it is 3.92/kWh, after which it is constant thereafter at 3.92/kWh till 20th year.
4. **Operating and Maintenance (O&M) costs** – considered as per purchase orders to the technology suppliers Enercon and Suzlon
5. **Tax Benefits**: As per The Income Tax Act of Government of India *"the depreciation allowance as percentage of written down value for wind mills and any specially designed devices which run on wind mills is 80%"*. Hence 80 % depreciation is claimed by each project proponent with respect to WDV (written down value) method. Further, as per the Income Tax Act under section 80 IA the wind projects have a tax holiday of 10 years which can be availed during the first 15 years of operation. However the Minimum Alternate Tax will be applicable for the project activity.
6. **Book Depreciation**: 5.28% as per the Schedule XIV of Comp Act, 1956, item II (b)
7. **MAT & Regular Tax**: 7.88% and 35.88% as per the financial budget of India

The investment analysis for project proponent is provided in the table below:

Sl. No	Company	Wind Farm Capacity	Project IRR without GHG Benefits	Benchmark (Based on RBI BPLR for the year 2003-04)	Assessment
1	Yamuna Power & Infrastructure Ltd.	2.45 MW	9.59%	10.5%[12]	Project IRRs are lesser than the Benchmark/Hurdle Rate of investment

It is evident from the above tables that the project IRR for the wind project was less than the hurdle or "Benchmark". However, consideration of the potential revenue through carbon credits would improve the returns.

Sensitivity analysis:
A sensitivity analysis was conducted on the financial indicator.
Choice of parameter for variation:
Tariff for the crediting period is fixed and project cost considered is based on actual, hence the only variable is generation. Sensitivity analysis has been done for all the WTGs by +5% and +10% change in generation. Please refer the table below for the results:

Ownership	Bench-mark	Project IRR at base PLF	Project IRR with PLF avg. +5%	Project IRR with PLF avg. +10%	Remarks
Yamuna Power & Infrastructure Ltd.	**10.5%**	9.59%	10.45%	11.29%	Though, the IRR has crossed the benchmark at +10% PLF, however this is less likely as prevailing PLF at site is lower

[11] Jaipur Vidyut Vitaran Nigam refered to as Jaipur Discom/RVPN
[12] http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/40728.pdf

Based on the additionality tool for investment analysis and after comparing the Project IRR with the benchmark and further performing the sensitivity analysis, it is clear that the project is not financially viable and hence the project is additional and not the baseline scenario. Further, upon considering the benefits from VCS, the risks related to the operating of the wind project can be partially mitigated.

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:

As all the monitoring methodologies under CDM (Clean Development Mechanism) are approved under VCS 2007.1[13], same has been applied to determine the project's baseline scenario emission levels and the process to monitor emission reductions.

Type	:	I – Renewable Energy Projects
Project Category	:	I.D. – Grid connected renewable electricity generation (Version 14: EB 48)

Reference: Appendix B of the simplified modalities and procedures for small-scale CDM project activities i.e. 'indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories' Version- 10.

PD also refers to:-

Tool to calculate the emission factor for an electricity system (Version 01.1, EB 35)

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

- *Purpose of monitoring:*

The project activity is operated and managed by the project proponent with the help of site incharge (personal from the project proponent) and site O & M contractor (personal from the wind turbine manufacturer). The purpose of monitoring is accurate measurement of the net electricity exported to the grid from the project activity and subsequently data interpretation techniques for monitoring and verification of GHG emissions with specific focus on technical / efficiency / performance parameters. The project activity essentially involves generation of electricity from wind energy and therefore the electricity generation measurements are required by the utility and the investors to assess electricity sales revenue.

- *Types of data and information to be reported, including units of measurement:*

The monitoring plan is being devised as per approved methodology AMS 1D (Version 14), Para 16 and the 'Tool to calculate the emission factor for an electricity system (Version 01.1, EB 35). The referred necessitate monitoring of the following parameters:

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

- Electricity generation from the proposed project activity, in MWh/year. Kindly refer section 3.3.

Note: The simple OM emission factor and BM have been calculated ex-ante therefore not required to be monitored. The project activity does not have any project activity emissions and leakages as discussed in section 4.3 hence it is not required to be monitored.

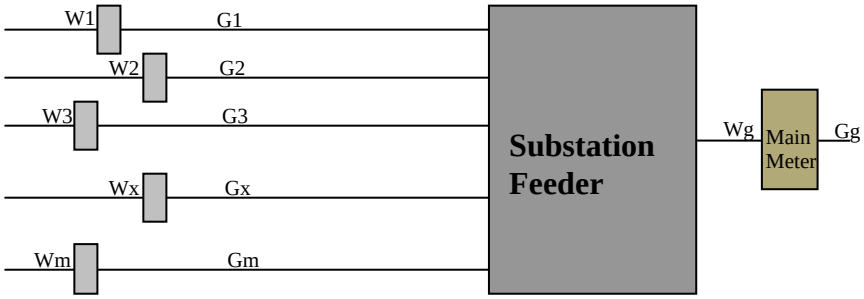
- *Origin of the data*

Please refer to the "Section 3.3: Data and parameters monitored" of the VCS PD.

