



44.40 MW WIND ENERGY PROJECT BY RUCHI SOYA INDUSTRIES LIMITED, INDIA



Document Prepared by EKI Energy Services Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Project

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

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

Pre-project scenario:

In case of wheeling the electricity for captive use the receiving plants were using grid electricity in the pre-project scenario. While in case of supplying the electricity to the Unified Indian Grid for selling it was being generated by the power plants connected to the Unified Indian Grid in the pre-project scenario. Therefore, in both the cases scenario existing prior to the start of the project activity, baseline scenario would be electricity generation from the existing grid. Hence, in the absence of the project activity, the equivalent amount of electricity would have been generated from the connected / new power plants in the Unified Indian Grid.

Project scenario:

The project activity is a renewable source of power generation and supplies the electricity to the Unified Indian Grid. The total installed capacity of the project activity is 44.40 MW equipped with 44 WTGs with rated capacity of 600 kW each (model S-52) and 12 WTGs with rated capacity of 1500 kW each (model S-82). The electricity generated by three WTGs of capacity 600 kW each in Madhya Pradesh is being wheeled to the company's plants in the state-Madhya Pradesh and the electricity from the remaining WTGs of 42.60 MW installed capacity is being sold to the respective state utilities. All WTGs involved in the project activity are developed and supplied by Suzlon Energy Limited. Suzlon Infrastructure Services Limited (SISL), a SUZLON Group Company, provides all operations and maintenance services to the project activity. The project activity uses wind energy in producing electricity and no other input is being used, therefore, it doesn't produce any GHG emission during its lifetime.

The relevant implementation dates

The project plant has commissioned on 26-February-2010 and since then it is running satisfactorily.

It is estimated that 91,158 MWh of electricity will be produced annually in second crediting period, The estimated annual GHG emission reductions in second crediting period monitoring period is 84,822 tCO₂e .

The total emission reductions achieved in this monitoring period i.e., from 13-December-2018 to 30-June-2021 (first and last days included) is 140,837 tCO₂ e.

1.2 Sectoral Scope and Project Type

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

Project Type: Wind Energy Project

Project is not grouped project activity as per VCS guidelines

1.3 Project Eligibility

The project activity involves installation and generation of electricity using wind energy resources i.e. by using the renewable sources replacing electricity supply from a fossil-fuel dominated electricity, thus leads to reductions of anthropogenic GHG emissions from atmosphere. Hence the project activity is eligible Sectoral scope 1 i.e., energy industries (renewable/ non-renewable sources) under the scope of the VCS Program.

1.4 Project Design

The project involves setting up a wind farm of 44.4 MW ("Project) in the state of Madhya Pradesh and Rajasthan, India. Hence, the project has been designed to include a single installation of an activity and is not a grouped activity.

Eligibility Criteria

Not applicable to this project activity as this is not a grouped project.

1.5 Project Proponent

Organization name	Ruchi Soya Industries Limited
Contact person	Mr. Ashish Verma
Title	Assistant Manager
Address	601, Part B-2, Metro Tower, 6 th Floor, Vijay Nagar, AB Road, Indore, Madhya Pradesh 452010
Telephone	0731 428 9086
Email	registry@enkingint.org

1.6 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultant
Contact person	Mr. Bibhushita Ghose
Title	Assistant Manager-Operations

Address	Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010,Madhya Pradesh, India
Telephone	0731 428 9086
Email	bibhushita@enkingint.org

1.7 Ownership

The Project is owned by M/s Ruchi Soya Industries Limited, which is the project participant of the Project. Further the Ownership is demonstrated through Commissioning certificates as well as the PPA in the name of Project Participant.

1.8 Project Start Date

The projects starts the operations on 26-February-2010 (Date of Commissioning of the first WTG).

1.9 Project Crediting Period

Project Crediting Period Start date: 26-February-2020

Project Crediting Period End date: 25-February-2030

Total Crediting Period: 10 Years

This is the second crediting period of this project activity. The first crediting period of this project activity was from 26-February-2010 to 25-February-2020.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Estimated average annual GHG emission reductions from the project activity are 84,822 tCO₂e per year, which is less than 300,000 tCO₂e per year. Hence the project scale of the project activity will become "Projects" as shown below:

Project Scale	
Project	√
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
2020 -21	84,822

2021 – 22	84,822
2022 – 23	84,822
2023 – 24	84,822
2024 – 25	84,822
2025 – 26	84,822
2026 – 27	84,822
2027 – 28	84,822
2028 – 29	84,822
2029 – 30	84,822
Total estimated ERs	848,220
Total number of crediting years	10
Average annual ERs	84,822

1.11 Description of the Project Activity

Project Activity:

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

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

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

Physical Location	Location No.	Capacity	Sale to
Village-Naulakha, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	NL-01, NL-02, NL-03, NL-04, NL-05, L-06, NL-07, NL-08, NL-09, NL-10	10x0.60 = 6 MW	M.P.Power Trading Company Limited
Village-Padliya Umat, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	JO- 08	1x0.60 = 0.60 MW	M.P.Power Trading Company Limited
Village-Bargad, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	JO- 13	1x0.60 = 0.60 MW	M.P.Power Trading Company Limited
Village-Hariyakheda, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	JO-14, JO-15, JO-16, JO-17, JO-18	5x0.60 = 3 MW	M.P.Power Trading Company Limited
Village-Chourasi Badayla, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	JO-03, JO-04, JO-05	3x0.60 = 1.80 MW	M.P.Power Trading Company Limited
Village-Uperwada, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	JO-20, JO-21, JO-22	3x0.60 = 1.80 MW	M.P.Power Trading Company Limited
Village-Akal, Taluka-Fatehgarh, District-Jaisalmer (Rajasthan)	AK-400, AK-401, AK-414, AK-415, AK-416, AK-417, AK-253, AK-308	8x1.50 = 12 MW	Jodhpur Vidyut Vitaran Nigam Limited
Villages-Belwa Ranaji & Sagat Nagar, Taluka-Shergarh, District-Jodhpur (Rajasthan)	RKB-075, RKB-076	2x1.50 = 3 MW	Jodhpur Vidyut Vitaran Nigam Limited
Village-Dhundhariya, Taluka-Osiyan, District-Jodhpur (Rajasthan)	OS-48, OS-49	2x1.50 = 3 MW	Ajmer Vidyut Vitaran Nigam Limited
Village-Gopalpura, Taluka-Ratlam, District - Ratlam (Madhya Pradesh)	PR-01, PR-02, PR-03, PR-04, PR-05, PR-06, PR-08, PR-09, PR-10, PR-11, PR-12, PR-13, PR-14, PR-15, PR-16, PR-17, PR-18, PR-19	18x0.60 = 10.8 MW	M.P.Power Trading Company Limited
Total Capacity		42.60 MW	

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

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

Technology:

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

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

The important parts of a WTG are:

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

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

Suzlon S82 model:

S82-1.5 MW is designed for generating the optimal power output even at sites with a modest wind speed regime. The wind turbine concept is based on robust design with pitch regulated blade operation, a 3- stage gearbox with 1650 kW rating and flexible coupling to the asynchronous induction generator. The Suzlon Flexi-slip System provides efficient control of the load and power control. The turbine operation is efficiently controlled by the Suzlon controller. These technologies are all well-known in the wind power industry and have proven themselves. The S82-1.5 MW is designed to withstand extreme conditions and operate effectively with low maintenance cost.

Suzlon S52 model:

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

1.12 Project Location

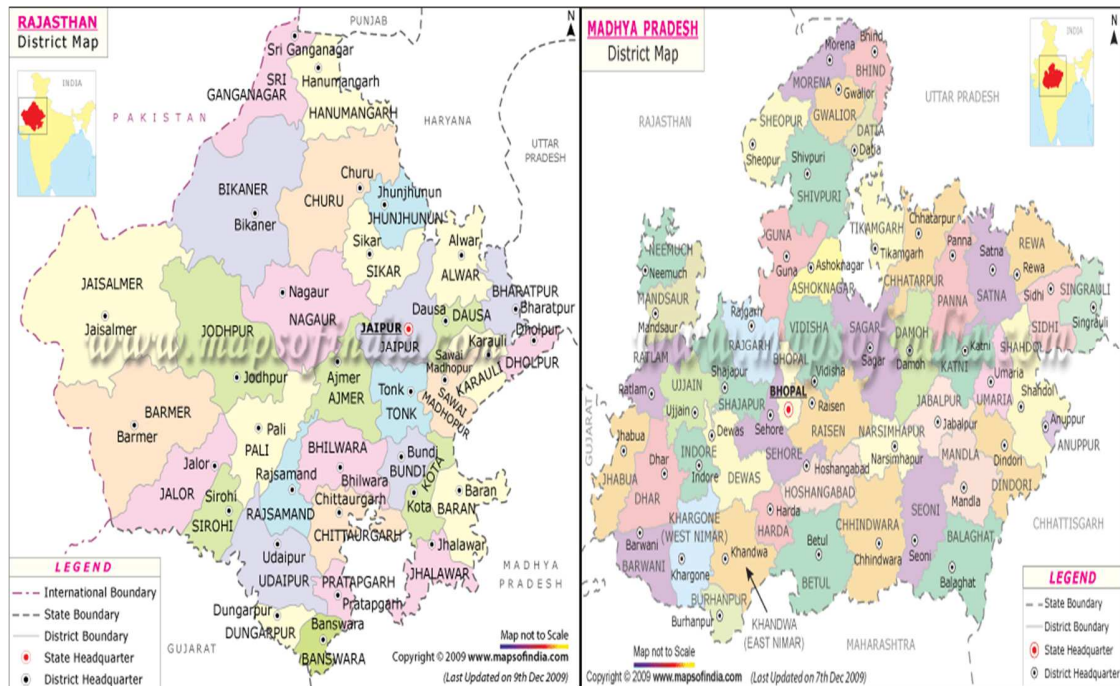
The physical locations of the WTGs installed in the project activity spread across two states of India – Madhya Pradesh and Rajasthan. A summary of the physical locations of the installed WTGs is as follows:

