



22.5 MW WINDPOWER PROJECT BY RUCHI SOYA INDUSTRIES LIMITED AT PALSODI, DISTRICT – RATLAM, MADHYA PRADESH



Document Prepared by EKI Energy Services Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project activity is promoted by Ruchi Soya Industries Limited (RSIL) involving supply, erection, commissioning and operation of 15 x 1.5 MW rated Wind Turbine Generators (WTGs), Make – Suzlon, Model S-82. The total installed capacity is 22.5MW. The generated electricity from the project activity is being sold to Madhya Pradesh State PashchimKshetraVidyutVitaran Company Limited (MPPKVCL), a company of Madhya Pradesh State Electricity Board (MPSEB). The electricity is being supplied to the NEWNE grid(now a part of Unified Indian Grid)at 132 kVA substation at Sailana (Ratlam) for selling to MPPKVCL. All WTGs are located on the site - “hills of Palsodi village of District Ratlam, Madhya Pradesh, India” where no renewable power plant was operated prior to the implementation of the project activity.

The following table shows the details of the installed Wind Turbine Generators (WTGs) of the project activity:

Project Participant	Make/ Model	Rated Capacity (MW)	Date of Commissioning	No. of WTGs	Total Capacity (MW)
Ruchi Soya Industries Limited	Suzlon/ S-82	1.5	29-February-2008	5	7.50
			29-March-2008	7	10.50
			30-May-2008	3	4.50
Total					22.5

The purpose of the project activity is to utilize renewable wind energy for generation of the electricity and to sell the generated electricity to Madhya Pradesh State PashchimKshetraVidyutVitaran Company Limited connected with the NEWNE grid (now a part of Unified Indian Grid) comprising mainly fossil fuel-based power plants.

The project activity involves the use of wind energy which is a renewable resource of electricity generation and supplies electricity to the NEWNE grid (now a part of Unified Indian Grid). The electricity generation from wind energy does not cause emissions of greenhouse gases whereas grid electricity is mostly generated from fossil fuels (i.e. coal) that are highly carbon intensive and cause GHG emissions. During the Current Monitoring Period from 10-January-2011 to 28-February-2018 (Inclusive of both the dates) the project activity has supplied 323,354.961 MWh of electricity, and thus contributing to the GHG reductions 298,285 tCO₂e.

1.2 Sectoral Scope and Project Type

The project activity falls into Sectoral Category 1, Energy industries (renewable- /nonrenewable 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 Project Proponent

Organization name	Ruchi Soya Industries Ltd.
Contact person	Mr. Vinay Shah
Title	Vice President (Banking)
Address	7/5 South Tukoganj, NathMandir road, 301, Mahakosh House, Indore, Madhya Pradesh
Telephone	+91-731-4289086
Email	manish@enkingint.org

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Project Consultant
Contact person	Bibhushita Ghose
Title	Assistant Manager - Operations
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Telephone	+91-731-4289086
Email	manish@enkingint.org

1.5 Project Start Date

Start date of the project activity is the earliest date of interconnection with the grid i.e. 29-February-2008. This is the date of commissioning of first WTG of 22.5 MW Wind Project activity by Ruchi Soya Industries Limited (RSIL).

1.6 Project Crediting Period

Crediting Period Start date: 29-February-2008

Crediting Period End date: 28-February-2018

The project activity adopts fixed crediting period of 10 years period.