- *Monitoring, including estimation, modelling, measurement or calculation approaches*

The mechanism of billing calculation form each of the WTGs is carried out based on the net energy exported to the grid as reflected in the main energy installed as substation and the individual SCS/LCS Controller (attached to the individual wind mill) by apportioning of electricity, as described below:

Each substation is connected to numbers of wind turbines. The generation reading is collectively displayed by the main energy meter. The net electricity generation of each of the wind turbines is then calculated in the following manner:



In the figure G1, G2, G3, Gx ….Gm are the generation from individual machines (WTGs) and W1,W2,W3, Wx …. Wm are the WTGs installed at the site connected to one substation feeder.

The sum of generation of all the wind turbines connected to a particular substation feeder is Gg

$$i.e.\ (G1+G2+G3+Gx+\ldots+Gm) = Gn$$

The reading at the substation will be considered as net generation exported to Grid, i.e. Gg

Gg > Gn as some transmission loss takes place on the way to the substation.

Thus difference is, Gg-Gn >0

The total proportional transmission loss for all the turbines is

$$\frac{Gg - Gn}{Gg} = X \text{ (say)}$$

This transmission loss is distributed amongst the entire wind turbine in proportion to their generation as shown below:

$$G1 \times (1- X) = B1 \text{ (say)}$$

Here B1 is the actual bill amount raised by WEG 1 after consideration of the transmission losses.

Similarly the bill amount generation is calculated for all the WEG attached to the single substation.

The bill (invoice) amount electricity is the most conservative of the net electricity generated by a wind mill and therefore this value has been considered for the calculation of Baseline Emissions for each WTG.

For detailed GHG emission reduction procedures and sample calculation tables, please refer to the sections 4.2, 4.3 and 4.4 of the VCS PD.

- *Monitoring times and periods, considering the needs of intended users*

Monitoring will be done on yearly basis for entire crediting period. Please refer to the "Section 3.3: Data and parameters monitored" of the VCS PD.

- *Monitoring roles and responsibilities*

The project participant has signed an operation and maintenance agreement with the supplier of the wind turbines i.e. Suzlon and Enercon respectively. The performance of the turbines, safety in operation and scheduled /breakdown maintenances is responsibility of the respective facility provider and are organized and monitored by these companies.

Various activities carried out by the Operations and Maintenance team is as follows:

(i) <u>Project Monitoring:</u>

- Data logging in for gross power generation, grid availability, machine availability.
- Taking monthly meter reading jointly with RVPN for the WTGs in Rajasthan, of power generated at the wind plant and supplied to the Grid from the meter/s maintained by RVPN for the purpose and coordinate to obtain necessary power credit report/ certificate.
- Preparation and submission of monthly performance report in agreed format.
- Sending the detailed daily and monthly reports for power generation to all the individual project proponent.
- Storage of recorded data and making it available until two years after the last issuance of credits for the Project

(ii) <u>Routine & Breakdown Maintenance:</u>

The O & M contractor (Suzlon / Enercon) is responsible for periodic preventive maintenance and upkeeping the equipment including periodic replacement of consumables. The repairs and maintenance of the Equipment to be performed in the event of any breakdown or suspected breakdown due to operational reasons in the Equipment or any part thereof. The breakdown shall be attended as soon as practically possible to put the Equipment back into operation.

(ii) Technical Services:

- Visual inspection of the WTG and all parts thereof.
- Technical Assistance including checking of various technical, safety and operational parameters of the Equipment, trouble shooting and relevant technical services.
- Calibration of Meters on regular basis.

(iii) Security Services:

This service includes watch and ward and Security of the Wind Farm and the Equipment.

The project promoter has assigned responsibilities to the respective personnel for overall supervision of the project performance to the contact details given below:

Sl. No.	Company	Name of the person and contact details
1	Yamuna Power & Infrastructure Ltd.	Mr.G S Chawla Technical Advisor Mobile : 9810530109 Email Id:gschawla@yamunapower.com

The assigned personal will take care of the overall supervision of the project performance including the following:

- Performance review of the WEG installations
- Monitoring & liaison with the state electricity utility
- Arranging for annual verification of the installations for issuance of CERs

- *Managing data quality*

Measures to insure the Accuracy of Results

Main meter: The calibration of the meters (and the check meter) is carried out by RVPNL once in a year. a check meter is also provided along with the main meter. The reading of both the meters is matched every month to ensure accuracy of the meters. In the event mal function of main meter, check meter reading is used during the period.

WEG Controller/SCS (LCS) Controller: It is a micro-processor based intelligent controller which has been specially designed for control of wind turbines. It uses a Woodward Multi function Relay that has three current inputs from CT and three direct voltage inputs (690 Volts). The analog values of current/voltage are converted into digital signal internally using A/D Converters at very high sampling rate. A software program reads these values and displays instantaneous parameters such as voltage, current, power factor, kVAh, kVArh and kWh. These instantaneous values are then time integrated and displayed/stored.