S. No.	Physical Location	Rated Capacity of the WTG (kW)	Location No.	Latitude	Longitude
1.	Village-Naulakha, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	600	NL-1	23°38'23.0" N	74°59'12.7" E
		600	NL-2	23°38'25.9" N	74°59'07.1" E
		600	NL-3	23°38'37.3" N	74°59'13.1" E
		600	NL-4	23°38'45.1" N	74°59'25.7" E
		600	NL-5	23°38'35.9" N	74°59'33.3" E
		600	NL-6	23°38'25.9" N	74°59'39.7" E
		600	NL-7	23°38'17.1" N	74°59'39.4" E
		600	NL-8	23°38'21.9" N	74°59'53.7" E
		600	NL-9	23°38'33.5" N	75°00'00.2" E
		600	NL-10	23°38'43.1" N	75°00'00.2" E
2.	Village-Padliya Umat, Taluka- Piploda, District – Ratlam (Madhya Pradesh)	600	JO-10	23°35'51.6" N	75°04'44.1" E
		600	JO-08	23°35'45.5" N	75°04'47.9" E
3.	Village-Bargad, Taluka - Piploda, District Ratlam (Madhya Pradesh)	600	JO-12	23°36'10.3" N	75°04'30.3" E
		600	JO-13	23°36'17.2" N	75°04'26.6" E
4.	Village-Hariyakheda, Taluka- Piploda, District - Ratlam (Madhya Pradesh)	600	JO-14	23°36'23.7" N	75°04'24.3" E
		600	JO-15	23°36'31.0" N	75°04'21.8" E
		600	JO-16	23°36'37.7" N	75°04'20.8" E
		600	JO-17	23°36'45.9" N	75°04'15.2" E
		600	JO-18	23°36'59.3" N	75°04'12.6" E
		600	JO-19	23°37'05.9" N	75°02'48.5" E
5.	Village-Chourasi Badayla, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	600	JO-03	23°34' 46.9" N	75°05'46.8"E
		600	JO-04	23°34' 53.5" N	75°05'48.4"E
		600	JO-05	23°34' 57.2" N	75°05'22.1"E
6.	Village-Uperwada, Taluka-Piploda, District - Ratlam (Madhya Pradesh)	600	JO-20	23°36' 46.5" N	75°02'20.9"E
		600	JO-21	23°36' 38.2" N	75°02'21.7"E
		600	JO-22	23°36' 58.6" N	75°02'46.0"E
7.	Village-Akal, Taluka-Fatehgarh, District-Jaisalmer (Rajasthan)	1500	AK-400	26°47'17.3" N	77°05'12.0"E
		1500	AK-401	26°47'05.0" N	77°05'25.3"E
		1500	AK-414	26°48'12.4" N	77°05'06.8"E
		1500	AK-415	26°48'33.5" N	77°05'23.5"E
		1500	AK-416	26°48'25.6" N	77°05'35.8"E
		1500	AK-417	26°48'12.2" N	77°05'46.1"E
		1500	AK-253	26°47'51.2" N	77°08'14.0"E
		1500	AK-308	26°47'56.9" N	77°08'55.6"E
8.	Villages-Belwa Ranaji & Sagat Nagar, Taluka-Shergarh, District-Jodhpur (Rajasthan)	1500	RKB-075	26°30'52.3" N	72°32'22.2"E
		1500	RKB-076	26°30'05.7" N	72°31'06.4"E
9.	Village-Dhundhariya, Taluka- Osiyan, District-Jodhpur (Rajasthan)	1500	OS-48	26°43'57.6" N	72°56'43.1"E
		1500	OS-49	26°43'55.5" N	72°56'59.5"E
10.	Village-Gopalpura, Taluka-Ratlam, District-Ratlam	600	PR-01	23°23'26.4"N	74°55'27.1"E
		600	PR-02	23°23'20.8"N	74°55'23.1"E

S. No.	Physical Location	Rated Capacity of the WTG (kW)	Location No.	Latitude	Longitude
	(Madhya Pradesh)	600	PR-03	23°23'14.9"N	74°55'13.4"E
		600	PR-04	23°23'08.1"N	74°55'10.8"E
		600	PR-05	23°23'01.5"N	74°55'07.9"E
		600	PR-06	23°22'44.6"N	74°55'08.1"E
		600	PR-08	23°22'29.6"N	74°55'14.0"E
		600	PR-17	23°22'54.0"N	74°55'12.0"E
		600	PR-19	23°23'18.0"N	74°55'36.6"E
11.	Village-Rampuriya, Taluka-Ratlam, District-Ratlam (Madhya Pradesh)	600	PR-09	23°22'25.6"N	74°55'24.6"E
		600	PR-10	23°21'59.1"N	74°55'34.4"E
		600	PR-11	23°21'25.3"N	74°55'11.9"E
		600	PR-12	23°21'34.5"N	74°55'30.8"E
		600	PR-13	23°21'41.6"N	74°55'31.2"E
		600	PR-14	23°21'47.8"N	74°55'32.0"E
		600	PR-15	23°21'53.8"N	74°55'32.6"E
		600	PR-16	23°21'28.2"N	74°55'29.2"E
		600	PR-18	23°21'21.8"N	74°55'23.6"E

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





1.13 Conditions Prior to Project Initiation

The project activity is a Greenfield activity that is the installation of WTGs for generating electricity. In the absence of the project activity taken up by the Project Proponent, the renewable energy source from the wind power would not have been generated. This would have resulted in equivalent power generation from the fossil fuel based Indian Grid, India. Therefore the energy base line is the electrical energy displaced by the wind mill installed by the project proponent in the India Grid that would have continued without implementation of project activity.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

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

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

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project activity is registered with UNFCCC as two CDM projects as detailed below:

Sr. No.	Ref. No.	Date of Registration	Project Title
1	8592	13-December-2012	35.10 MW Wind Energy Project by Ruchi Soya Industries Limited, India
2	8818	20-December-2012	Grid Connected Wind Power Generation Project by Ruchi Soya Industries Limited in Madhya Pradesh

The Web-link for the same has been mentioned below:

CDM 8592: <https://cdm.unfccc.int/Projects/DB/RWTUV1354786640.92/view>

CDM 8818: <https://cdm.unfccc.int/Projects/DB/RWTUV1355735181.12/view>

1.15.2 Projects Rejected by Other GHG Programs

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

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

India is Non-annex1 country and there is no compliance with an emission trading program or to meet binding limits on GHG emissions for this project activity. The project is registered under CDM with registration ID 8592 and 8818. Project Proponent has submitted undertaking that they will not claim same GHG emission reductions of the project from CDM and VCS. PP would not use net GHG emission reductions by the projects for compliance with emission trading program to meet binding limits on GHG emissions.

1.16.2 Other Forms of Environmental Credit

The project activity will not be involved in creating another form of GHG-related environmental credit, such as renewable energy certificates. Project Proponent has submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration.

1.17 Additional Information Relevant to the Project

Leakage Management

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

Commercially Sensitive Information

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

Sustainable Development

Designated National Authority (DNA) of the host country (India) has stipulated four indicators for sustainable development in the interim approval guidelines for Clean Development Mechanism

(CDM) projects in India. The project proponent believes that the project activity has contributed to sustainable development in terms of the four indicators as follows:

1. Social well being:

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

2. Economic well being:

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

3. Environmental well being:

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

4. Technological well being:

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

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

Further Information

There are no information or incidents that will have bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2 SAFEGUARDS

2.1 No Net Harm

According to Indian regulation, the implementation of the wind park does not require an environmental impact assessment. The Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India notification¹ dated 14-September-2006 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 the Ministry of Environment and Forests (including a public hearing and an EIA) in case the industry or project is listed in a predefined list. Wind parks are not included in this list and thus an EIA is not required.

Thus, there are no any significant impacts due to implementation of project activity on air, water, soil quality and ambience are envisaged due to the project activity.

¹ <http://www.environmentwb.gov.in/pdf/EIA%20Notification,%202006.pdf>

2.2 Local Stakeholder Consultation

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

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

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

1. Date of Public Notice published in local newspaper: 10-January-2010

Date & Time of the meeting: 23-January-2010; 11.30 a.m.

