



**Verified Carbon
Standard**

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



Document Prepared by EKI Energy Services Limited

Project Title	44.40 MW Wind Energy Project by Ruchi Soya Industries Limited, India
Version	04
Report ID	VVER 268
Date of Issue	18-November-2022
Project ID	835 ¹
Monitoring Period	13-December-2012 to 12-December-2018 (first and last days included)
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¹<https://registry.terra.org/app/projectDetail/VCS/835>

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project activity is a renewable source of power generation and supplies the electricity to the NEWNE grid(now a part of 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). 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 is located in Rajasthan and Madhya Pradesh state of India.

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

Brief description of the installed technology and equipment:

The project activity involves WTGs made by Suzlon, models S82²- rated capacity 1500 kW, and S52³-rated capacity 600 kW.

The relevant implementation dates

The first WTG was commissioned on 26-February-2010. The last WTG was commissioned on 17-June-2011. Since then, all WTGs have been running satisfactorily.

The total GHG emission reductions or removals generated in this monitoring period.

The total emission reductions achieved in this monitoring period i.e. from 13-December-2012 to 12-December-2018 (first and last days included) is 330,047 tCO₂ e.

1.2 Sectoral Scope and Project Type

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

Project Type: I – Renewable Energy Projects

Project is not grouped project activity as per VCS guidelines.

1.3 Project Proponent

Organization name	Ruchi Soya Industries Limited
Contact person	Mr. Ashish Verma

²<https://www.suzlon.com/pdf/product/Suzlon-S82-product-brochure.pdf>

³<https://pdf.directindustry.com/pdf/suzlon/s52-600-kw/102149-295859.html>

Title	Assistant Manager
Address	Ruchi Soya Industries Limited, 601, Part B-2, Metro Tower 6 th Floor, Vijay Nagar, A B Road, Indore-452010
Telephone	+91-731-4289086
Email	registry@enkingint.org

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Project Consultant
Contact person	Bibhushita Ghose
Title	Manager
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1.5 Project Start Date

Project Start Date: The project start date is the date on which the project began generating GHG emission reductions. The first WTG of the project activity commissioned on 26-February-2010 and started generating GHG emission reductions. Therefore, Project Start Date is 26-February-2010.

1.6 Project Crediting Period

Project Crediting Period Start date: 26-February-2010

Project Crediting Period End date: 25-February-2020

Total Crediting Period: 10Years

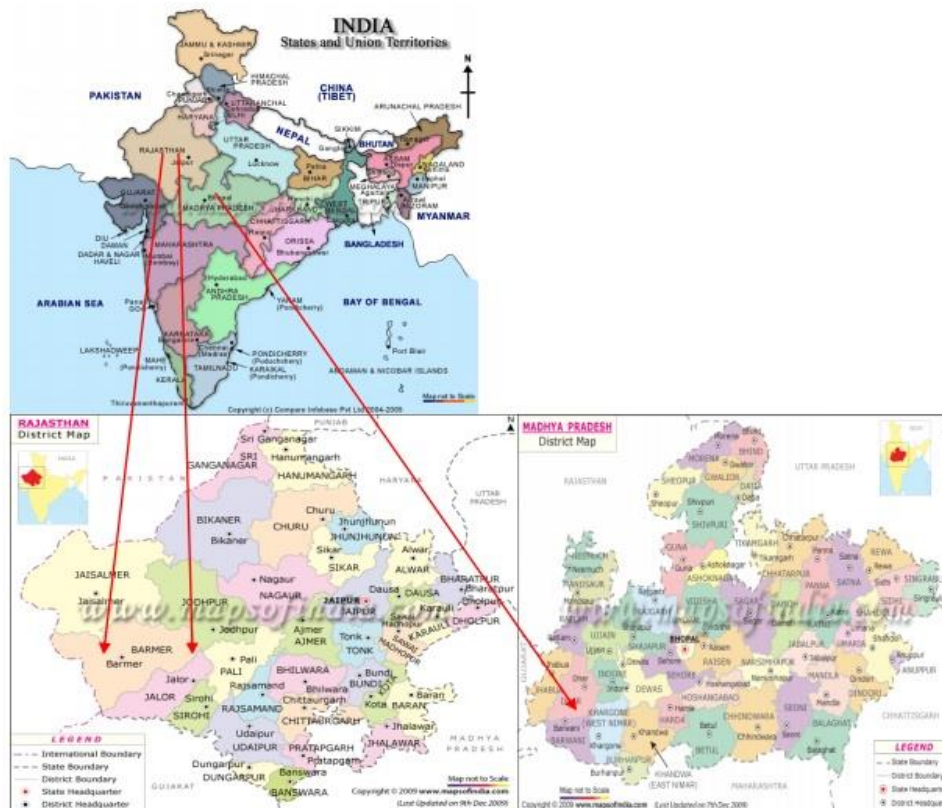
1.7 Project Location

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

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

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



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

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

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

1.8 Title and Reference of Methodology

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

Reference: Approved consolidated baseline and monitoring methodology ACM0002; Version 12.1.0 (EB 58)⁴.