Please refer to the “Section 3.4: Description of the Monitoring Plan” of the VCS PD.

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

The following parameters would be monitored as mentioned in the tables presented below. For details of calculation procedures and sample calculation tables, please refer to the Sections 4.2 and 4.3 of the VCS PD.

Data / Parameter:	EG_y
Data unit:	MWh /Year
Description:	Net electricity supplied by individual WTGs included in the project activity.
Source of data to be used:	Metered net electricity supplied by the project activity as reported in the monthly joint meter reading issued by RVNPL.
Value of data applied for the purpose of calculating expected emission reductions	4560 MWh
Description of measurement methods and procedures to be applied:	The data is calculated using the Joint Energy Meters (Tri vector meter of accuracy class 0.2) installed at the substation, together with controller meter reading at the WTGs. The joint energy meter (Main Meters and check meters) are two-way meters where RVNPL officials take the readings (joint meter reading) on monthly basis. The joint energy metering reading report is issued by RVNPL together with the O & M personnel. This reading is used to estimate the net power exported to the grid. The energy generated from individual WTGs is monitored continuously through SCS/LCS Controller. The net electricity exported to the grid by individual WTGs is calculated based on the appropriation of electricity as mentioned in section 3.4.
QA/QC procedures to be applied:	The main energy meters and the check meter are calibrated once in a year to maintain the accuracy. In case of failure of main meters, check meters installed with the main meter used to record the generation. The WTG SCS/LCS Controller is micro-processor based. The measurement accuracy of the controller is 0.5% and these readings are highly accurate and reliable.
Any comment:	$EG_{BL,y}$ would be monitored separately for each WTG included in this project. The relevant data will be recorded in electronic form and the same along with the electricity bills will be archived for two years beyond the crediting period.

The Grid Emission Factor will be applied during ex-ante throughout the crediting period.

3.4 Description of the monitoring plan

- Enercon India Ltd. and Suzlon Energy Ltd. are responsible for monitoring of the electricity generation at the wind mill. Both have qualified site personnel to ensure constant and reliable monitoring of the installed wind turbines.
- The proposed project activity requires evacuation facilities for sale to grid and the evacuation facility is essentially maintained by the state power utility (RVPNL).
- The project activity consists of two parallel measurements, one at the main meter installed at the substation and another at each WTG.
- The joint meter reading of the electricity fed to the state utility grid is carried out jointly at the incoming feeder of the state power utility every month in presence of

both parties (the developer's representative and officials of the state power utility) through the main meter. Both parties sign the recorded readings.

- The reading at each WTG is carried out through an integrated electronic meter (SCS/LCS Controller) which measure the gross electricity generated by each WTG. These meters are connected to the Central Monitoring Station (CMS) of the entire wind farm through a wireless Radio Frequency (RF) network. The generation data of individual machine can be monitored as a real-time entity at CMS. The snapshot of generation on the last day of every calendar month will be kept as a record both in electronic as well as printed (paper) form.
- The difference in the net electricity exported to the grid and total of gross electricity generated by all the wind mills is measured as transmission loss. These losses are estimated by the O and M contractor which are further approved by the RVPNL. This transmission loss is equally distributed to each of the wind mill associated to the grid based on the gross power generated by the each wind mill.
- Based on the above data, the net electricity exported to the grid by each of the wind mill is calculated and accordingly invoices are raised by the project proponent against the net electricity generated and exported by individual machines. This is described in section 3.2 above.
- The entire monitoring is done in very transparent manner. As an emergency preparedness plan, check meter are installed along with the main meters to record the data in case of any malfunctioning of the main meter.
- To ensure the reliability & accuracy of the data, the energy meters (main and check) are calibrated at least once in a year and the accuracy class of the energy meters is maintained.

For detailed roles and responsibilities of relevant personnel involved in the monitoring of the project activity, please refer to Annexure-1 of the VCS PD.

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

The following Approved Small Scale Methodology has been followed for the project activity under consideration:

Title of Approved Methodology: **'**Grid Connected Renewable Electricity Generation'
Reference of the Approved Methodology: Category I.D - Renewable Energy Projects: Approved Small Scale Methodology AMS –I.D. / Version 14

For further details regarding the applicability criteria pertaining to the above-Methodology in the context of the project activity, please refer to section 2.2 of the VCS PD.

For the project activity under consideration, the baseline is given by paragraph 9 of the methodology AMS-I.D. / Version 14 as follows:

"the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/kWh) calculated in a transparent and conservative manner as:
(a) A combined margin (CM) [14], consisting of the combination of operating margin (OM) [15] and build margin (BM)[16] according to the procedures prescribed in the 'Tool to calculate the

[14] The project activity will have an effect on the both the operating margin and build margin.
[15] Present power generation sources of the grid, weighted according to their actual participation in the grid mix (all generating sources participating in the grid except hydro, geothermal, wind, low cost biomass, nuclear, and solar power)

emission factor for an electricity system'. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM calculations must be considered. OR
(b) The weighted average emissions (in kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.
Calculations must be based on data from an official source (where available) and made publicly available."