Venue: Suzlon office, Village-Barakheda, Tehsil: Jaora, Distt. Ratlam (Madhya Pradesh)

Stakeholders present: No. 45; including local villagers, NGO, students, employees of Suzlon, and RSIL.

2. Date of Public Notice published in local newspaper: 04-March-2010

Date & Time of the meeting: 16-March-2010; 11.30 a.m.

Venue: Primary school, village-Govindpura, Tehsil-Osiyan, District-Jodhpur (Rajasthan)

Stakeholders present: No. 24; including local villagers, employees of Suzlon, and RSIL.

3. Date of Public Notice published in local newspaper: 04-March-2010

Date & Time of the meeting: 17-March-2010; 11.30 a.m.

Venue: Secondary school, village-Bhalu Ratangarh, Tehsil-Balesar, District-Jodhpur (Rajasthan)

Stakeholders present: No. 39; including local villagers, employees of Suzlon, and project participants including RSIL.

4. Date of Public Notice published in local newspaper: 04-March-2010

Date & Time of the meeting: 18-March-2010; 11.30 a.m.

Venue: Community hall, village-Akal, Tehsil-Jaisalmer, District-Jaisalmer (Rajasthan)

Stakeholders present: No. 18; including local villagers, employees of Suzlon, and RSIL.

5. Date of Public Notice distributed: 16-May-2011

Date & Time of the meeting: 30-May-2011; 10.00 a.m.

Venue: Suzlon office, Village-Palsodi, Taluka: Palsodi, Distt. Ratlam (Madhya Pradesh)

Stakeholders present: No. 37; including local villagers, members of local gram panchayat, employees of Suzlon, and RSIL.

The process of Local Stakeholder Consultation is continuous. No grievance was received from the stakeholders in current monitoring period thus no mitigation measure is required. PP maintains a grievance register in plant office for local stakeholders to give feedback/grievances. In case of grievances, the nature of probable resolution is discussed with the plant head office and implemented by the site in charge. The grievance copies have been submitted to DOE.

2.3 Environmental Impact

According to Indian regulation, the implementation of the wind park does not require an environmental impact assessment. The Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India notification dated 14-September-2006 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 the Ministry of Environment and Forests (including a public hearing and an EIA) in case the project is listed in a predefined list. Wind parks are not included in this list and thus an EIA is not required. The project activity has no significant impact on the environment. However, certain foreseen impacts due to the project activity are discussed below: Also, in the redefined EIA notification i.e. S.O. 1533, dated 14-September-2006, Ministry of Environment, Forest and Climate Change (MoEFCC), Govt. of India, the wind projects are not included in the list of projects that has to get Prior Environmental Clearance (EC) either from State or Central Govt. authorities and hence no EIA study was conducted.

The project does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India. However due weightage has been given to environmental aspects.

During construction

Impact on air

Movement of construction material during construction had some impact on the air. As the transportation is quite less for the project activity, the impacts were negligible.

Impact on Land use

The land on which the project activity takes place is largely unproductive. Prior to the project activity, most of the land had no beneficial use. The project proponents had bought the land for a worthwhile application and obtained necessary approvals for installation of windmills. No dislocation of people is involved in the course of the project activity.

The magnitude of the impacts during the construction phase is negligible and exists for a temporary period of time till the end of construction phase. Therefore, it would not affect the environment considerably. The impacts on the environment due to construction activities of wind turbines are negligible.

Operation and Maintenance Phase

Suzlon maintains highest level of safety standards. Systematic and scientific maintenance of all equipment's has been undertaken to ensure the best safety standards.

Impact on air

Wind energy plants are known to contribute to zero atmospheric pollution as no fuel combustion is involved during any stage of the operation.

Impact on water

There is absolutely no effluent discharge during operation of wind turbine generators.

Impact on ecology

There are no known migratory birds/endangered species in the region of project activity. Therefore no harm on the ecological environment is envisaged.

Socio-Economic Impacts

There is no inconvenience to the local community due to the transmission lines. The project activity helps up-liftment of skilled and unskilled manpower in the region. The project has provided employment opportunities not only during the construction phase, but also during its operational lifetime. The project activity improves employment rate and livelihood of local populace in the vicinity of the project. Moreover, the project generates eco-friendly, GHG free power which contributes to sustainable development of the region.

Conclusion

The net impact under environmental pollution category would be positive as all necessary abatement measures would be adopted and periodically monitored. The project activity does not have any major adverse impacts on environment during its construction or operational phase. The human interest parameters would show positive impacts due to increased job opportunities at the facility as well as other ancillary units coming up.

As discussed above, the project activity would not have any adverse environmental impacts. The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. Hence EIA is not required to be undertaken by the host party.

As the wind power generation projects are not listed in any of the categories of the schedule, it does not require Environmental Impact Assessment..

2.4 Public Comments

The Global Stakeholder Consultation commenting period had been completed before first crediting period. No comments had been received in the commenting period.

2.5 AFOLU-Specific Safeguards

The project activity deals with generation of electricity using wind and not from AFOLU projects. Hence not applicable.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

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

For Second Crediting Period,**Title of the approved baseline and monitoring methodology:**

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

Reference of the methodology applied to the project activity: ACM0002; Version 20.0 (EB 105).
<https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG>

Title and reference of tools applied to the project activity:

TOOL 11: “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period.” Version 03.0.1².

“Tool to calculate the emission factor for an electricity system”; Version: 07.0 (EB 100)
<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf>

For First Crediting Period,

² <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf>

Title of the approved baseline and monitoring methodology:

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

Reference of the methodology applied to the project activity: ACM0002; Version 12.1.0 (EB 58).
<https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG>

Title and reference of tools applied to the project activity:

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

3.2 Applicability of Methodology

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

Sr. No.	Applicability Conditions as per ACM0002	Applicability to this Project Activity
1.	This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s).	The project activity involves installation of new wind power units in different locations. Therefore, the project activity satisfies this applicability criterion.
2.	The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	This condition is satisfied as this is a wind power project.
3.	In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit or rehabilitation of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	There is no capacity addition, retrofit, rehabilitation or replacement in the project activity. Therefore, this condition is not applicable.
4.	In case of hydro power plants: The project activity is implemented in an existing single or multiple reservoir, with no change in the volume of any of the reservoirs, or	This condition is not relevant, as the project activity does not have hydro power plant.

	• The project activity is implemented in existing single or multiple reservoirs, where the volume of reservoir(s) is increased and the power density of the project activity, calculated using equation (7) of the methodology, is greater than 4 W/m², or • The project activity results in new single or multiple reservoirs and the power density of the power plant, calculated using equation (7) of the methodology, is greater than 4 W/m². • The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (7) of the methodology, is lower than or equal to 4 W/m² all of the following conditions shall apply: i. The power density calculated using the total installed capacity of the integrated project, as per equation (8), is greater than 4 W/m²; ii. Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; iii. Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m² shall be: a) Lower than or equal to 15 MW; and b) Less than 10 per cent of the total installed capacity of integrated hydro power project.	
5	In the case of integrated hydro power projects, project proponent shall: a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs	Not applicable as this project activity is not an integrated hydro project activity.

	constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore, this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum of five years prior to the implementation of the CDM project activity.	
6.	The methodology is not applicable to: a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; b) Biomass fired power plants/units.	Not applicable as this project activity is not switching from fossil fuels to renewable energy sources or biomass power unit.
7.	In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is “the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”	Not applicable as this is not a case of retrofits, rehabilitations, replacements, or capacity additions.
Applicability conditions of “Tool to calculate the emission factor for an electricity system”		
1.	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	This condition is applicable. OM, BM and CM are estimated using the tool under section 4.1 for calculating baseline emissions.
2.	Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off grid power plants. In the latter case, the conditions specified in “Appendix 2: Procedures related to off grid power generation” should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the	Since the project activity is grid connected, this condition is applicable and the emission factor has been calculated accordingly.

	reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	
3.	In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project activity is located in India, a non-Annex I country. Therefore, this criterion is not applicable for the project activity.
4.	Under this tool, the value applied to the CO ₂ emission factor of biofuels is zero.	The project activity is a grid connected wind power project and not a hydro power plant. Therefore, this criterion is not applicable for the project activity.
Applicability conditions of “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period”		
1.	This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism.	This criterion is applicable for this project activity as there is no change in baseline condition.