1.7 Project Location

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

Table: Location details of all installed WTGs

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

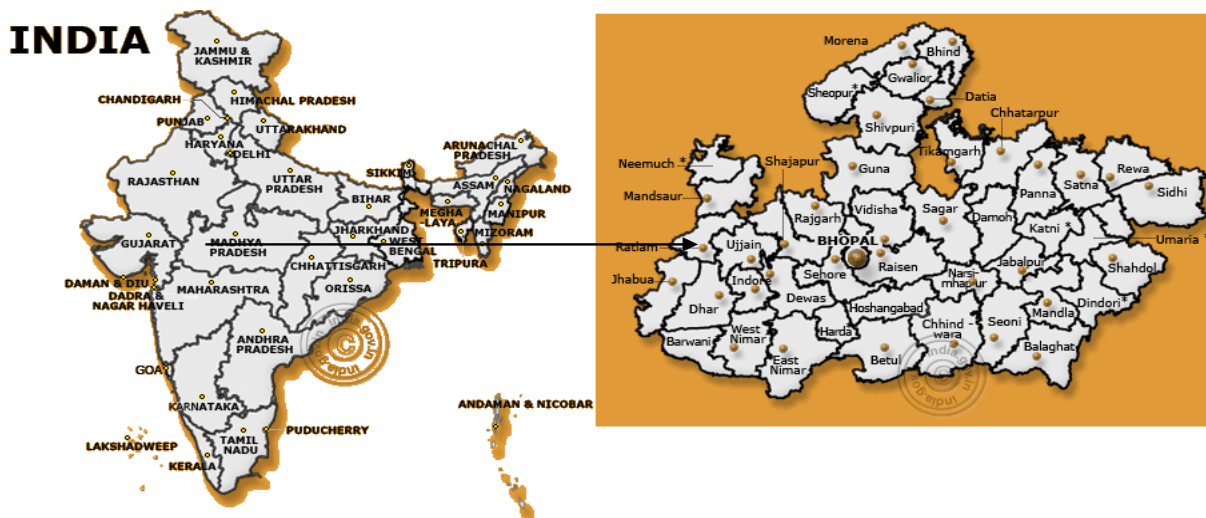


Figure 1: Maps showing location of the project activity

1.8 Title and Reference of Methodology

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: ACM0002¹; Version 10

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

1. “Toolforthedemonstrationandassessmentofadditionality”;Version:05.2(EB39)<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf>
2. “Toolto calculatethe emissionfactorforanelectricitysystem”;Version:01.1(EB35).<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.1.pdf>

1.9 Participation under other GHG Programs

The project activity has already been registered with UNFCCC for CDM on 10-January-2011 with Ref. No. 3996².

¹<https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG>

²<https://cdm.unfccc.int/Projects/DB/RWTUV1285157251.43/view>

1.10 Other Forms of Credit

The Project has no intend to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

1.11 Sustainable Development

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.

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 healthawareness 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, primaryeducation etc., to the local community at project site, which would not happen if theproject activity was not taken up, leading to improvement in living standards. Theproject activity also contributes in infrastructure development by improving theavailability of the electricity to the grid. Developer in association with NGO/self helpgroups is implementing sustainability program by implementing plantation, waterconservation and self-health awareness program.

Economic well being

The wind farms need large area of land. As project Participant / wind energy developerprocured land on lease from Department of Forests, M.P., the cost of land of surroundingareas appreciated benefiting the local landowners directly. These lands generallycommand low prices because most of the land is unfertile. But due to the land demand forwind 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 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.

2 SAFEGUARDS

2.1 No Net Harm

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 of Environment, Forest and Climate Change (MoEFCC), Government of India on September 14, 2006³, thirty-nine activities are required to undertake environmental impact assessment studies. This 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.

³<http://www.environmentwb.gov.in/pdf/EIA%20Notification,%202006.pdf>

During operation phase

Impact on Air

There are absolutely no negative impacts on air due to the project activity, as it doesn't 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.

2.2 Local Stakeholder Consultation

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
- 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), exsarpanch (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.

2.3 AFOLU-Specific Safeguards

Not Applicable.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

Project start date 29-February-2008

The project activity started on 29-February-2008 which is the first commissioning date of WTG. In second phase, 7 WTGs were commissioned on 29-March-2008 and in third phase 3 more WTGs were commissioned in 30-May-2008. The plant is now in fully operational. In current monitoring period there is no major breakdown/shutdown of plant occurred in this project activity.

Commissioning dates of all WTGs:

Location No.	Date of Commissioning
P143, P145, P148, P150, P154	29-February-2008
P109, P112, P113, P114, P131, P137, P140	29-March-2008
P101, P104, P107	30-May-2008

3.2 Deviations

3.2.1 Methodology Deviations

There is no deviation in methodology in current monitoring period.

3.2.2 Project Description Deviations

As per the direction of Honorable commission for the electricity in the state of Madhya Pradesh, meter has been changed to move for better accuracy class from 0.5s to 0.2s in 2013. The meter change details has been provided in Appendix I of the Monitoring report.