Accordingly, referring the "Tool to calculate the emission factor for an electricity system (Ver 01.1)" the calculation of the GHG emission reductions by the project activity is calculated as per the steps below. The grid emission factors[17] calculated by the Central Energy Authority of India (Ver 04, Sep 2008) and prepared as determined in "Tool to calculate the emission factor for an electricity system (Version 01.1)" are used to calculate the baseline emissions from grid electricity generation.

Emission coefficient for the grid electricity is calculated as Combined Margin (CM) which is the combination of Operation Margin (OM) and Build Margin (BM) factors according to the following six steps:

Step 1: Identification of the relevant electric power system:

Central Electricity Authority (CEA), Ministry of Power, Government of India (Host Country) has given the delineations of the project electricity system and the connected electricity system in India, (as shown in table below). As per CEA (Ver 04, Sep 2008) the Indian power system is divided two Grid systems i.e. Integrated NEWNE (Northern, Eastern, Western and North Eastern) Grid and Southern Grid of India.

Therefore the Indian power system is divided into two grids, namely NEWNE and Southern Grid. The geographical scope of each grid is as follows:

Geographical Scope of five regional grids:

NEWNE GRID				SOUTHERN GRID
Northern	**Western**	**North-Eastern**	**Eastern**	**Southern**
Chandigarh	Chhattisgarh	Arunachal Pradesh	Bihar	Andhra Pradesh
Delhi	Gujarat	Assam	Jharkhand	Karnataka
Haryana	Daman & Diu	Manipur	Orissa	Kerala
Himachal Pradesh	Dadar & Nagar Haveli	Meghalaya	West Bengal	Tamil Nadu
Jammu &Kashmir	Madhya Pradesh	Mizoram	Sikkim	Pondicherry
Punjab	Maharashtra	Nagaland	Andaman-Nicobar	Lakshadweep
Rajasthan	Goa	Tripura		
Utter Pradesh				
Uttaranchal				

As per the delineation given by CEA, Rajasthan State falls in NEWNE Grid of India.

Step 2: Selection of an Operating Margin (OM) method

[16] Weighted average emissions of recent capacity additions (most recent 20% or the 5 most recent plants)

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

For calculation of operating margin four options are available:
(a) Simple operating margin;
(b) Simple adjusted operating margin;
(c) Dispatch data analysis operating margin;
(d) Average operating margin

CO_2 Baseline Database Version 4, Date – October 2008, published by Central Electricity Authority (hereafter CEA Database) has been referred for the values of OM. As per the *"Tool to calculate the emission factor for an electricity system"* (Version 01.1, EB 35), any of the four methods can be used, however, the simple OM method can be used only if the low-cost/must run resources constitute less than 50% of the total grid generation in: 1) average of the three most recent years, or 2) based on long term averages for hydroelectricity production.

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)

	2005-06	2006-07	2007-08
NEW NE	**18.0%**	**18.5%**	**19.0%**
South	**27.0%**	**28.3%**	**27.1%**
India	**20.1%**	**20.9%**	**21.0%**
Average for 3 years for NEWNE region			**18.5%**

(Source :CEA Baseline Database, Version 4)

In NEWNE Grid, the low-cost/must run resources constitute only 18.5 % (as demonstrated above) of the total grid generation in average of the three most recent years, hence simple OM has been opted for.

Step 3: Calculation of operating margin emission factor ($EF_{grid,OM,y}$) for the region based on simple OM

OM (Simple OM) values have been taken from CEA Database as discussed above. The *"Tool to calculate the emission factor for an electricity system"* (Version 01.1, EB 35) has been used in the CEA Baseline Database for the calculation of operating margin.

Simple Operating Margin emission factor (NEWNE Region) in tCO2/GWh (incl. imports)	
Year	**Simple OM (WR)**
2005-2006	**1019 (~1019.4)**
2006-2007	**1008 (~1008.3)**
2007-2008	**999 (~999.51)**
Average of 3 years	**1009 (~1009.003)**

Reference- CEA Baseline Database, Version 4

As per the *"Tool to calculate the emission factor for an electricity system"* (Version 01.1, EB 35), the calculation of OM has been done *ex ante* based on the most recent 3 years for which data is available at the time of PD submission.

Step 4: Identification of the cohort of power units to be included in Build Margin (BM)

BM calculation is based on 20% most recent capacity additions in the grid based on net generation.

20% of Net Generation (GWh)

	2005-06	2006-07	2007-08
NEWNE	**87,575**	**93,072**	**99,224**
South	**27,666**	**30,441**	**31,463**
India	**115,241**	**123,513**	**130,687**

Reference – CEA Baseline Database, Version 4

Net Generation in Built Margin (GWh)

	2005-06	2006-07	2007-08
NEWNE	**87,764**	**93,524**	**100,707**
South	**28,228**	**30,442**	**31,613**
India	**115,991**	**123,965**	**132,320**

Table reference- CEA Baseline Database, Version 4

Vintage of data is based on option 1 of step 4. (Refer *"Tool to calculate the emission factor for an electricity system"* -Version 01.1, EB 35). BM calculation has been done *ex-ante* and hence BM value will remain fixed and need not be monitored during the crediting period.