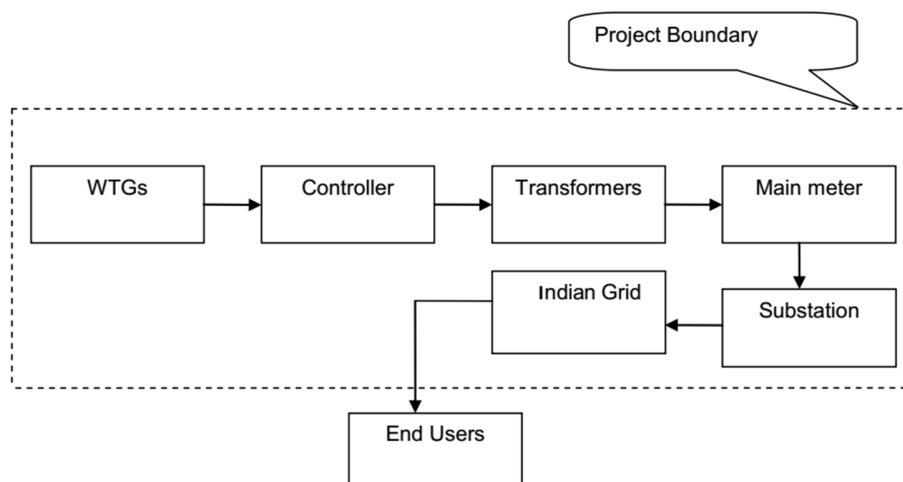
Thus the project activity is complying with requisite criteria for ACM0002 (Version-20.0).

3.3 Project Boundary

The Project Boundary:

Project boundary has ascertained using para 20 of ACM0002 (Version 20.0) -, ‘The spatial extent of the project boundary includes the project power plant/unit and all power plants/units connected physically to the electricity system that the CDM project power plant is connected to.’

The project activity is located in the State of Madhya Pradesh and Rajasthan and is supplying generated electricity to the Unified Indian Grid of India. The project boundary consists of project activity, evacuation facility, on site metering point and connectivity to the Indian Grid. The schematic diagram of project boundary is as follows:



Emission Sources:

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

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

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

3.4 Baseline Scenario

Baseline scenario for the second crediting period in line with the “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period.” Version 03.0.1³.

The tool stipulates the following steps to be carried out.

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

The baseline scenario remains unchanged and is in compliance with all the relevant mandatory national and/or sectoral policies.

Step 1.2: Assess the impact of circumstances

The baseline scenario identified at the validation of the project activity was the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid connected power plants and by the addition of new generation sources into the grid. Thus this project activity was a voluntary investment which intends to replace equivalent amount of electricity at grid from renewable source. PP was not bound to incur this investment; hence absence of project

³ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf>

activity (i.e. the investment) does not lead to any continued baseline practice for PP within their scope whereas the continued operation of the project activity would continue to replace equivalent amount of electricity at grid. Hence, the same baseline as identified in the previous crediting period is still valid for the project. Therefore, the assessment of the changes in market characteristics is not required for the renewal of the project's crediting period under VCS.

Nevertheless, there is an impressive growth attained by the Indian Power Sector within the recent years, the installed capacity has grown from mere 1,713 MW in 1950 to 382,151.22 MW as on 31-March-2021, consisting of 234,728.22 MW Thermal, 46,209.22 MW Hydro, 94,433.79 MW Renew and 6,780 MW Nuclear. Sector-wise details of installed capacity are shown in Table 1. However, it is evident from Table 1⁴ that the installed capacity is predominantly coal based and therefore, is a major source of carbon dioxide emissions in India. Hence, there exists scope for reducing the CO₂ emissions in the country by increased use of renewable energy sources.

Furthermore, project participant has considered the latest available CO₂ Baseline Database (CEA database, version 17) at the time of requesting renewal of the crediting period for establishing the baseline emission factor, which itself considered all the new circumstances. Hence, the new circumstances do not have an impact on the baseline emission. As per below table, the fossil fuel based thermal power generation is dominant over the renewable based power generation, thus baseline scenario remains same as original.

Table 1: Sector- wise installed capacity (MW) as on 31-March-2021 (CEA Database version 17⁵)

Sector	Thermal					Nuclear	Hydro	RES	Total
	Coal	Lignite	Gas	Diesel	Total				
State	65931.50	1150.00	7087.36	236.01	74404.86	0.00	27069.50	2395.27	103869.64
Central	62570.00	3640.00	7237.91	0.00	73447.91	6780.00	15646.72	1632.30	97506.93
Private	74173.00	1830.00	10598.74	273.70	86875.45	0.00	3493.00	90406.21	180774.66
All India	202674.50	6620.00	24924.01	509.71	234728.22	6780.00	46209.22	94433.79	382151.22

Thus, current baseline remain same and there is no impact if circumstances, existing at the time of requesting renewal of crediting period.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

As explained in step 1.2, the baseline scenario was the electricity import/generation from the power plants connected to the electricity grid. The project activity in green field project and there is no any baseline equipment or investment involved in project activity. Therefore this condition is not applicable to the project activity.

Step 1.4: Assessment of the validity of the data and parameters

This step stipulates that “Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the VCS project activity.”

⁴ https://cea.nic.in/wp-content/uploads/tpe_cc/2022/02/User_Guide_ver_17_2021.pdf

⁵ https://cea.nic.in/wp-content/uploads/tpe_cc/2022/02/User_Guide_ver_17_2021.pdf

In the context of the present project activity the emission factor has been updated along with the approach used to calculate the emission factor.

Step 2: Update the current baseline and the data and parameters

As evident from the explanation provided above the baseline scenario remains unchanged. Only the approach used to calculate the baseline emission factor is updated as per the latest version of CEA database available at the time of PD submission for renewal.

In line with the project standard version 03.0, the impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant EB guidance with regard to renewal of the crediting period at the time of requesting renewal of crediting period; and the correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period.

Impact of the national and/or sectoral policies and circumstances upon the baseline scenario of the project activity

The Government of India enacted the Electricity Act in the year 2003 to harmonize and rationalize the provisions in the existing laws. The Act consolidated the laws relating to generation, transmission, distribution, trading and use of electricity. With the Enactment of the act, the then existing laws viz, The Indian Electricity Act 1910, The Electricity Supply Act, 1948 and The Electricity Regulatory Commissions Act, 1998 were repealed. The Electricity Act 2003 was in force at the time of the completion of the baseline study for the registered PD.

Section 3 of the said act required the Central Government to prepare the national electricity policy and tariff policy, in consultation with the State Governments and the Authority for development of the power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy. In accordance with the section 3 of the Electricity Act 2003, the Central Government notified the National Electricity Policy⁶ on 12th February 2005 which was in force at the time of completion of the baseline study as stated in the registered PD of the project activity. This policy has not been revised since then and is currently in force as well.

In addition to the above policies, State Electricity Regulatory Commissions (SERCs) have announced preferential tariffs and Indian Renewable Energy Development Agency (IREDA) provides term loan assistance towards establishing wind power projects. All these fiscal and financial incentives were in force at the time of completion of the baseline study for the registered VCS PD of the project activity and still continue to exist.

The state electricity regulatory commission issues tariff order in respect of procurement of power generated from renewables and there is no mandatory national and/or sectoral policies have come into effect that would affect the compliance of the current baseline. Hence, it can be concluded the current baseline complies with all relevant mandatory national and/or sectoral policies that have come into effect after the submission of the project activity for validation and are applicable at the time of requesting renewal of the crediting period.

However, in spite of the financial incentives given by the government to renewable power projects in India the generation from the low cost must run resources connected to the Southern Grid has not increased to such an extent that this would lead to more than 50% contribution from the low cost must run resources towards the total generation from the Southern Grid.

The approved large scale methodology for Grid connected electricity generation from renewable sources, ACM0002 (Version 20.0), has been used to determine the baseline and the estimation of emission reductions for the applicable crediting period. As referred in the methodology "Tool to calculate the emission factor for an electricity system" (version 07.0) has been used to determine continued validity of the baseline based on combined margin (CM) calculations.

⁶ <http://www.cercind.gov.in/Act-with-amendment.pdf>

As per CEA database version 17, the fossil fuel dominated electricity is more than renewable sector and is continuing with same pattern. In light of the above discussion it is to be concluded that in accordance with relevant guidelines stipulated in the Project Standard version 03.0, national and/or sectoral policies and circumstances had been considered towards formulating the OM & BM baseline scenario. Hence the baseline scenario as applied for the present project activity remains justified.

As per the approved large scale methodology for Grid connected electricity generation from renewable sources, ACM0002 (Version 20.0) para 22: "If the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in "TOOL07:Tool to calculate the emission factor for an electricity system".

The project activity involves setting up of wind project to produce electricity and supply to the grid. In the absence of the project activity, the equivalent amount of power would have been supplied by the Indian grid, which is fed mainly by fossil fuel fired plants.

In the absence of the project activity, the equivalent amount of power would have been drawn from the Indian grid. Hence, the baseline for the project activity is the equivalent amount of power from the Indian grid.

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source (where available) and made publically available. The CEA database version 17 is the latest available data at the time of PD submission to DOE for validation, hence same is considered for emission factor calculations.