3.3 Grouped Projects

Not Applicable.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO ₂ /MWh
Description	Operating margin CO ₂ emission factor of NEWNE grid(now a part of Unified Indian Grid) in year y
Source of data	“CO₂ Baseline Database for Indian Power Sector” version 5.0, published by the Central Electricity Authority, Ministry of Power, Government of India. The “CO₂ Baseline Database for Indian Power Sector” is available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value applied	1.004919 tCO ₂ /MWh
Justification of choice of data or description of measurement methods and procedures 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 tool —Tool to calculate the emission factors for an electricity system, published by CDM Executive Board .
Purpose of Data	To calculate combined margin CO ₂ emission factor of NEWNE grid(now a part of Unified Indian Grid).
Comments	It is calculated on <i>ex ante</i> basis and will remain same throughout the crediting period.

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO ₂ /MWh
Description	Build margin CO ₂ emission factor of NEWNE grid(now a part of Unified Indian Grid) in year y
Source of data	“CO₂ Baseline Database for Indian Power Sector” version 5.0, published by the Central Electricity Authority, Ministry of Power, Government of India. The “CO₂ Baseline Database for Indian Power Sector” is available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Value applied	0.675181 tCO ₂ /MWh

Justification of choice of data or description of measurement methods and procedures 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 tool “Tool to calculate the emission factors for an electricity system”, published by CDM Executive Board.
Purpose of Data	To calculate combined margin CO ₂ emission factor of NEWNE grid(now a part of Unified Indian Grid).
Comments	It is calculated on <i>ex ante</i> 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(now a part of Unified Indian 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	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/reports/planning/cdm_co2/cdm_co2.htm
Value applied	0.92248 tCO ₂ /MWh
Justification of choice of data or description of measurement methods and procedures 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”.
Purpose of Data	To calculate baseline emissions.
Comments	It is calculated on <i>ex ante</i> basis and will remain same throughout the crediting period.

4.2 Data and Parameters Monitored

Data / Parameter	EG _{TOTAL,y}
Data unit	

	MWh (Mega-watt hour) As per actual
Description	Total electricity generation by the wind mills during the year y
Source of data	Controller attached with each WTG
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.
Frequency of monitoring/recording	Daily
Value monitored	334,658.493
Monitoring equipment	Controller
QA/QC procedures to be applied	The net electricity recorded at controller can be cross checked with the CMS data.
Purpose of the data	-
Calculation method	Not Applicable
Comments	-The data on the electricity generation is archived electronically. 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 _{export}
Data unit	MWh(Mega-watt hour)-As per VCS-PD
Description	Electricity exported to the grid by the project activity in year y
Source of data	Two Main meters (MPSEB Meters) located at common metering points (one for 8 WTGs at feeder-I and second for 7 WTGs at feeder-III) and owned by MPPKV CO. LTD.
Description of measurement methods and procedures to be applied	The export of electricity is measured continuously by the main meters. Main meters' readings are recorded and verified, once in a month, jointly by the representatives of MPPKV CO. LTD. and the authorized representative of the SISL. Site operators also record main meters readings daily.
Frequency of monitoring/recording	Monthly
Value monitored	324,830.609
Monitoring equipment	Monitoring Equipment: Energy Meters

	Type: two-way tri-vector energy meters Calibration Frequency: Yearly The details of Monitoring meters has been provided in Appendix I of the Monitoring Report.
QA/QC procedures to be applied	With actual load comparing to standard reference meter which itself is 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.
Purpose of the data	To calculate baseline emission.
Calculation method	Not applicable
Comments	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	Two Main meters (MPSEB Meters) located at common metering points (one for 8 WTGs at feeder-I and second for 7 WTGs at feeder-III) and owned by MPPKVV CO. LTD.
Description of measurement methods and procedures to be applied	The import of electricity is measured continuously by the main meters. Main meters' readings are recorded and verified, once in a month, jointly by the representatives of MPPKVV CO. LTD. and the authorized representative of the SISL. Site operators also record main meters readings daily.
Frequency of monitoring/recording	Monthly
Value monitored	1475.647
1475.	Monitoring Equipment: Energy Meters Type: two-way tri-vector energy meters Calibration Frequency: Yearly The details of Monitoring meters has been provided in Appendix I of the Monitoring Report.
QA/QC procedures to be applied	With actual load comparing to standard reference meter which itself is 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.
Purpose of the data	To calculate baseline emission
Calculation method	Not applicable