Step 5: Calculation of build margin ($EF_{grid,BM,y}$) emission factor for the region (ex ante)

BM values have been taken from CO_2 Baseline Database for the Indian Power Sector, Version 4, October 2008. CO_2 Baseline Database for the Indian Power Sector is published by Central Electricity Authority, Ministry of Power, Govt. of India.

Build Margin emission factor (NEWNE Region) in tCO2/GWh	
Year	**BM**
2007-2008	**598**

Reference- CEA Baseline Database, Version 4

Step 6: Calculation of combined margin (CM) emissions factor or the emission coefficient for the grid electricity ($EF_{grid,CM,y}$):

The combined margin emissions factor is calculated as follows:

$$\mathbf{EF_{grid,CM,y}} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where,

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)

w_{OM} = Weighting of operating margin emissions factor (%)

w_{BM} = Weighting of build margin emissions factor (%)

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

Hence,

$$\mathbf{EF_{grid,CM,y}} = EF_{grid,OM,y} \times 0.75 + EF_{grid,BM,y} \times 0.25$$ **……..Equation I**

= 1009 X 0.75 + 598 X 0.25

= **906 tCO_2/GWh …….** (Refer Baseline calculation Excel Sheet)

The emission reduction factor ($EF_{grid,CM,y}$)has been calculated Ex ante and therefore need not to be monitored during the crediting period.

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

Baseline Emission Calculation:

For all other systems, the baseline (**BE_y**) is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2equ/kWh). Hence baseline emissions from the project are estimated as under:

$BE_y = EG_y$ x $EF_{grid,CM,y}$ ……..Equation II

Where,

BE_y = kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2equ/kWh)

EG_y = Net quantity of electricity supplied to the manufacturing facility by the project during the year y in MWh, and

$EF_{grid,CM,y}$ = Grid emission coefficient for the electricity displaced due to the project activity during the year y (tCO_2/MWh).

Site	Jaisalmer, Rajasthan	
Installed capacity of turbine (MW)	2.45	As per commissioning certificates
Transmission loss	5%	Grid availability and Transmission Losses
PLF	22.37%	As per RERC Wind Tariff Order, April 2003
Net Electricity Generation MWh/Yr	4560	

The project will provide a gross power output of 4560 MWh/Yr estimated as below

BE_y = 4,560 MWh/ Yr X 0.906 tCO_2 / MWh

= 4133 tCO_2 / Year

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

The Methodology is applied in the context of the project activity in order to calculate the project emissions and leakages as follows:

Project Emissions:
As the project activity is a wind power project, there are no anthropogenic emissions by sources of GHGs within the project boundary as a result of the project activity. Hence there are no project emissions to be considered.

$PE_y = 0$ **……..Equation III**

Leakage Emissions:
There are no anthropogenic emissions identified by sources outside the project boundary due to the project activity. Furthermore, the equipments (WTGs) used by the project activity are newly procured and hence not transferred from another project. Thus, there are no leakage emissions attributable to the project activity.

$L_y = 0$ **……..Equation IV**

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

Emission Reduction (ER_y):

The emission reduction ER_y by the project activity during a given year y is the difference between the baseline emissions through substitution of electricity generation with fossil fuels (BE_y) and project emissions (PE_y)

$ER_y = BE_{electricity, y} - PE_y - L_y$ ……..Equation V

Where:

ER_y = emission reductions of the project activity during the year y in tons of CO_2.
BE_y = baseline emissions due to displacement of electricity during the year y in tons of CO_2
PE_y = project emissions during the year y in tons of CO_2
L_y = Leakages from the project activity during the year y in tons of CO_2

Thus, $ER_y = BE_y – PE_y - L_y$

= 4133– 0-0

ER_y = 4,133 tCO2/y

Accordingly, the year wise emission reduction for Ist crediting Period is given in table below:

Years	Estimation of project activity Emissions (tonnes of CO_2e)	Estimation of baseline Emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions in tonnes of CO_2e
2006-2007	0	4133	0	4133
2007-2008	0	4133	0	4133
2008-2009	0	4133	0	4133
2009-2010	0	4133	0	4133
2010-2011	0	4133	0	4133
2011-2012	0	4133	0	4133
2012-2013	0	4133	0	4133
2013-2014	0	4133	0	4133
2014-2015	0	4133	0	4133
2015-2016	0	4133	0	4133
Total (tones of CO2 e)	0	41330	0	41330

5 Environmental Impact:

As per Ministry of Environment and Forest Notification dated 27th January 1994 (Para 3) followed by its amendment dated 13th June 2002 (clause ii), the implementation of the wind farm does not require an environmental impact assessment. Also, as per Ministry of Environment and Forests (MoEF), Government of India the amended notification dated September 14, 2006[18] regarding the requirement of Environment Impact Assessment (EIA) studies as per the Environment Protection Rule, 1986 (Published in the Gazette of India, Extraordinary, Part-II, and Section 3, Sub-section (ii) Ministry of Environment and Forests) states that any project developer in India needs to file an application to MoEF (including a public hearing and an EIA) in case the proposed industry or project is listed in a predefined list. The wind farms are not included in this list. Therefore the project activity does not require an EIA study to be carried out.