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

“Tool for the demonstration and assessment of additionality”; Version: 05.2.1(EB39)⁵

“Tool to calculate the emission factor for an electricity system”; Version: 02.2.1(EB63)⁶

1.9 Participation under other GHG Programs

The project activity has already been registered with UNFCCC for two CDM projects as detailed below

Project 8592⁷ : 35.10 MW Wind Energy Project by Ruchi Soya Industries Limited, India.

Capacity of the project UN 8592 is 35.1 MW. Out of 35.1 MW, 33.6 MW is registered in this VCS project activity. The WTGs which are registered in this VCS project activity and UN 8592 are – JO-10, JO-12, JO-19, NL-01, NL-02, NL-03, NL-04, NL-05, NL-06, NL-07, NL08, NL-09, NL-10, JO-08, JO-13, JO-14, JO-15, JO-16, JO-17, JO-18, JO-03, JO-04, JO-05, JO-20, JO-21, JO-22, AK-400, AK-401, AK-414, AK-415, AK-416, AK-417, AK-253, AK-308, RKB-075, RKB-076, OS-48, OS-49. During current Monitoring Period (13-December-2012 to 12-December-2018), issuance hasn't been claimed from UN 8592 verification. PP has also given undertaking that PP will not claim credit for the same Monitoring Period under other GHG programs.

⁴<https://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNV3LTK1BP3OR24Y5L>

⁵<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf>

⁶<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf>

⁷<https://cdm.unfccc.int/Projects/DB/RWTUV1354786640.92/view>

Project 8818⁸ : Grid Connected Wind Power Generation Project by Ruchi Soya Industries Limited in Madhya Pradesh.

The project UN 8818 was verified for Monitoring Period from 31-December-2012 to 09-April-2015. Capacity of the project UN 8818 is 10.8 MW and all the WTG is also registered under this VCS project activity. The Palsodi site WTGs of this project activity is registered with UN 8818 and thus verified for same Monitoring Period. Project Proponent didn't count the generation from Palsodi site WTGs (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) for the period from 31-December-2012 to 09-April-2015 in current Monitoring Period. PP has also given undertaking that PP will not claim credit for the same Monitoring Period under other GHG programs.

1.10 Other Forms of Credit

The Project has no intend to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program. Also, the project activity has not claimed REC benefits in current monitoring period and has no intend to claim in future.

1.11 Sustainable Development Contributions

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:

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.

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.

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.

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.

⁸ <https://cdm.unfccc.int/Projects/DB/RWTUV1355735181.12/view>

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
Sequential row number	SDG Target number	Number and text of SDG indicator or, if no official SDG indicator is applicable, user-defined indicator	Indicate the project's contribution to the SDG Indicator (implemented activities to increase or decrease)	Brief description of the quantifiable impact of the project's activities related to the SDG indicator, during the monitoring period.	Brief description of the cumulative quantifiable impact of the project's activities related to the SDG indicator, over the project lifetime.

This SDG parameter is not applicable upto 2025.

2 SAFEGUARDS

2.1 No Net Harm

As per the Schedule 1 of the EIA notification dated 27-January-1994 and further modified on 14th September 2006⁹, given by the Ministry of Environment, Forest and Climate Change (Government of India) under the Environment (Protection) Act 1986, EIA is not a regulatory requirement in India for wind energy projects. Thus the project activity doesn't fall under the list of activities requiring EIA. The project activity will not involve any negative environmental impacts, as the WTGs are installed for generation of power using wind which is a clean source of energy.

2.2 Local Stakeholder Consultation

The process of Local Stakeholder Consultation is continuous. No major comments/feedbacks received from the stakeholders since commissioning of plant. PP maintains a grievance register at site office to put feedback and grievances from local stakeholders. In case any grievance is put on the register, the issue is discussed with Head Office and necessary action is taken to resolve the issue. In current Monitoring Period, no such negative feedback has been received from local stakeholder thus no mitigation measure is required. Copy of grievance register is submitted to DOE.

2.3 AFOLU-Specific Safeguards

The project activity deals with generation of electricity using wind energy by Wind Turbine Generator (WTG) and not from AFOLU projects. Hence not applicable.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

Project start date 26-February-2010

Commissioning dates of all WTGs:

Location Nos.	Date of Commissioning
OS-48, OS-49	26-February-2010
RKB-075, RKB-076	08-March-2010
AK-400, AK-401, AK-414, AK-415, AK-416, AK-417	26-March-2010
NL-01, NL-02, NL-03, NL-04, NL-05, NL-06, NL-07, NL-08, NL-09, NL-10, JO-19	27-March-2010
JO-10, JO-12	30-March-2010
JO-13, JO-14, JO-15	31-May-2010
AK-253	24-January-2011
AK-308	15-February-2011
JO-08, JO-16, JO-17, JO-18, JO-20, JO-21, JO-22	29-March-2011

⁹<http://www.environmentwb.gov.in/pdf/EIA%20Notification,%202006.pdf>

JO-03, JO-04, JO-05,	30-March-2011
PR-01, PR-02, PR-03, PR-04, PR-05, PR-06, PR-08, PR-09, PR-17, PR-19	30-March-2011
PR-10, PR-12, PR-13, PR-15, PR-16, PR-18	04-June-2011
PR-11, PR-14	17-June-2011

All the WTGs are running satisfactorily during the reported monitoring period. There are no special events occur during the reported monitoring period. Hence, no impact occurs on the GHG reduction from the project activity. Also no major breakdown has been occurred in current monitoring period.