Comments	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 grid by the project activity in year y
Source of data	Credit reports
Description of measurement methods and procedures to be applied	The data is calculated as $EG_y = EG_{\text{export}} - EG_{\text{import}}$ The export (EG_{export}) and import (EG_{import}) of electricity is measured continuously by the main meters. Main meters' readings are recorded and verified, once in a month, jointly by the representatives of MPPKV CO. LTD. and the authorized representative of the SISL.
Frequency of monitoring/recording	Monthly
Value monitored	323,354.961
Monitoring equipment	Monitoring Equipment: Energy Meters Type: two-way tri-vector energy meters Calibration Frequency: Yearly The details of Monitoring meters has been provided in Appendix I of the Monitoring Report.
QA/QC procedures to be applied	The data can be cross-checked with the invoices generated.
Purpose of the data	To calculate baseline emission.
Calculation method	Calculated as $EG_y = EG_{\text{export}} - EG_{\text{import}}$
Comments	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

4.3 Monitoring Plan

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.

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

Data to be calculated:

EG_y : Net Electricity exported to the grid by the project activity in year

MWh: Unit of measurement

Origin of the data

EG_{export} / EG_{import} is 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 $(EG_{export} - EG_{import})$.

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. policy notified on 17-October-2006. Billing of the metered energy is being carried out on the monthly basis. The meter reading shall be carried out by the Parties MPPKVCL 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 MPPKVVCL. 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 MPPKVVCL 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 MPPKVVCL and the authorized representative of the contractor (SISL). As per the applicable provisions mentioned in the power purchase agreement the main meters' readings will be taken in the middle of each calendar month for previous one month as far as possible. Both representatives of MPPKVVCL 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's (project participant's) portal 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 Plan:

The secondary monitoring, which provides 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 in electronic form.

Troubleshooting Contingency Plan:

If the electricity recorded at the main meter in any month differs from the reading at the CMS beyond the permissible limit the main meter shall be tested as per provisions of power purchase agreement. If error is found exceeding the permissible limit during the testing of Main Meter, then it will immediately be repaired and recalibrated and correction will be applied, as agreed between the parties, to the monthly main meter readings to arrive at the correct energy for billing purpose for the period of the month up to the time of such test repair and recalibration. The tests on main meter shall be conducted by the meter relay testing staff of the MPPKVVCL jointly with the staff of the contractor SISL and results and corrections so arrived at mutually shall be applicable and binding on both the parties. The correction factor means the percentage of error between standard test meter and main meter. The main meter will be used only after calibration.

If the main meter fails to record energy due to any reason whatsoever, the net supplied electricity to the grid during the period of outage will be calculated by apportioning the net supply of the electricity recorded at the energy meter, owned by MPPKVVCL and located at the sub-station, as follows:

Net supply of the electricity by i^{th} WTG = (Total net supply of the electricity by entire wind farm as recorded at energy meter installed at the sub-station) * (Net generation of the electricity by i^{th} WTG as recorded on its controller / Sum of net generation by all WTGs of the wind farm as recorded on their controllers).

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

There are instances when the claim of emission reduction starts or ends in middle of a monitoring period and apportioning has to be done to arrive at electricity supplied for that certain period. The following apportioning procedure has been followed, if the crediting period start or end dates falls in between the main meter reading cycles:

The apportioning has been done as per the net electricity generated at controllers of the WTGs of the project activity. The daily generation data on controllers will be used for deriving a ratio for apportioning.

Procedure for apportioning:

Let us assume,

X = Sum of the net electricity generation at controller of each WTG of the project activity during the partial period of the corresponding period of main meter reading (kWh)

Y = Sum of the net electricity generation at controller of each WTG of the project activity during the corresponding full period of main meter reading (kWh)

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

If G = Net electricity supplied by the WTGs of the project activity to the grid during the corresponding full period of main meter reading as per credit notes(kWh)

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

Operational and organizational structure for monitoring

Monitoring responsibility - contractor (SISL):

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

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

-Site in-charge/site engineer does necessary documentation and presents at the time of monthly main meter reading by the representative of the MPPKVCL also they are authorized representative to jointly certify the meter reading.

-Site in-charge communicates all meter readings to the project participant.

-O&M team at site is responsible for preventive maintenance and trouble-free operation of WTGs under the overall responsibility of site in-charge. He/she ensures preventive maintenance of the WTGs and all meters.