The project activity does not involve any major construction activity. It primarily requires the installation of the Wind Electric Generators, interfacing the generators with the State Electricity Board by setting up HT transmission lines and installation of other accessories. However, there are no negative impacts on air, water; soil quality and ambience are envisaged due to the project activity

6 Stakeholders comments:

The stakeholder Meeting for the project activity was conducted on 11th May, 2009 at Soda Mada village in Jaisalmer, Rajasthan. The stakeholders were invited via public notice, news paper advertisement and personal invitations.

The following stakeholders attended the meeting:

- Elected body of representatives administering the local area (village Panchayat) and the local residents
- Non Governmental Organization
- Facility developer and operators
- Consultants

A scanned copy of the attendance sheet is attached in the Annex-II.

The agenda of the meeting was as follows:

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

Mr. Gaurav Jain and Dr. Shitole, representative of M/s Suzlon Energy Ltd, welcomed the stakeholders and project proponent to the Stakeholder Consultation Meeting. Mr. Jain enumerated the benefits of the wind power project. Later, a brief explanation was made how carbon levels are increasing in the atmosphere, the effects of global warming how the wind project will help in reduction of carbon levels. The benefits of carbon credits in encourage such projects was also discussed used. It was also made understood that wind power project will help in creating employment opportunities to the local villages.

[18] http://envfor.nic.in/divisions/iass/notif/eia.htm

It was further discussed that the project activity has been installed after receiving the necessary consent and entering into power purchase agreement with RVPNL as per the state electricity policy of RERC (Rajasthan Electricity Regulatory Commission) for implementation of wind electric generators. The final outcome of the procedure resulted in the following licences & permissions:

- Permission to commission / implement the project
- Power Purchase Agreements between the electricity utility & project proponent and No Objection Certificate
- Commissioning & Grid Synchronization Certificates

The stakeholders also shared their views on the project activity. Issues raised by some of the local residents were clarified.

Summary of comments received:

No negative comments were received in context of the project. The stakeholders support the project as they believe the project is environmentally sound and it has lead to an overall development of the area by:

- Generation of additional revenue generated thro' land / lease to outsiders like contractors & their employees.
- Generation of job opportunities for day -to - day maintenance and security of WTGs
- Development of roads, etc.

Documents related to the stakeholder meeting as invitation letters, Minutes of meeting, Meeting photographs, comments from stakeholders, attendance sheet etc. would be provided to the validator.

7 Schedule:

Sl. No.	Activity	Date
1	VCS Project Start Date	03/03/04
2	Stakeholder Consultation	11/05/09
3	Appointment of Validation Agency for Validation/Verification	10/11/2008
4	Life time of WTGs	20 years
5	Crediting period under VCS	10 years Start Date: 28/03/2006 End Date 27/03/2016
6	Frequency of monitoring	Continuous (meter readings aggregated monthly)

8 Ownership:

8.1 Proof of Title:

The requirements of the VCS Project Document pertaining to this section have been addressed as follows:

- *Ownership of the plant, equipment and/or process generating the reductions/removals*

The ownership of the project promoter of the wind-farms and the WTGs can be established by means of the following documents:

- Purchase Orders for the WTGs and other auxiliary equipments
- Power Purchase Agreements with the State Electricity Boards for sale of electricity generated by each WTG involved in the project activity.
- Commissioning certificates for each of the WTGs

- *A contractual arrangement with the owner of the plant, equipment or process that grants all reductions/removals to the proponent*

The project promoter has undertaken the responsibility of accruing and handling the GHG emission reductions for the WTGs therefore the contractual agreement is not applicable.

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

The requirements of the VCS Project Document pertaining to this section have been addressed as follows:

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;*

The host country of the project activity under consideration, *i.e.*, India is a non Annex-I, or, a developing nation as recognised by the Kyoto Protocol. Hence, there are no GHG emission reduction targets or commitments for India and it does not fall under the purview of any compliance driven Emission Trading Programs. Furthermore, there are also no such voluntary emission trading programs similar to the VCS existent in the country. This confirms there are no emissions trading programs prevalent in the host country of the project activity under consideration, *i.e.*, India at the time of preparation of the VCS PD. Therefore, it is not applicable for the project activity.