3.2 Deviations

2.1.1 Methodology Deviations

No methodology deviation is applied during the monitoring period

2.1.2 Project Description Deviations

The meter accuracy class for all Main Meters is 0.2%.

3.3 Grouped Projects

Not applicable as the project is not a grouped project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	EF_{grid,OM,y}
Data unit	tCO ₂ /MWh
Description	Operating margin CO ₂ emission factor for NEWNE grid in the year y
Source of data	“Baseline Carbon Dioxide Emission Database ¹⁰ Version 6.0” published by the Central Electricity Authority, Ministry of Power, Government of India.
Value applied	0.9941
Justification of choice of data or description of measurement methods and procedures applied	Calculated using “Tool to calculate the emission factor for an electricity system, version 02.2.1” as 3-year generation-weighted average of latest three years, 2007-2008, 2008-2009, 2009-2010, data obtained from “CO ₂ Baseline Database for Indian Power Sector” version 6.0, published by the Central Electricity Authority, Ministry of Power, Government of India

¹⁰ https://cea.nic.in/wp-content/uploads/baseline/2020/07/database_6.zip

Purpose of Data	As required by the applied tool data from the official source need to be used for the calculation of emission factor and emission reductions. To meet this requirement here, the value applied is evaluated using data taken from CEA database.
Comments	Computed once during PD finalization (ex-ante) and remain same throughout the crediting period.

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO ₂ /MWh
Description	Build margin CO ₂ emission factor for NEWNE grid in the year y
Source of data	"Baseline Carbon Dioxide Emission Database ¹¹ Version 6.0" published by the Central Electricity Authority, Ministry of Power, Government of India.
Value applied	0.8123
Justification of choice of data or description of measurement methods and procedures applied	Calculated ex ante as per "Tool to calculate the emission factor for an electricity system, ver. 02.2.1" based on the most recent year (2009-10) data available on "Baseline Carbon Dioxide Emission Database Version 6.0".
Purpose of Data	As required by the applied tool data from the official source need to be used for the calculation of emission factor and emission reductions. To meet this requirement here, the value applied is taken from CEA database.
Comments	Computed once during PD finalization (ex-ante) and remain same throughout the crediting period.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO ₂ /MWh
Description	Combined margin CO ₂ emission factor for NEWNE grid in the year y
Source of data	Calculated weighted average combined margin using equation – $EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM}$ The default values for W_{OM} and W_{BM} are taken as applicable to solar power generation project activities as $W_{OM} = 0.75$ and $W_{BM} = 0.25$. Reference: Page 18 of "Tool to calculate the emission factor for an electricity system", Version 02.2.1¹².

¹¹ https://cea.nic.in/wp-content/uploads/baseline/2020/07/database_6.zip

¹² <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v2.2.1.pdf>

Value applied	0.94865
Justification of choice of data or description of measurement methods and procedures applied	Calculated ex ante as per “Tool to calculate the emission factor for an electricity system, ver. 02.2.1” as follows: $EF_{grid,CM,y} = 0.75 \times EF_{grid,OM,y} + 0.25 \times EF_{grid,BM,y}$
Purpose of Data	As required by the applied tool data from the official source need to be used for the calculation of emission factor and emission reductions. To meet this requirement here, the value applied is calculated as per “Tool to calculate the emission factor for an electricity system”.
Comments	Computed once during PD finalization (ex-ante) and remain same throughout the crediting period.

4.2 Data and Parameters Monitored

Data / Parameter	EG_{export,y}
Data unit	MWh (Mega-watt hour)
Description	Electricity exported to the grid by the project activity in year y
Source of data	The main meter located at common metering point at each project location.
Description of measurement methods and procedures to be applied	The main meter installed at each of the common metering point measure 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 monitored	350,867.42
Monitoring equipment	Energy Meter (Main Meter)
QA/QC procedures to be applied	Calibration: Once in a year. Accuracy: 0.2% ¹³ (Main meter) The meter calibration details has been provided in Appendix I.
Purpose of the data	Calculation of Baseline Emissions
Calculation method	Not Applicable
Comments	The data is archived for the crediting period + 2 years.

¹³ In previous Monitoring Period the accuracy class of Main Meter was 0.5% for Palsodi and Jaora site. However, in this Monitoring period, meter replacement has been taken place in those sites and current accuracy class of Main Meter is 0.2%.

Data / Parameter	EG_{import, y}
Data unit	MWh (Mega-watt hour)
Description	Electricity imported from the grid by the project activity in year y
Source of data	The main meter located at common metering point at each project location.
Description of measurement methods and procedures to be applied	The main meter installed at each of the common metering point 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	2,951.363
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	Calculation of Baseline Emissions
Calculation method	Not Applicable
Comments	The data is archived for the crediting period + 2 years.