The combined margin of the Indian grid used for the project activity is as follows

Parameter	Value	Nomenclature	Source
$EF_{grid,CM,y}$	0.9305 tCO ₂ /MWh	Combined margin CO ₂ emission factor for the project electricity system in year y	Calculated as the weighted average of the operating margin (0.75) & build margin (0.25) values, sourced from Baseline CO ₂ Emission Database, Version 17.0, October 2021 published by Central Electricity Authority (CEA), Government of India.
$EF_{grid,OM,y}$	0.9522 tCO ₂ /MWh	Operating margin CO ₂ emission factor for the project electricity system in year y	Calculated as the last 3 year (2018-19, 2019-20, 2020-21) generation-weighted average, sourced from Baseline CO ₂ Emission Database, Version 17.0, October 2021 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,BM,y}$	0.8653 tCO ₂ /MWh	Build margin CO ₂ emission factor for the project electricity system in year y	Baseline CO ₂ Emission Database, Version 17.0, October 2021 published by Central Electricity Authority (CEA), Government of India

3.5 Additionality

Regulatory Surplus Demonstration:

In India, there is no any regulation to install the wind projects and the project activity is a voluntary step taken by PP. In India, the fossil fuel based thermal power generation is dominant over the renewable based power generation, thus baseline scenario remains same as original. As discussed in section 3.4 of VCS PD, there is no any Impact of the national and/or sectoral policies and circumstances upon the baseline scenario of the project activity and project activity is additional as per CDM Tool for the demonstration and assessment of additionality and as per VCS Program rules.

There are no certain laws and regulations which give comparative advantage to more emission intensive technologies or less emission intensive technologies. There are no any Type E+ and E- policies applicable to the project activity which prevent the implementation of local laws and regulations that would seek to contribute towards climate change mitigation. The project activity is in compliance with local laws and regulations. As explained in section 3.4, the current baseline complies with all relevant mandatory national and/or sectoral policies.

Project Additionality

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

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

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

The project activity is the installation of a new grid-connected renewable power plant/unit, hence the baseline scenario is the electricity delivered to the grid by the project activity which would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system, ver. 02.2.1”.

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

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

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

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

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

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

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

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

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

Outcome of Step 1a:

Alternatives 1 & 2 above have been identified as realistic and credible alternative scenario(s) to the project activity.

Sub-step 1b: Consistency with mandatory laws and regulations:

There are no legal and regulatory requirements that prevent Alternatives 1 & 2 from occurring in India. Both alternatives are as per national policies as described in section 2.4 above.

Outcome of Step 1b: Identified realistic and credible alternative scenario(s) to the project activity are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations.

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

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

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

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

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

Step 2: Investment analysis:

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

Sub-step 2a: Determine appropriate analysis method:

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

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

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

Selection of benchmark:

As per para 12 of the “Guidelines on the Assessment of Investment Analysis, Version 05, EB 62, Annex 5”, Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity (ROE) are appropriate benchmarks for equity IRR.

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

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

Benchmark at the time of investment decision for 33.60 MW:

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

Benchmark at the time of investment decision for 10.80 MW:

On 01-July-2010 RBI started a policy to control lending base rates and accordingly started publishing base rates in place of BPLR. Therefore, BPLR data for different banks was not available on RBI website at the time of investment decision for 10.8 MW project. PP sourced the BPLR data of different public sector banks from other available sources. The benchmark prime lending rate (BPLR) of different major public sector banks in India was as follows at the time of investment decision:

Bank	BPLR	Reference
Punjab National Bank	12.50% w.e.f. 08-December-2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=ba9d9e83-d2ef-4700-95a5-ff22c3f98a98&param1=1
Corporation Bank	13% w.e.f. 13-December-2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=38994047-578c-4449-aa7d-bdd2146a4e69&param1=1
State Bank of India	12.50% w.e.f. 21-October-2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=ba021c2f-6e56-4d95-b0c9-aa76293e185c&param1=1
Bank of Baroda	13.25%	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=82a06e26-2c6b-4398-8f43-b93709a336c2&param1=1

	w.e.f. 13-December-2010	
Bank of India	13.25% w.e.f. 15-December-2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=fe6bda95-ed52-4128-aaf0-8a1b66c81d51&param1=1
Dena Bank	13.75% w.e.f. 15-December-2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=225835b3-7d5d-4cc6-bda1-6b2118160f11&param1=1
Allahabad Bank	13.25% w.e.f. 14-December-2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=7206917f-5e23-4172-b808-6fa7f7db58b5&param1=1
Andhra Bank	13% w.e.f. 13-December-2010	http://www.bseindia.com/stockinfo/anndet.aspx?newsid=99459413-0093-43cd-95bf-327ab20bbbb0&param1=1

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

Step 3. Barrier analysis:

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

Step 4. Common practice analysis:

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

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

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

Program in 2003, which was designed to bring wind power development in India onto a new commercial footing.

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

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

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

(ii) Large scale wind power projects in Rajasthan:

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

R-14.	16.5 MW Grid-connected, Bundled Wind Power Project, Jodhpur, Rajasthan, India.	14-January-2009	16.5
R-15.	19.5 MW wind power project in Ossiya, Rajasthan by Gujarat Fluorochemicals Limited (GFL)	04-January-2008	19.5

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

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

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

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

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

3.6 Methodology Deviations

There is no request for methodology deviation applied during current monitoring period.

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline Emissions (BE_y):

As per the approved consolidated Methodology ACM0002 (Version 20.0) para 39:

Baseline emissions include only CO₂ emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

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

Where:

BE _y	=	Baseline emissions in year y (tCO ₂)
EG _{PJ,y}	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)
EF _{grid,CM,y}	=	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO ₂ /MWh)

As per methodology, combined grid emission factor as per the “Tool to calculate the emission factor for an electricity system” version 07 is calculated as below.

CO₂ Baseline Database for the Indian Power Sector, Version 17, October 2021 published by Central Electricity Authority (CEA), Government of India has been used for the calculation of emission reduction.

As per Methodological tool: Tool to calculate the emission factor for an electricity system (Version 07.0, EB 100, Annex 4), following six steps have been followed:

- | | | |
|-----|---------|---|
| (a) | Step 1: | Identify the relevant electricity systems; |
| (b) | Step 2: | Choose whether to include off-grid power plants in the project electricity system (optional); |
| (c) | Step 3: | Select a method to determine the operating margin (OM); |
| (d) | Step 4: | Calculate the operating margin emission factor according to the selected method; |
| (e) | Step 5: | Calculate the build margin (BM) emission factor; |
| (f) | Step 6: | Calculate the combined margin (CM) emission factor. |

Step 1: Identify the relevant electricity systems

As described in tool “For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity systems”. It also states that “If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used”. Keeping this into consideration, the Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern.

However since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this CO₂ Baseline Database. As of 31-December-2013, the Southern grid has also been synchronized with the NEWNE grid, hence forming one unified Indian Grid. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the INDIAN grid as per CM calculations is serving as the baseline for this project.

Table: Geographical Scope of Indian Electricity Grid

Northern	Eastern	Western	North-Eastern	Southern
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Andhra Pradesh
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryana	Orissa	Daman & Diu	Manipur	Kerala
Himachal Pradesh	West Bengal	Dadar & Nagar Haveli	Meghalaya	Tamil Nadu
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Telangana
Punjab	Andaman & Nicobar	Maharashtra	Nagaland	Puducherry

Rajasthan		Goa	Tripura	Lakshadweep
Uttar Pradesh				
Uttarakhand				

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

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

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

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

The Project Participant has chosen only grid power plants in the calculation.

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

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods, which are described under Step 4:

- (a) Simple OM; or
- (b) Simple adjusted OM; or
- (c) Dispatch data analysis OM; or
- (d) Average OM.

The data required to calculate Simple adjusted OM and Dispatch data analysis OM is not possible due to lack of availability of data to project developers. The choice of other two options for calculating operating margin emission factor depends on generation of electricity from low-cost/ must-run sources. In the context of the methodology low cost/must run resources typically include hydro, geothermal, wind, low cost biomass, nuclear and solar generation.

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

	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
India	15.1%	14.6%	14.3%	14.5%	17.0%	16.5%

Data Source: Central Electricity Authority (CEA) database Version 17, October 2021

The above data clearly shows that the percentage of total grid generation by low-cost/ must-run plants (on the basis of average of five most recent years) for the Indian grid is less than 50 % of the total generation. Thus the Average OM method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation.

The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

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

(a) Ex-ante option: if the ex-ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required.

OR

(b) Ex-post option: if the ex-post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

PP has chosen ex-ante option for calculation of Simple OM emission factor using a 3-year generation-weighted average, based on the most recent data available at the time of submission of the PD to the DOE for validation.

OM determined at validation stage will be the same throughout the crediting period. There will be no requirement to monitor & recalculate the emission factor during the crediting period.

Step 4: Calculate the operating margin emission factor ($EF_{grid,OMSimple,y}$) according to the selected method

The operating margin emission factor has been calculated using a 3 year data vintage:

Net Generation in Operating Margin (GWh) (incl. Imports)			
	2018-19	2019-20	2020-21
INDIAN Grid	995,957	965,009	958,218

Simple Operating Margin (tCO ₂ /MWh) (incl. Imports)			
	2018-19	2019-20	2020-21
INDIAN Grid	0.9603	0.9555	0.9405

Weighted Generation Operating Margin	
INDIAN Grid	0.9522

Step 5: Calculate the build margin (BM) emission factor ($EF_{grid,BM,y}$)

As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, and Annex 4) para 72:

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

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

(b) Option 2 - For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin

emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 1 as described above is chosen by PP to calculate the build margin emission factor for the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PD and is fixed for the entire crediting period.