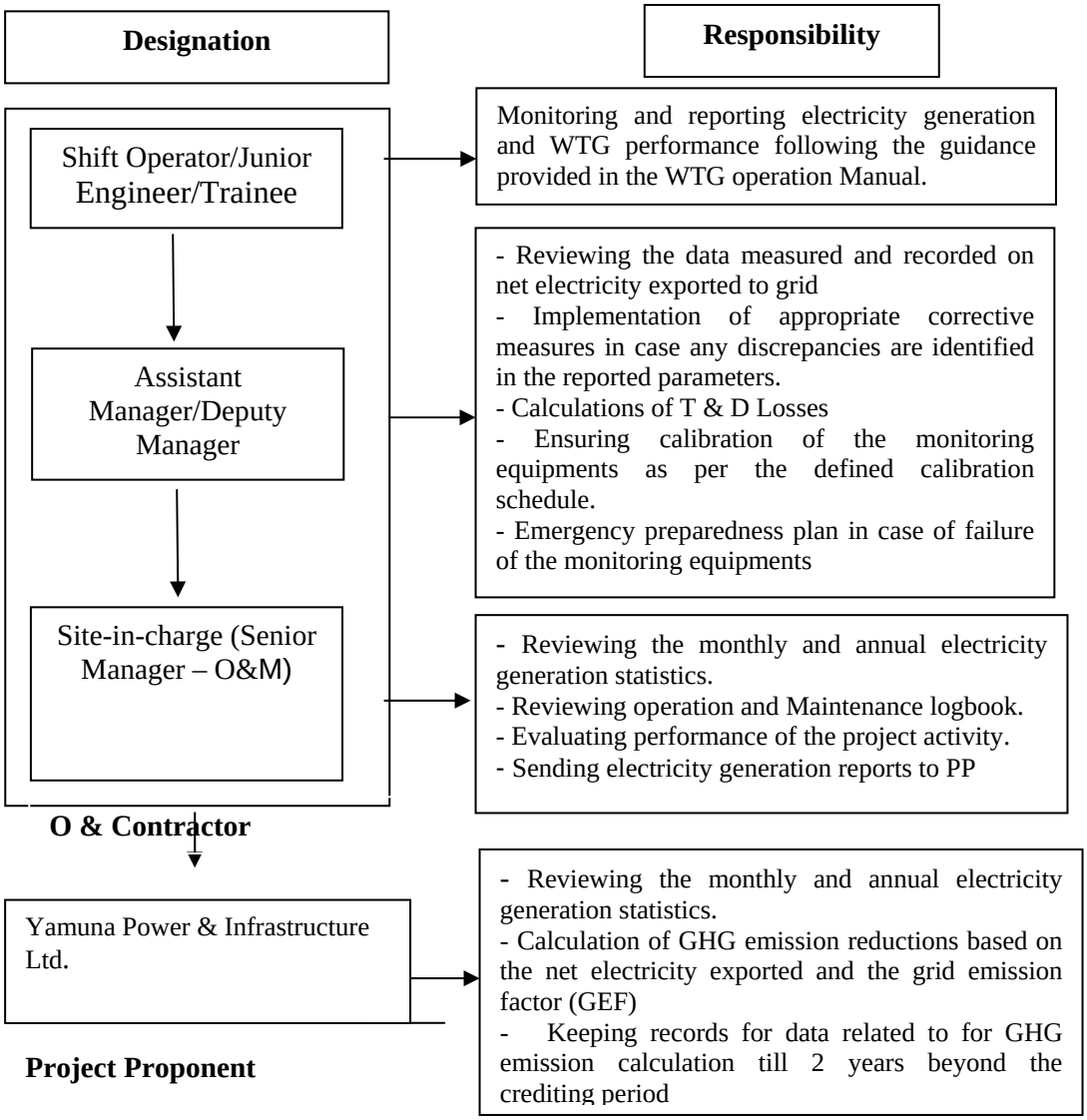
Shall provide evidence that the reductions or removals generated by the project have or will not be used in the Program or jurisdiction for the purpose of demonstrating compliance. The evidence could include:

- *a letter from the Program operator or designated national authority that emissions allowances (or other GHG credits used in the Program) equivalent to the reductions/removals generated by the project have been cancelled from the Program; or national cap as applicable or;*
- *Purchase and cancellation of GHG allowances equivalent to the reductions/removals generated by the project related to the Program or national cap.*

The host country of the project activity, India being a non Annex-I nation under the Kyoto Protocol, there are no GHG emission reduction targets or commitments for India. This confirms there are no national caps on GHG emissions prevalent in India at the time of preparation of the VCS PD. Therefore, it is not applicable for the project activity.