Data / Parameter	EG_{PJ, y}¹⁴
Data unit	MWh (Mega-watt hour)
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	347,916.05

¹⁴ Generation from WTG ID 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 haven't been considered for the period from 31-December-2012 to 09-April-2015 as this is already verified in UN 8818 verification.

Monitoring equipment	Energy Meter (Main Meter). The Accuracy class of Main Meter is 0.2%. Meter calibration details has been provided in Appendix I of Monitoring Report.
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	Calculation of Baseline Emissions
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 is archived for the crediting period + 2 years

4.3 Monitoring Plan

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

- $EF_{\text{grid}, \text{CM}, y}$: Combined margin CO_2 emission factor for NEWNE grid(now a part of 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 CO_2 emission factor for the grid, the monitoring of operating margin emission factor and build margin emission factor is not required. Further, wind based electricity generation is not associated with any kind of leakages. Hence, the sole parameter for monitoring is the electricity produced and supplied to the grid by the project activity.

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

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

Monitoring Plan:

Metering arrangement:

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

Metering Equipment:

The project activity has the following metering systems:

Controller:

The controller installed on each WTG records export of the electricity by that WTG. Its primary use is to gather data from the anemometer (weather station) located on the top of

the wind turbine. With the collected data the controller points the turbine in the most desired direction with respect to wind direction. It controls the operations of the WTG to optimize working of the WTG through Central Monitoring System (CMS). The controller does not require calibration as it operates with the software.

Main and check meters:

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

Monitoring of power generation at the WTGs:

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

Monitoring of electricity supplied to the grid by the WTGs:

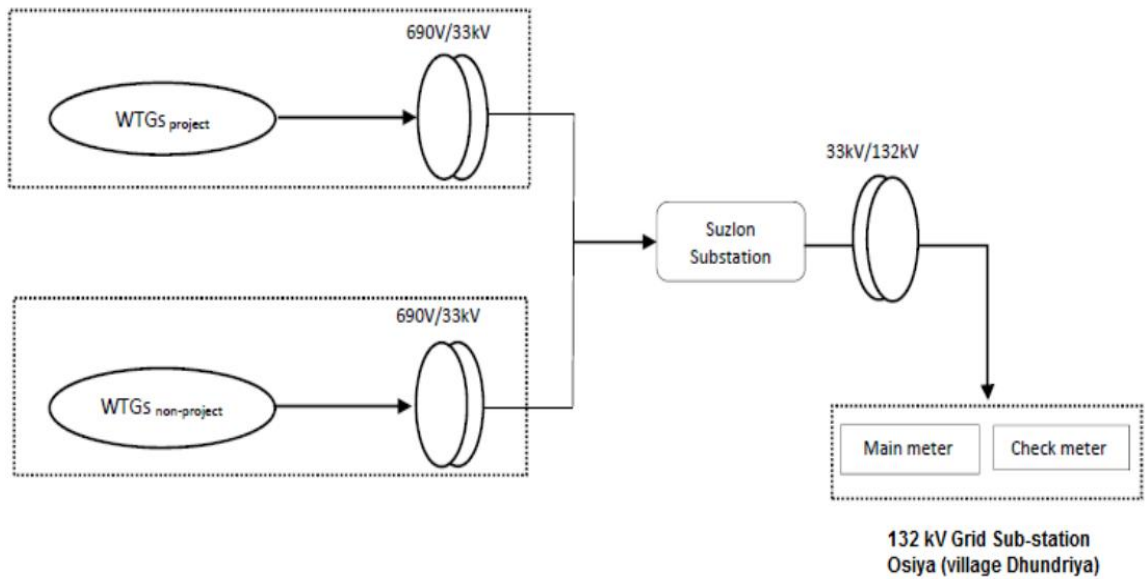
The electricity supplied to the grid by the WTGs connected to the main / check meter is recorded monthly. The main/ check meter reading is taken and certified jointly by the representatives of the respective state utility and the contractor (SISL). The main meter readings are noted by the authorities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

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

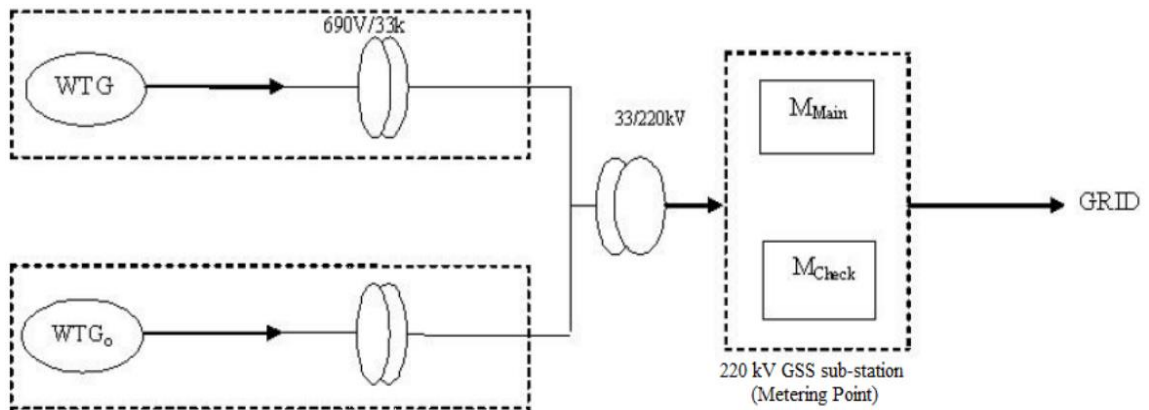
Apportioning Procedure to calculate net electricity supplied to the grid by individual WTG:

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

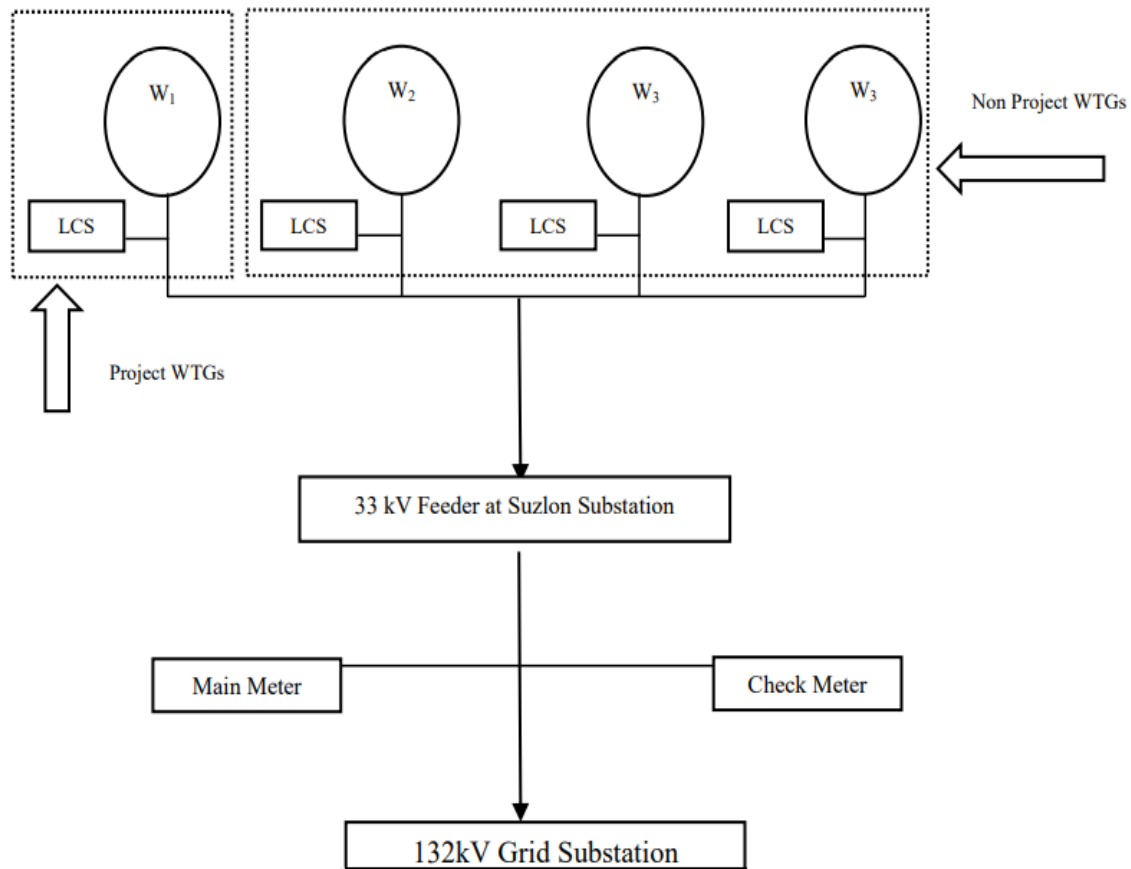
Line diagram to show metering arrangement of at **Osiyan site** in Rajasthan



Line diagram to show metering arrangement of at **RKB, AKAL I and II** site in Rajasthan



Line diagram showing Palsodi & Jaora site in Madhya Pradesh



Procedure to calculate export of electricity by individual WTG

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,

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

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

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

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

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

The apportioning is 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 automatically get shut down and the controller is replaced by a new controller immediately. However no such even occurs during the current verification period. Furthermore, if any change happening in controller will be reported in the concerned monitoring report during verification. Controller data is 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 of the corresponding period of main meter reading (kWh)

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

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

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

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

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

with-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. In 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 sub-station as follows:

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

However during the current verification cycle no such event occurred, all the energy meters were working within the permissible limits. Furthermore, for the delayed calibration period error factor is been applied to the export and import values.