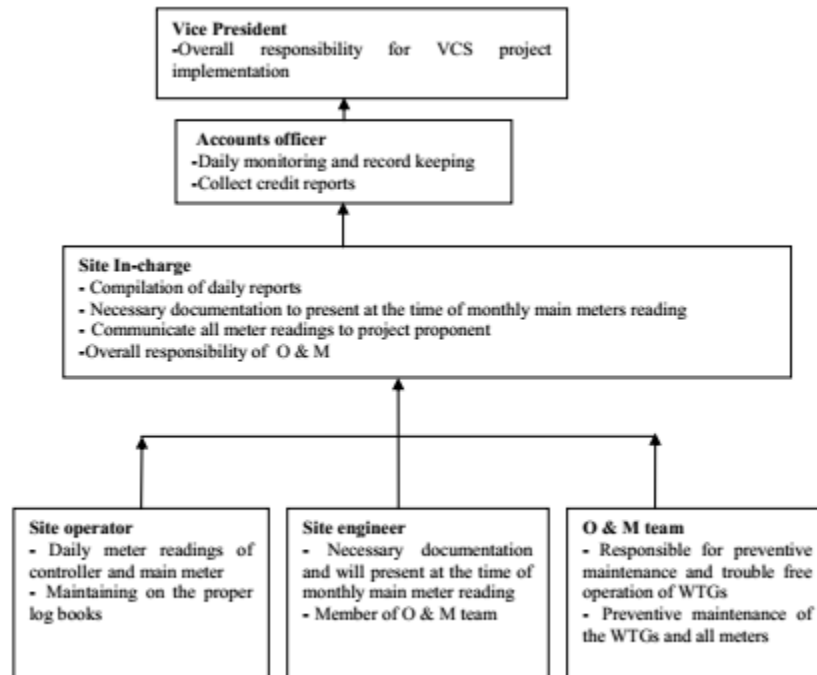
Monitoring responsibility - Project Participant:

Overall project management responsibility, which includes responsibility for VCS implementation, lies with Vice President (VP). Under his guidance, officer in-charge arranges 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 MPPKVCL 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.

Operational and organizational chart for monitoring is shown below:



5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline emissions in the year y (in tCO₂), BE_y, due to electricity supplied to the grid are the product of the baseline grid emission factor, EF_{grid,y}(in tCO₂/MWh) and the electricity supplied to the grid in the year y, EG_y, (in MWh), over the crediting period as given below:

BE_y = EG_y * EF_{grid,y} Where:

BE_y = Baseline emissions of the project activity in the year y (tCO₂)

EG_y = Net electricity supplied to grid in year y (MWh)

EF_{grid,y} = Baseline emission factor of the grid in the year y (tCO₂/MWh)

Emission Factor for NEWNE grid (now part of Unified Indian Grid), EF_{grid,y} = 0.92248 tCO₂/MWh

Baseline Emission for 2011 is,

BE_y = 49,510.477 MWh × 0.92248 tCO₂/MWh

=45,672 tCO₂e(Rounded Down)

Baseline Emission for 2012 is,

$$BE_y = 50,939.084 \text{ MWh} \times 0.92248 \text{ tCO}_2/\text{MWh}$$

=46,990 tCO₂e(Rounded Down)

Baseline Emission for 2013 is,

$$BE_y = 47,777.716 \text{ MWh} \times 0.92248 \text{ tCO}_2/\text{MWh}$$

=44,073 tCO₂e(Rounded Down)

Baseline Emission for 2014 is,

$$BE_y = 47,190.861 \text{ MWh} \times 0.92248 \text{ tCO}_2/\text{MWh}$$

=43,532 tCO₂e(Rounded Down)

Baseline Emission for 2015 is,

$$BE_y = 41,297.981 \text{ MWh} \times 0.92248 \text{ tCO}_2/\text{MWh}$$

=38,096 tCO₂e(Rounded Down)

Baseline Emission for 2016 is,

$$BE_y = 39,080.630 \text{ MWh} \times 0.92248 \text{ tCO}_2/\text{MWh}$$

=36,051 tCO₂e(Rounded Down)

Baseline Emission for 2017 is,

$$BE_y = 43,071.212 \text{ MWh} \times 0.92248 \text{ tCO}_2/\text{MWh}$$

=39,732 tCO₂e(Rounded Down)

Baseline Emission for 2018 is,

$$BE_y = 4,487.001 \text{ MWh} \times 0.92248 \text{ tCO}_2/\text{MWh}$$

=4,139 tCO₂e(Rounded Down)

Total Baseline Emission for this project = 298,285 tCO₂e.