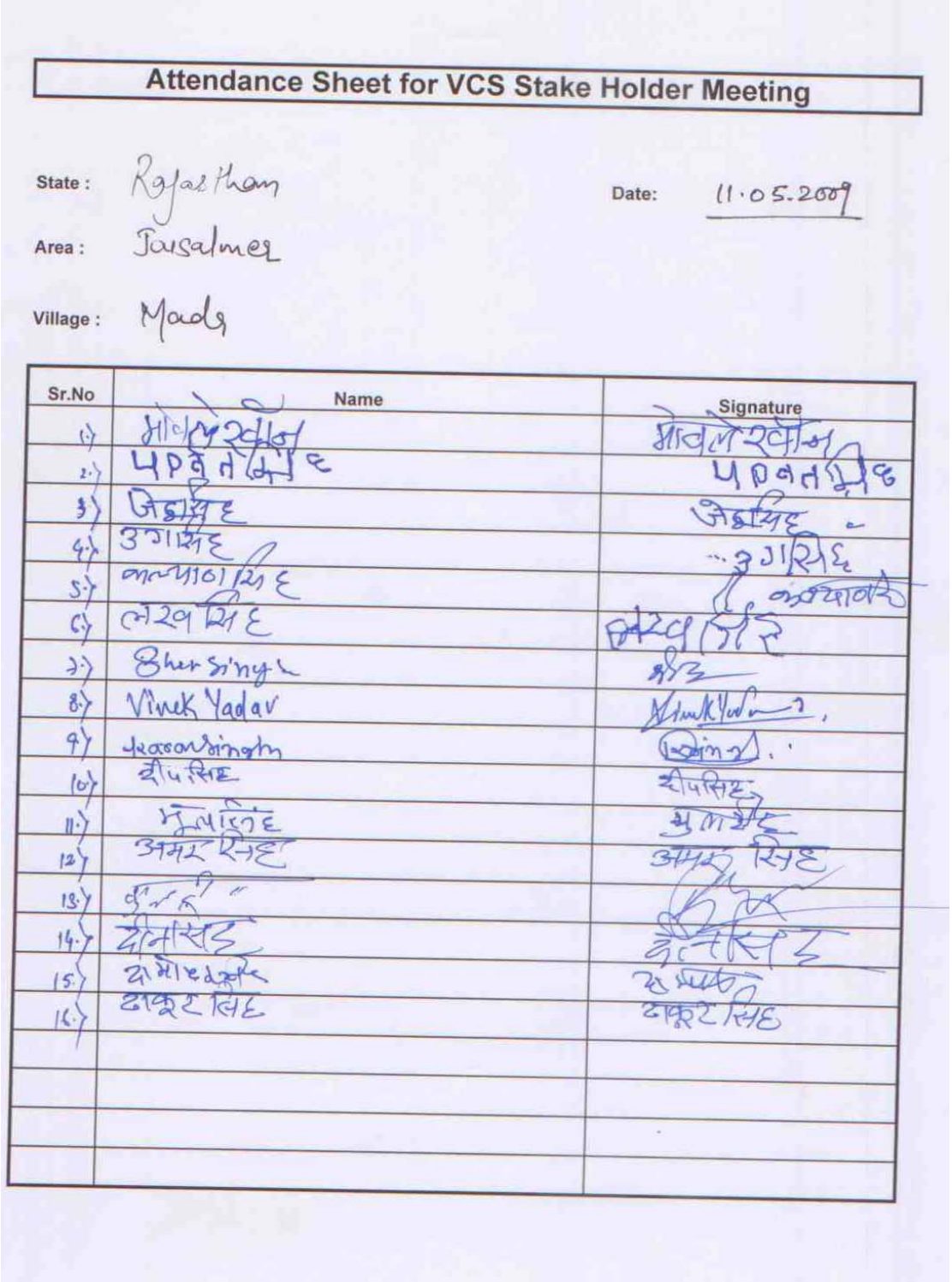
Annex 1

Roles and responsibilities for Monitoring



ANNEX-II

(Attendance sheet for stakeholder Meeting for the project activity was conducted on 11th May 2009 at Soda Mada village in Jaisalmer, Rajasthan)



Attendance Sheet for VCS Stake Holder Meeting

State : Rajasthan Date: 11.05.2009

Area : Jaisalmer

Village : Mada

Sr.No	Name	Signature
1.)	भोपालसिंह	भोपालसिंह
2.)	UPवतसिंह	UPवतसिंह
3.)	जेठूसिंह	जेठूसिंह
4.)	उगमसिंह	उगमसिंह
5.)	कल्याणसिंह	कल्याणसिंह
6.)	लेखूसिंह	लेखूसिंह
7.)	Sher Singh	
8.)	Vivek Yadav	Vivek Yadav
9.)	Jaswantsingh	
10.)	दीपसिंह	दीपसिंह
11.)	भूपसिंह	भूपसिंह
12.)	अमरसिंह	अमरसिंह
13.)		
14.)	दीपसिंह	दीपसिंह
15.)	दामोदरसिंह	दामोदरसिंह
16.)	ठाकूरसिंह	ठाकूरसिंह

Attendance Sheet for VCS Stake Holder Meeting

State : Rajasthan Date: 11.05.09

Area : Jaisalmer

Village : Mado

Sr.No	Name	Signature
1	Deepak Pundlik (MITCON CSL)	DS Pundlik.
2	Surendra Kumar Sethi (R.C.P.L)	
3.	Himmat Bareeya (NCCL-Udaipur)	
4	Radhe Shyam Rathi (Rajasthan Cement Ltd)	
5	AKSHAY VYAS (SEL)	Akshay Vyas.
6.	Gaurav Jain	
7)	Dr. Rajendra Shirke (SIFL)	
8.	Dr Vinod Mehra (SISL)	