QA/QC procedures

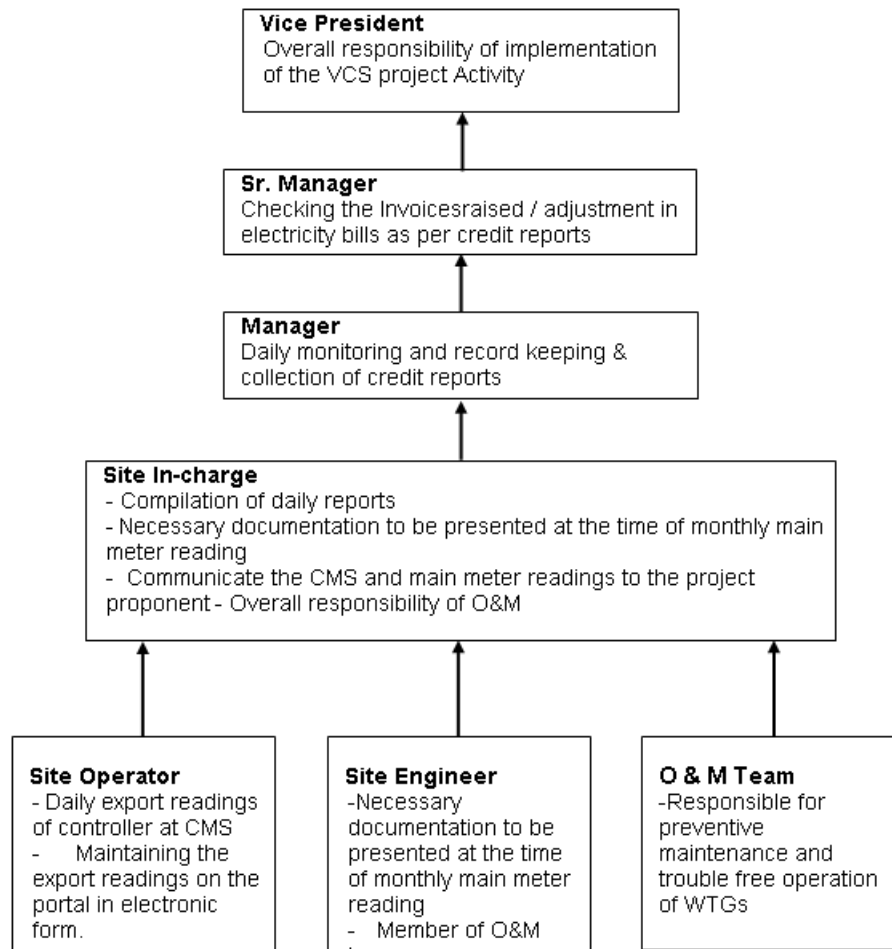
The energy main/ check meter installed at the project site is having the accuracy class of 0.2¹⁵%. The main/ check meter shall be jointly inspected and sealed by the utility and shall not be interfered by either utility or project proponent except in the presence of the accredited representatives of both utility and SISL. The meters are calibrated by the state electricity utility once in a year.

Data archiving:

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

¹⁵ During replacement of metres, 0.2s accuracy class of meters have been installed.

Operational and organizational chart for monitoring:



5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The baseline emissions are calculated using the following formula:

$$\text{Baseline emissions (BE}_y\text{)} = \text{EG}_{PJ,y} * \text{EF}_{\text{Grid,CM},y}$$

Where:

- BE_y** = Baseline emissions in the year y (tCO₂/yr)
- EG_{PJ,y}** = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
- EF_{grid,y}** = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system, ver. 02.2.1” (tCO₂/MWh)

As per the VCS PD, the baseline emissions factor (EF_{Grid,CM,y}) is 0.94865 tCO₂/MWh

Monitoring Period: 13-December-2012 to 12-December-2018

Year wise Baseline Emission calculation is shown table below:

Year	Net Electricity Exported(MWh)	Baseline Emission(tCO ₂)
2012	3,487.53	3,308(Rounded Down Value)
2013	46,332.249	43,953(Rounded Down Value)
2014	47,950.965	45,488(Rounded Down Value)
2015	60,586.023	57,474(Rounded Down Value)
2016	63,145.435	59,902(Rounded Down Value)
2017	65,589.296	62,221(Rounded Down Value)
2018	60,824.556	57,701(Rounded Down Value)
Total	347,916.05	330,047(Rounded Down Value)

5.2 Project Emissions

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

5.3 Leakage

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

5.4 Net GHG Emission Reductions and Removals

Emission reduction is calculated as follows:

The net GHG emission reduction is calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

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

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

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

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

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)
2012	3308	0	0	3308
2013	43953	0	0	43953
2014	45488	0	0	45488
2015	57474	0	0	57474
2016	59902	0	0	59902
2017	62221	0	0	62221
2018	57701	0	0	57701
Total	330,047	0	0	330,047