Build Margin (tCO ₂ /MWh) (not adjusted for imports)	
	2020-21
INDIAN Grid	0.8653

Step 6: Calculate the combined margin (CM) emission factor (EF_{grid,CM,y})

As per Methodological tool: “Tool to calculate the emission factor for an electricity system” (Version 07.0, EB 100, and Annex 4) para 81:

The calculation of the combined margin (CM) emission factor (EF_{grid,CM,y}) is based on one of the following methods:

- (a) Weighted average CM; or
- (b) Simplified CM.

PP has chosen option (a) i.e weighted average CM to calculate the combined margin emission factor for the project activity.

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$$

Where:

- EF_{grid,BM,y} = Build margin CO₂ emission factor in year y (t CO₂/MWh)
- EF_{grid,OM,y} = Operating margin CO₂ emission factor in year y (t CO₂/MWh)
- W_{OM} = Weighting of operating margin emissions factor (per cent)
- W_{BM} = Weighting of build margin emissions factor (per cent)

The following default values should be used for W_{OM} and W_{BM}:

Wind and solar power generation project activities: W_{OM} = 0.75 and W_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods. Since project activity is of Wind power generation, the above weightage has been considered for OM and BM.

$$\begin{aligned} \text{Therefore, } EF_{grid,CM,y} &= 0.9522 * 0.75 + 0.8653 * 0.25 \\ &= 0.9305 \text{ tCO}_2/\text{MWh} \end{aligned}$$

Baseline emission factor (EF_y):

The baseline emission factor is calculated using the combined margin approach as described in Step 6 above:

$$\text{Therefore, } EF_y = EF_{grid,CM,y} = 0.9305 \text{ tCO}_2/\text{MW}$$

EG_{PJ,y} = EG_{facility,y} as this project activity is a greenfield power plant.

Baseline Emissions

$$\begin{aligned}
 BE_y &= EG_{\text{facility},y} \times EF_{\text{grid},CM,y} \\
 &= 91,158 \text{ MWh} \times 0.9305 \text{ tCO}_2\text{e/MWh} \\
 &= 84,822 \text{ tCO}_2\text{e/year (Round down Value)}
 \end{aligned}$$

4.2 Project Emissions

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

4.3 Leakage

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

4.4 Estimated Net GHG Emission Reductions and Removals

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
2020-2021	84,822	0	0	84,822
2021-2022	84,822	0	0	84,822
2022-2023	84,822	0	0	84,822
2023-2024	84,822	0	0	84,822
2024-2025	84,822	0	0	84,822
2025-2026	84,822	0	0	84,822
2026-2027	84,822	0	0	84,822
2027-2028	84,822	0	0	84,822
2028-2029	84,822	0	0	84,822
2029-2030	84,822	0	0	84,822
Total	848,220	0	0	848,220

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO ₂ /MWh
Description	Operating margin CO ₂ emission factor for Unified Indian Grid in the year y
Source of data	CO ₂ Baseline Database for the Indian Power Sector, User Guide (Version 17)
Value applied:	0.9522
Justification of choice of data or description of measurement methods and procedures applied	The Central Electricity Authority of India prepares the data
Purpose of Data	For the calculation of grid emission factor for estimating the baseline emissions.
Comments	This database is an official publication of Government of India for the purpose of CDM baseline. It is based on most recent data available to the Central Electricity Authority and hence considered authentic. As the calculation of baseline emission has been done ex ante its value will remain fixed for the entire crediting period.

Data / Parameter	EF _{grid,BM,y}
Data unit	tCO ₂ /MWh
Description	Build margin CO ₂ emission factor for Unified Indian Grid in the year y
Source of data	CO ₂ Baseline Database for the Indian Power Sector, User Guide (Version 17 ⁷)
Value applied	0.8653
Justification of choice of data or description of measurement methods and procedures applied	The Central Electricity Authority of India prepares the data.
Purpose of Data	For the calculation of grid emission factor
Comments	This database is an official publication of Government of India for the purpose of CDM baselines. It is based on most recent data available to the Central Electricity Authority and hence considered

⁷ https://cea.nic.in/wp-content/uploads/tpe_cc/2022/02/User_Guide_ver_17_2021.pdf

authentic. As the calculation of baseline emission has been done ex ante its value will remain fixed for the entire crediting period.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO ₂ /MWh
Description	Combined margin CO ₂ emission factor for Unified Indian Grid in the year y
Source of data	Grid emission factor calculation: $EF_{grid,CM,y} = 0.75 \times EF_{OM,y} + 0.25 \times EF_{BM,y}$ $= 0.75 \times 0.9522 + 0.25 \times 0.8653$ $= 0.9305 \text{ tCO}_2/\text{MWh}$ Values of OM and BM are taken from CEA User Guide, CO₂ Baseline Database for the Indian Power Sector, Version 17.
Value applied	0.9305
Justification of choice of data or description of measurement methods and procedures applied	The $EF_{grid,CM,y}$ calculation is based on the guidelines in emission tool.
Purpose of Data	For the calculation of emission reductions from the project activity.
Comments	The calculation is done ex ante.

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{export, y}$
Data unit	MWh
Description	Electricity exported to the grid by the project activity in year y
Source of data	The main meter located at common metering point at each project location.
Description of measurement methods and procedures applied	The main meter installed at each of the common metering point measures the export of electricity on continuous basis. Main meter reading is taken and verified, once in a month, jointly by the representatives of the state utility and the contractor (SISL).
Frequency of monitoring/recording	Continuous measurement and monthly recording

Value applied:	91,158
Monitoring equipment	Energy Meter (Main Meter).
QA/QC procedures applied	Calibration: Once in a year. Accuracy:0.2% (Main meter)
Purpose of data	To calculate baseline emission.
Calculation method	Not applicable
Comments	The data will be archived for the crediting period + 2 years

Data / Parameter	$EG_{import, y}$
Data unit	MWh
Description	Electricity imported by the project activity from the grid in year y
Source of data	The main meter located at common metering point at each project location.
Description of measurement methods and procedures to be applied	The main meter installed at each of the common metering point measures the import of electricity on continuous basis. Main meter reading is taken and verified, once in a month, jointly by the representatives of the state utility and the contractor (SISL).
Frequency of monitoring/recording	Continuous measurement and monthly recording
Value monitored	0
Monitoring equipment	Energy Meter (Main Meter)
QA/QC procedures to be applied	Calibration: Once in a year. Accuracy:0.2% (Main meter)
Purpose of the data	To calculate baseline emission
Calculation method	Not applicable
Comments	The data will be archived for the crediting period + 2 years

Data / Parameter	$EG_{facility, y}$
Data unit	MWh
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the project activity in year y
Source of data	Joint meter reading report / Credit report (Madhya Pradesh & Rajasthan)

Description of measurement methods and procedures to be applied	The main meter installed at each of the common metering point measures the export and import of electricity on continuous basis. Main meter readings are taken and verified, once in a month, jointly by the representatives of the state utility and the contractor (SISL). The net electricity supplied to the grid is calculated by subtracting the import of the electricity from the export of the electricity.
Frequency of monitoring/recording	Monthly
Value monitored	91,158
Monitoring equipment	Energy Meter (Main Meter)
QA/QC procedures to be applied	The data is cross-checked with the invoices raised in case sale of the electricity and electricity bills in case of captive use.
Purpose of the data	To calculate baseline emission.
Calculation method	Net electricity fed to the grid is calculated as $EG_{PJ,y} = EG_{\text{export},y} - EG_{\text{import},y}$
Comments	The data will be archived for the crediting period + 2 years

5.3 Monitoring Plan

Monitoring of emission reductions is carried as per the applied methodology in the project activity i.e. ACM0002, version 20.0, which requires monitoring of the following relevant parameters:

- $EF_{\text{grid,CM},y}$: Combined margin CO₂ emission factor for Unified Indian Grid in the year y
- $EG_{PJ,y}$: Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y

Since the project proponent has chosen ex-ante determination of CO₂ emission factor for the grid, the monitoring of operating margin emission factor and build margin emission factor is not required. Further, wind based electricity generation is not associated with any kind of leakages. Hence, the sole parameter for monitoring is the electricity produced and supplied to the grid by the project activity.