5.2 Project Emissions

The project activity is based on renewable wind energy; therefore, project emissions should not be considered as per methodology ACM0002, $PE_y = 0 \text{ tCO}_2\text{e}$.

5.3 Leakage

According to the applied methodology, ACM0002, no leakage is considered for the project activity. Therefore, $LE_y = 0tCO_2e$.

5.4 Net GHG Emission Reductions and Removals

The net GHG emission reduction is calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

ER_y : Emission Reduction due to project activity in year y;

BE_y : Baseline Emission due to project activity in year y;

PE_y : Project Emission due to project activity in year y;

LE_y : Leakage Emission due to project activity in year y;

The vintage wise baseline emission and emission reduction is shown table below:

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2011	45,672	0	0	45,672
2012	46,990	0	0	46,990
2013	44,073	0	0	44,073
2014	43,532	0	0	43,532
2015	38,096	0	0	38,096
2016	36,051	0	0	36,051
2017	39,732	0	0	39,732
2018	4,139	0	0	4,139
Total	298,285	0	0	298,285

The total emission reduction for current monitoring period is 298,285tCO₂e. The estimated annual emission reduction for this project activity is 46,323 tCO₂e. The current monitoring period (from 10-January-2011 to 28-February-2018) is of 2607 days. So the estimated emission reduction for this project activity for current monitoring period is = $(46,323/365) \times 2607$

=330,860 tCO₂e.

So the actual emission reduction is 9.85% less than the estimated emission reduction for current monitoring period. The project activity being a wind power project, is dependent on weather condition. So, this deviation is acceptable.

APPENDIX I: <METER CALIBRATION DETAILS>

WTG ID	Meter No.	Make	Meter Type	Accuracy Class ⁴	Calibration Date	Validity of Calibration	Delay in Calibration ⁵	Remarks
P101, P104, P107, P109, P112, P113, P114, P131	MPE15233	SEMS	Main Meter	0.5	20-February-2010, 18-July-2011, 04-June-2012	19-February-2011, 17-July-2012, 03-June-2013	20-February-2011 to 17-July-2011, 25-February-2014 to 21-May-2014, 22-May-2015 to 19-February-2016,	Meter No. MPE15233 was replaced by Meter No. MPC49084 on 25-February-2013.
	MPC 49084	SEMS	Main Meter	0.2	25-February-2013, 22-May-2014, 20-February-2016	24-February-2014, 21-May-2015, 19-February-2017	20-February-2017 to 28-February-2018	Meter No. MPC 49084 was replaced by Meter No. XE479853 on 31-May-2019.
	XE479853	Secure	Main Meter	0.2	31-May-2019, 03-September-2020	30-May-2020, 02-September-2021		
	3596373	Genus Power	Check Meter	0.5	20-February-2016	19-February-2017		
P137, P140, P143, P145, P148, P150, P154	MPE57986	SEMS	Main Meter	0.5	19-March-2010, 04-June-2012	18-March-2011, 03-June-2013	19-March-2011 to 03-June-2012, 25-February-2014 to 21-May-2014 , 22-May-2015	Meter No. MPE57986 was replaced by Meter No. MPC49086 on 25-

⁴ As per the direction of Honorable commission for the electricity in the state of Madhya Pradesh, meter has been changed to move for better accuracy class from 0.5s to 0.2s in 2013.

⁵ Error Factor has been applied where delay in calibration occurred.

							to 19-February-2016,	February-2013.
	MPC 49086	Secure	Main Meter	0.2	25-February-2013, 22-May-2014, 20-February-2016	24-February-2014, 21-May-2015, 19-February-2017	20-February-2017 to 28-February-2018	Meter No. MPC 49086 was replaced by Meter No. XE479855 on 31-May-2019.
	XE479855	Secure	Main Meter	0.2	03-September-2020	02-September-2021		
	3596488	Genus Power	Check Meter	0.5	20-February-2016	19-February-2017		

APPENDIX II: <MAJOR BREAKDOWN DETAILS>

WTG ID	Date	Breakdown Duration(in Hrs.)
P112	03-July-2015	24.00
P148	20-August-2015	22.5
P143	17-August-2015	20.00
P148	11-October-2016	72
P145	04-July-2016	72
P154	29-October-2016	24
P150	15-March-2017	21.5
P143	18-July-2017	18