The total length of Monitoring period is 2,191 days (13-December-2012 to 12-December-2018). The annual estimated emission reduction of this project activity is 81,853 tCO₂e. So, the estimated emission reduction for total monitoring period (taking 44.4 MW capacity together) is

$$= (81,853 \text{ tCO}_2\text{e}/365) \times 2,191$$

$$= 491,342 \text{ tCO}_2\text{e}$$

Out of 44.4 MW, 10.8 MW capacity is also registered with UN 8818 project activity and issuance already was completed for UN 8818 project activity from 31-December-2012 to 09-April-2015 (830 days). The annual net generation from UN 8818 project activity is 22,270.72 MWh. Taking Combined Margin Emission Factor as 0.94865 tCO₂e/MWh (which is combined margin emission factor of VCS 835 project as VCS 835 was registered separately), the estimated annual emission reduction for UN 8818 project is

$$= 22,270.72 \text{ MWh} \times 0.94865 \text{ tCO}_2\text{e/MWh}$$

$$= 21,127 \text{ tCO}_2\text{e} \text{ (Round Down Value)}$$

So, estimated emission reduction for UN 8818 project activity for the duration from 31-December-2012 to 09-April-2015 (830 days) is

$$= (21,127 \text{ tCO}_2\text{e}/365) \times 830$$

= 48,042 tCO₂e (Round Down Value)

So, estimated emission reduction in current monitoring period after subtracting estimated emission reduction of UN 8818 for which issuance already done(tCO₂e)

= 491,342 tCO₂e - 48,042 tCO₂e

= 443,300 tCO₂e

The actual emission reduction in current monitoring period is 330,047 tCO₂e which is 25.55% lower than the estimated emission reduction.

APPENDIX I: <METER CALIBRATION DETAILS>

Palsodi

WTG ID	Feeder	Meter No.	Meter Type	Make	Accuracy	Calibration Date	Validity of Calibration	Delay in Calibration ¹⁶
PR-11, 12, 16, 18	Palsodi Feeder-I	MPE15233	Main Meter	SEMS	0.5	04-June-2012	03-June-2013	25-February-2014 to 21-May-2014, 22-May-2015 to 19-February-2016, 20-February-2017 to 12-December-2018
		MPC49084 ¹⁷	Main Meter	SEMS	0.2	25-February-2013, 22-May-2014, 20-February-2016	24-February-2014, 21-May-2015, 19-February-2017	
		XE479853 ¹⁸	Main Meter	Secure	0.2	31-May-2019	30-May-2020	
		MPE15232	Check Meter	SEMS	0.5	04-June-2012	03-June-2013	25-February-2014 to 19-February-2016, 20-February-2017 to 21-February-2018.
		3596373 ¹⁹	Check Meter	Genus Power	0.5	25-February-2013, 20-February-2016, 22-February-2018	24-February-2014, 19-February-2017, 21-February-2019	
PR-01 to 06, PR-17, 19	Palsodi Feeder-II	MPE20352	Main Meter	SEMS	0.5	04-June-2012	03-June-2013	25-February-2014 to 21-May-2014, 22-May-2015 to 19-February-
		MPC49087 ²⁰	Main Meter	Secure	0.2	25-February-2013, 22-May-2014, 20-	24-February-2014, 21-May-2015, 19-	

¹⁶ Error Factor has been applied where delay in calibration occurred.

¹⁷ Meter No. MPE15233 was replaced by Meter No. MPC49084 on 25-February-2013.

¹⁸ Meter No. MPC49084 was replaced by Meter No. XE479853 on 31-May-2019

¹⁹ Meter No. MPE15232 was replaced by Meter No. 3596373 on 25-February-2013.

²⁰ Meter No. MPE20352 was replaced by Meter No. MPC49087 on 25-February-2013.

						February-2016	February-2017	2016, 20-February-2017 to 12-December-2018
		XE479854 ²¹	Main Meter	Secure	0.2	31-May-2019	30-May-2020,	
		MPE20353	Check Meter	SEMS	0.5	04-June-2012	03-June-2013	25-February-2014 to 19-February-2016, 20-February-2017 to 21-February-2018.
		3596486 ²²	Check Meter	Genus Power	0.5	25-February-2013, 20-February-2016, 22-February-2018	24-February-2014, 19-February-2017, 21-February-2019	
PR-08, 09, 10, 13, 14, 15	Palsodi Feeder-III	MPE57983	Main Meter	SEMS	0.5	04-June-2012	03/06/2013	25-February-2014 to 21-May-2014, 22-May-2015 to 19-February-2016, 20-February-2017 to 12-December-2018
		MPC49086 ²³	Main Meter	SEMS	0.2	25-February-2013, 22-May-2014, 20-February-2016	24-February-2014, 21-May-2015, 19-February-2017	
		XE479855 ²⁴	Main Meter	Secure	0.2	03-September-2020	02-September-2021	
		MPE57984	Check Meter	SEMS	0.5	04-June-2012	03-June-2013	25-February-2014 to 19-February-2016, 20-February-2017 to 21-February-2018.
		3596488 ²⁵	Check Meter	Genus Power	0.5	25-February-2013, 20-February-2016, 22-February-2018	24-February-2014, 19-February-2017, 21-February-2019	

²¹ Meter no. MPC49087 was replaced by Meter No. XE479854 on 31-May-2019.

²² Meter No. MPE20353 was replaced by Meter No. 3596486 on 25-February-2013.

²³ Meter No. MPE57983 was replaced by Meter No. MPC49086 on 25-February-2013.