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

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

Monitoring Plan:

Metering arrangement:

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

Metering Equipment:

The project activity has the following metering systems:

Controller:

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

Main and check meters:

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

Monitoring of power generation at the WTGs:

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

Monitoring of electricity supplied to the grid by the WTGs:

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

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

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

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

Procedure to calculate export of electricity by individual WTG

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

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

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

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

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

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

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

$$\text{Export multiplying factor (Mi)} = \text{EG}_{\text{export}} / \text{EG}_{1,\text{sum}}$$

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

$$\text{EG}_{\text{export}i} = \text{Mi} \times \text{EG}_{1,i}$$

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

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

$\text{EG}_{\text{import}}$ = Electricity imported (consumed) by all WTGs from the grid as recorded at the main meter

Calculation of Multiplication Factor for import:

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

$$\text{Import multiplying factor (mi)} = \text{EG}_{\text{import}} / \text{EG}_{1,\text{sum}}$$

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

$$\text{EG}_{\text{import}i} = \text{mi} \times \text{EG}_{1,i}$$

$$\text{Net electricity exported to grid by } i^{\text{th}} \text{ WTG (EG}_{y,i}\text{)} = \text{EG}_{\text{export}i} - \text{EG}_{\text{import}i}$$

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

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

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

Example: Let us assume,

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

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

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

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

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

Troubleshooting Contingency Plan:

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

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

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

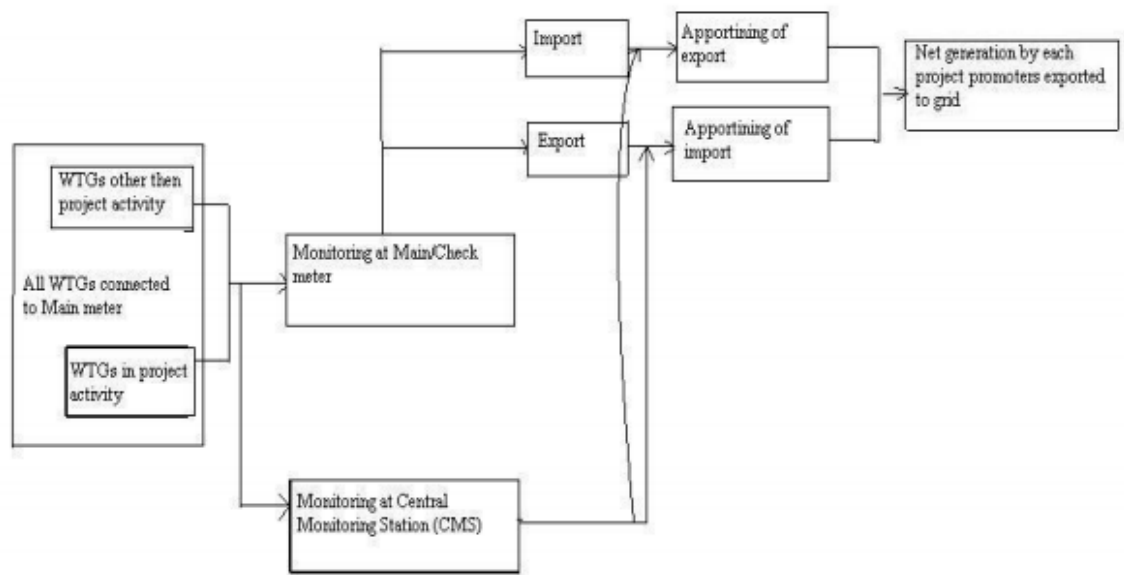
QA/QC procedures:

The energy main/ check meter installed at the project site is having the accuracy class of 0.2%. The main/check meter shall be jointly inspected and sealed by the utility and shall not be interfered by either utility or project proponent except in the presence of the accredited representatives of both utility and SISL. The meters are calibrated by the state electricity utility once in a year.

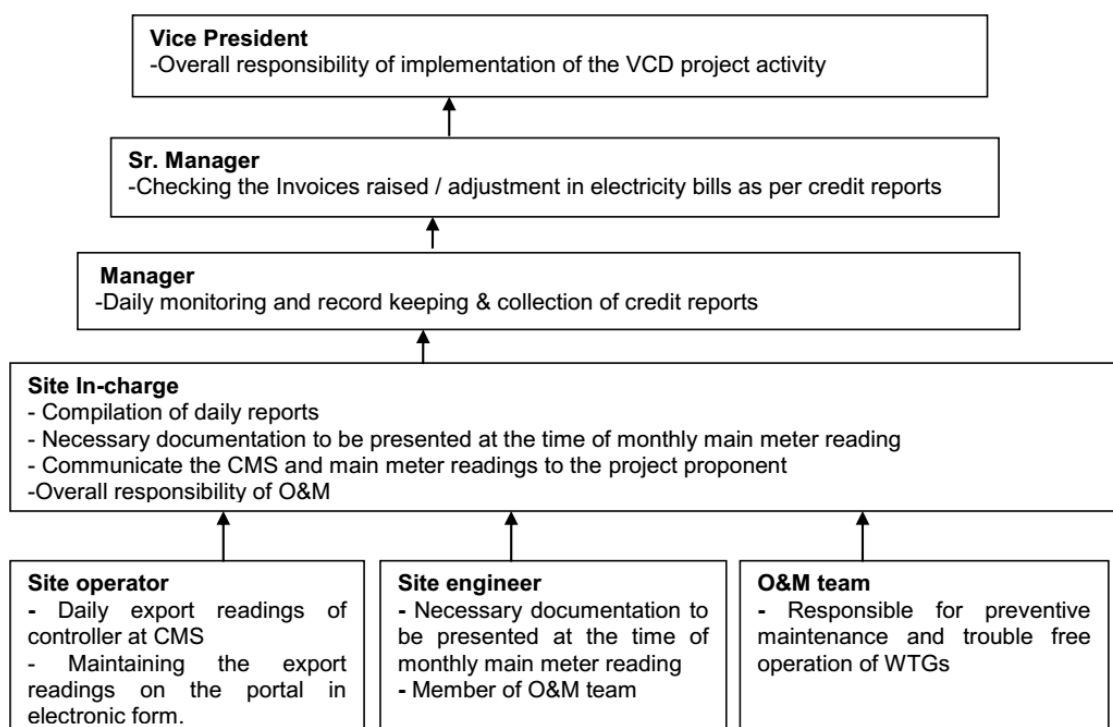
Data archiving:

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

Metering location diagram of this project activity is shown below:



Operational and organizational chart for monitoring:



6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	EG _{export, y}
Data unit	MWh
Description	Electricity exported to the grid by the project activity in year y
Value applied:	152,060.715
Comments	The data will be archived for the crediting period + 2 years

Data / Parameter	EG _{import, y}
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Data unit	MWh
Description	Electricity imported by the project activity from the grid in year y
Value applied:	1,382.25
Comments	The data will be archived for the crediting period + 2 years

Data / Parameter	EG _{facility,y}
Data unit	MWh
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the project activity in year y
Value applied:	149,951.566
Comments	The data will be archived for the crediting period + 2 years

6.2 Baseline Emissions

Baseline Emissions (BE_y):

Baseline Emission in 2018 from 13-December-2018 to 31-December-2018,

$$\begin{aligned}
 BE_y &= EG_{PJ,y} \times EF_{grid,CM,y} \\
 &= 2,618.576 \text{ MWh} \times 0.94865 \text{ tCO}_2\text{e/MWh} \\
 &= 2,484 \text{ tCO}_2\text{e(Rounded Down Value)}
 \end{aligned}$$

Baseline Emission in 2019 from 01-January-2019 to 31-December-2019,

$$\begin{aligned}
 BE_y &= EG_{PJ,y} \times EF_{grid,CM,y} \\
 &= 61,941.71 \text{ MWh} \times 0.94865 \text{ tCO}_2\text{e/MWh} \\
 &= 58,761 \text{ tCO}_2\text{e(Rounded Down Value)}
 \end{aligned}$$

Baseline Emission in 2020 from 01-January-2020 to 25-February-2020,

$$\begin{aligned}
 BE_y &= EG_{PJ,y} \times EF_{grid,CM,y} \\
 &= 7,549.2 \text{ MWh} \times 0.94865 \text{ tCO}_2\text{e/MWh}
 \end{aligned}$$

$$= 7,161 \text{ tCO}_2\text{e(Rounded Down Value)}$$

Baseline Emission in 2020 from 26-February-2020 to 31-December-2020,

$$\begin{aligned} BE_y &= EG_{\text{facility},y} \times EF_{\text{grid,CM},y} \\ &= 48,340.018 \text{ MWh} \times 0.9305^8 \text{ tCO}_2\text{e/MWh} \\ &= 44,527 \text{ tCO}_2\text{e(Rounded Down Value)} \end{aligned}$$

Baseline Emission in 2021 from 01-January-2021 to 30-June-2021,

$$\begin{aligned} BE_y &= EG_{\text{facility},y} \times EF_{\text{grid,CM},y} \\ &= 29,988.645 \text{ MWh} \times 0.9305 \text{ tCO}_2\text{e/MWh} \\ &= 27,904 \text{ tCO}_2\text{e(Rounded Down Value)} \end{aligned}$$

6.3 Project Emissions

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

6.4 Leakage

No other leakage emissions are considered. $LE_y = 0$

6.5 Net GHG Emission Reductions and Removals

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where

$$\begin{aligned} ER_y &= \text{Emission reductions in year } y \text{ (t CO}_2\text{e)} \\ BE_y &= \text{Baseline emissions in year } y \text{ (t CO}_2\text{e)} \\ PE_y &= \text{Project emissions in year } y \text{ (t CO}_2\text{e)} \\ LE_y &= \text{Leakage emissions in year } y \text{ (t CO}_2\text{e)} \end{aligned}$$

The net GHG emission reduction for this project activity for current monitoring period is shown table below:

Table: Net Emission Reduction from 13-December-2018 to 25-February-2020(Monitoring Period under First Crediting Period)

⁸ This is the combined margin emission factor of second crediting period.

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)
2018	2,484	0	0	2,484
2019	58,761	0	0	58,761
2020	7,161	0	0	7,161
Total	68,406	0	0	68,406

Table: Net Emission Reduction from 26-February-2020 to 30-June-2021(Monitoring Period under Second Crediting Period)

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)
2020	44,527	0	0	44,527
2021	27,904	0	0	27,904
Total	72,431	0	0	72,431

The total emission reduction for current monitoring period(13-December-2018 to 30-June-2021) is = (68,406 + 72,431) tCO₂e

= 140,837 tCO₂e.

The total monitoring period(13-December-2018 to 30-June-2021) is of 931 days within which first 440 days are under First Crediting Period and next 491 days are under Second Crediting Period. The estimated annual emission reduction as per PD is 81,853 tCO₂for first crediting period. The estimated annual emission reduction as per PD is 84,822 tCO₂ for second crediting period.

So, the estimated emission reduction for the first 440 days of monitoring period which are under First Crediting Period will be

= (81,853/365)×440

= 98,672 tCO₂e

The estimated emission reduction for the next 491 days of monitoring period which are under Second Crediting Period will be

$$= (84,822/365) \times 491$$

$$= 114,103 \text{ tCO}_2\text{e}$$

So, the estimated emission reduction in current monitoring period

$$= (98,672 + 114,103) \text{ tCO}_2\text{e}$$

$$= 212,775 \text{ tCO}_2\text{e}$$

The % fall in emission reduction in current monitoring period as compared to estimated emission reduction is = $(140,837 - 212,775)/212,775$

$$= -0.3381$$

$$= -33.81\%$$

The fall(33.81%) in generation as compared to estimated emission reduction is justified as the generation in wind power plant is dependent on weather conditions.

APPENDIX I: METER CALIBRATION DETAILS

Palsodi

WTG ID	Feeder	Meter No.	Meter Type	Make	Accuracy	Calibration Date	Validity of Calibration	Delay in Calibration
PR-11, 12, 16, 18	Palsodi I	MPC49084	Main Meter	SEMS	0.2	20-February-2016	19-February-2017	13-December-2018 to 30-May-2019,
		XE479853 ⁹	Main Meter	Secure	0.2	31-May-2019 03-September-2020	30-May-2020 02-September-2021	31-May-2020 to 02-September-2020
		3596373	Check Meter	Genus Power	0.5	22-February-2018	21-February-2019	22-February-2019 to 02-September-2020.
		Q0337345 ¹⁰	Check Meter	Secure	0.2	03-September-2020	02-September-2021	
PR-01 to 06, PR-17, 19	Palsodi II	MPC49087	Main Meter	Secure	0.2	20-February-2016	19-February-2017	13-December-2018 to 30-May-2019,
		XE479854 ¹¹	Main Meter	Secure	0.2	31-May-2019, 03-September-2020	30-May-2020, 02-September-2021	31-May-2020 to 02-September-2020
		3596486	Check Meter	Genus Power	0.5	22-February-2018	21-February-2019	22-February-2019 to 02-September-2020.
		Q0306206 ¹²	Check Meter	Secure	0.2	03-September-2020	02-September-2021	
PR-08, 09, 10, 13,	Palsodi III	MPC49086	Main Meter	SEMS	0.2	20-February-2016	19-February-2017	13-December-2018 to 30-May-2019,
		XE479855 ¹³	Main Meter	Secure	0.2	31-May-2019, 03-September-2020	30-May-2020, 02-September-2021	31-May-2020 to 02-

⁹ Meter No. MPC49084 was replaced by Meter No. XE479853 on 31-May-2019

¹⁰ Meter No. 3596373 was replaced by Meter No. Q0337345 on 03-September-2020.

¹¹ Meter no. MPC49087 was replaced by Meter No. XE479854 on 31-May-2019

¹² Meter No. 3596486 was replaced by Meter No. Q0306206 on 03-February-2020.

¹³ Meter No. MPC49086 was replaced by Meter No. XE479855 on 31-May-2019.

14, 15								September-2020
		3596488	Check Meter	Genus Power	0.5	22-February-2018	21-February-2019	22-February-2019 to 02-September-2020.
		Q0380984 ¹⁴	Check Meter	Secure	0.2	03-September-2020	02-September-2021	

Rajasthan(Osiyan, RKB, Akal)

WTG ID	Feeder	Meter No.	Meter Type	Make	Accuracy	Calibration Date	Validity of Calibration	Delay in Calibration
OS-48, OS-49	Phase-127	RJB74503	Main Meter	Secure	0.2	27-February-2018, 18-April-2019, 12-September-2020	26-February-2019, 17-April-2020, 11-September-2021	27-February-2019 to 17-April-2019, 18-April-2020 to 11-September-2020
		RJB74504	Back up Meter	Secure	0.2	27-February-2018	26-February-2019,	27-February-2019 to 12-July-2019, 13-July-2020 to 11-September-2020.
		RJB78180 ¹⁵	Back up Meter	Secure	0.2	13-July-2019, 12-September-2020	12-July-2020, 11-September-2021	
AK-400, AK-401, AK-414, AK-415, AK-416, AK-417, AK-253, AK-308	Phase 81	RJB90208	Main Meter	Secure	0.2	18-July-2017, 20-April-2018, 17-June-2019, 26-November-2020	17-July-2018, 19-April-2019, 16-June-2020, 25-November-2021	20-April-2019 to 16-June-2019, 17-June-2020 to 25-November-2020
		RJB90209	Back up Meter	Secure	0.2	18-July-2017, 20-April-2018, 17-June-2019, 26-November-2020	17-July-2018, 19-April-2019, 16-June-2020, 25-November-2021	20-April-2019 to 16-June-2019, 17-June-2020 to 25-November-2020

¹⁴ Meter No. 3596488 was replaced by Meter No. Q0380984 on 03-February-2020.

¹⁵ Meter No. RJB74504 was replaced by Meter No. RJB78180 on 13-July-2019.

RKB-075, RKB-076	Tinwari Feeder No. 1	RJB90216	Main Meter	Secure	0.2	24-April-2017, 25-April-2019, 07-November-2020	23-April-2018, 24-April-2020, 06-November-2021	13-December-2018 to 24-April-2019, 25-April-2020 to 06-November-2020
		RJB90217	Back up Meter	Secure	0.2	24-April-2017, 25-April-2019, 07-November-2020	23-April-2018, 24-April-2020, 06-November-2021	13-December-2018 to 24-April-2019, 25-April-2020 to 06-November-2020

Jaora

WTG ID	Feeder	Meter No.	Meter Type	Make	Accuracy	Calibration Date	Validity of Calibration	Delay in Calibration
NL-01-10, JO-10, 12, 19, JO-13,14,15)	Feeder III	MPC49089	Main Meter	SEMS	0.2	25-August-2015	24-August-2016	13-December-2018 to 31-May-2019, 01-June-2020 to 27-December-2020
		XE479856 ¹⁶	Main Meter	Secure	0.2	01-June-2019, 28-December-2020	31-May-2020, 27-December-2021	
		34412	Check Meter	SEMS	0.5	17-November-2012	16-November-2013	13-December-2018 to 31-May-2019, 01-June-2020 to 27-December-2020
		Q0306209 ¹⁷	Check Meter	Secure	0.2	01-June-2019, 28-December-2020	31-May-2020, 27-December-2021	
JO-03 to 05,	Feeder IV	MPC49082	Main Meter	SEMS	0.2	06-October-2018	05-October-2019	01-June-2020 to 27-

¹⁶ Meter No. MPC49089 was replaced by Meter No. XE479856 on 01-June-2019.

¹⁷ Meter No. 34412 was replaced by Meter No. Q0306209 on 01-June-2019.

JO-08, JO-16 to 18, JO-20 to 22		XE479857 ¹⁸	Main Meter	Secure	0.2	01-June-2019, 28-December-2020	31-May-2020, 27-December-2021	December-2020
		3475860	Check Meter	SEMS	0.5	17-November-2012	16-November-2013	15-November-2014 to 31-May-2019
		Q0306205 ¹⁹	Check Meter	Secure	0.2	01-June-2019, 28-December-2020	31-May-2020, 27-December-2021	

¹⁸ Meter No. MPC 49082 was replaced by Meter No. XE479857 on 01-June-2019.

¹⁹ Meter No. 3475860 was replaced by Meter No. Q0306205 on 01-June-2019.

APPENDIX II:<BREAKDOWN DETAILS>

WTG ID	Date	Breakdown Hours
05-December-2018	PR10	23
06-December-2018	PR10	24
13-December-2018	J014	19.1
21-February-2019	OS49	15
12-November-2019	AK416	10
02-April-2020	PR15	24
29-October-2020	PR18	24
17-April-2021	NL06	14.3