²⁴ Meter No. MPC49086 was replaced by Meter No. XE479855 on 31-May-2019.

²⁵ Meter No. MPE57984 was replaced by Meter No. 3596488 on 25-February-2013.

Rajasthan (Osian, Akal & RKB)

WTG ID	Feeder	Meter No.	Meter Type	Make	Accuracy	Calibration Date	Validity of Calibration	Delay in Calibration ²⁶
OS-48, OS-49	Phase-127	RJB074503	Main Meter	Secure	0.2	27-February-2018	26-February-2019,	13-December-2012 to 26-February-2018
		RJB074504	Back up Meter	Secure	0.2	27-February-2018	26-February-2019,	13-December-2012 to 26-February-2018
AK-400, AK-401, AK-414, AK-415, AK-416, Ak-417, AK-253, AK-308	Phase-81	MSB10311	Main Meter	Secure	0.2	15-March-2012	14-March-2013	15-March-2013 to 17-July-2017
		RJB90208 ²⁷	Main Meter	Secure	0.2	18-July-2017, 20-April-2018	19-April-2019	
		MSB10312	Back up Meter	Secure	0.2	15-March-2012	14-March-2013	15-March-2013 to 17-July-2017
		RJB90209 ²⁸	Back up Meter	Secure	0.2	18-July-2017, 20-April-2018	19-April-2019	
RKB	Tinwari Feeder No. 1	RJB00320	Main Meter		0.2	27-April-2010	26-April-2011	27-April-2011 to 23-April-2017, 24-April-2018 to 12-December-2018
		RJB90216 ²⁹	Main Meter	Secure	0.2	24-April-2017, 25-April-2019	23-April-2018, 24-April-2020	
		RJB00319	Back up Meter		0.2	27-April-2010	26-April-2011	27-April-2011 to 23-April-2017, 24-April-2018 to 12-
		RJB90217 ³⁰	Back up Meter	Secure	0.2	24-April-2017,	23-April-2018,	

²⁶ Error Factor has been applied where delay in calibration occurred.

²⁷ Meter No. MSB10311 was replaced by Meter No. RJB90208 on 18-July-2017.

²⁸ Meter No. MSB10312 was replaced by Meter No. RJB90209 on 18-July-2017.

²⁹ Meter no. RJB00320 was replaced by RJB90216 on 24-April-2017.

³⁰ Meter no. RJB00319 was replaced by RJB90217 on 24-April-2017.

						25-April-2019	24-April-2020	December-2018
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Jaora

WTG ID	Feeder	Meter No.	Meter Type	Make	Accuracy	Calibration Date	Validity of Calibration	Delay in Calibration ³¹
NL-01-10, JO-10, 12, 19, JO-13,14, 15	Feeder-III	34413	Main Meter	SEMS	0.5	17-November-2012	16-November-2013	17-November-2013 to 24-August-2015, 25-August-2016 to 12-December-2018.
		MPC49089 ³²	Main Meter	SEMS	0.2	25-August-2015	24-August-2016	
		XE479856 ³³	Main Meter	Secure	0.2	01-June-2019	31-May-2020	
		34412	Check Meter	SEMS	0.5	17-November-2012	16-November-2013	17-November-2013 to 12-December-2018
		Q0306209 ³⁴	Check Meter	Secure	0.2	01-June-2019	31-May-2020	
JO-03 to 05, JO-08, JO-16 to 18, JO-20 to 22	Feeder-IV	3475859	Main Meter	SEMS	0.5	17-November-2012	16-November-2013	17-November-2013 to 05-May-2014, 06-May-2015 to 29-February-2016, 01-March-2017 to 05-October-2018
		MPC49082 ³⁵	Main Meter	SEMS	0.2	06-May-2014, 01-March-2016, 06-October-2018	05-May-2015, 28-February-2017, 05-October-2019	
		3475860	Check Meter	SEMS	0.5	17-November-2012	16-November-2013	15-November-2014 to 31-May-2019
		Q0306205 ³⁶	Check Meter	Secure	0.2	01-June-2019	31-May-2020	

³¹ Error Factor has been applied where delay in calibration occurred.

³² Meter No. 34413 was replaced by Meter No. MPC49089 on 24-March-2013.

³³ Meter No. MPC49089 was replaced by Meter No. XE479856 on 01-June-2019.

³⁴ Meter No. 34412 was replaced by Meter No. Q0306209 on 01-June-2019.

³⁵ Meter No.3475859 was replaced by Meter No. MPC49082 on 24-March-2013.

³⁶ Meter No. 3475860 was replaced by Meter No. Q0306205 on 01-June-2019.

APPENDIX II: <BREAKDOWN DETAILS>

WTG ID	Date	Breakdown Hours
NL08	05-March-2013	17.9
AK253	25-May-2013	24
AK308	08-July-2013	24
AK416	05-Septemeber-2013	24
AK414	29-October-2013	24
JO17	15-May-2014	20
JO12	29-December-2014	12.6
RKB75	14-April-2015	19.5
PR05	02-September-2015	23
OS-49	12-March 2016	24
OS-49	31-July-2016	20
JO22	13-August-2018	24