14.1 MW GRID CONNECTED WIND ENERGY PROJECT IN TAMIL NADU BY ITC LIMITED.

Document Prepared by Infinite Solutions

Project Title	14.1 MW Grid Connected Wind Energy Project in Tamil Nadu by ITC Limited
Version	03
Report ID	VVER538-MP2
Date of Issue	13-July-2022
Project ID	538
Monitoring Period	01-October-2011 to 13-March-2017 (Inclusive both the dates)
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The main purpose of this project activity is to generate clean form of electricity through renewable Wind energy source. ITC Limited is the promoter of the proposed project activity. ITC Limited has installed 14.1 MW of Wind Electricity Generators (WEGs) for captive consumption at its packaging and printing facility located at Tiruvottiyur, Chennai, Tamil Nadu in India. The total GHG emission reductions or removals generated in this monitoring period are 138,703 tCO2.
The chronology of events is as follows:

Date	Event
15-September-2006	Contract with PwC (Consultants)
06-March-2008	Note on project feasibility
23-April-2008	CMC meeting approving the project based on the note
25-April-2008	email from corporate conveying confirmation of the project approval based on the project note dated 06-March-2008
29-April-2008	Certification from SBU Management committee of the directives given by CMC
10-July-2008	Purchase orders for Suzlon
23-July-2008 and 25-July-2008	Purchase orders for Vestas
05-September-2008	Intimation to DNA and UNFCCC regarding the wind project
20-September-2008	2 Suzlon WEGs commissioned
23-September-2008	2 Vestas WEGs commissioned
24-September-2008	1 Suzlon WEG commissioned
26-September-2008	1 Suzlon WEG commissioned
27-September-2008	1 Suzlon WEG commissioned
30-September-2008	2 Vestas WEGs commissioned
23-October-2008 and 24-October-2008	Stakeholder Consultation meeting
15-November-2008	Contract with DNV (DoE)
05-March-2009	Submission for DNA approval
Prior to registration VCUs	Issuance of VCU of amount 45037 under VCS for the period between 20-September-2008 to 13-March-2010.
14-March-2010	Registration by the CDM Executive Board, UNFCCC Project Reference No. # 3035
12-July-2011	Issuance of CER of amount 24563 under UNFCCC for the first verification for the monitoring period 14-March-2010 to 30-September-2010 (Both days inclusive).
03-August-2012	Issuance of CER of amount 31431 under UNFCCC for the second verification for the monitoring period 01-October-2010 to 30-September-2011 (Both days inclusive).

Table 1: Date chronology of the project activity

1.2 Sectoral Scope and Project Type

The project activity falls under the following Sectoral scope and Project Type:
Sectoral Scope: 01 - Energy industries (renewable / nonrenewable sources) Project
Type : I - Renewable Energy Projects
Project Type : I - Renewable Energy Projects
Methodology : AMS.I. D, Grid connected renewable electricity generation - Version 13.0
The project is not a grouped project activity

1.3 Project Proponent

Organization name	ITC Limited
Contact person	Mr. Prakash Dalmia
Title	Divisional Manager
Address	SBU- Packaging & Printing, Greenways Tower, 3rd Floor, No. 119, St. Mary's Road, Abhiramapuram, Chennai- 600018, India
Telephone	+91 44 42081503
Email	prakash.dalmia@itc.in

1.4 Other Entities Involved in the Project

ITC Limited is the sole owner of the project and emission reductions generated by it.

1.5 Project Start Date

Project Start Date: 20-September-2008

1.6 Project Crediting Period

Crediting Period Start date: 20-September-2008 Crediting Period End date:19-Setember-2018
The project activity adopts fixed crediting period of 10 years period.

1.7 Project Location

The proposed Wind Plant site is located in Tamil Nadu state of India. The site lies around the coordinates are below:

Make	Location No.	Survey Nos. (SF Nos.)	Village	Taluk	District	Latitude	Longitude
Vestas	234	SF No. 234/1(P)*, 234/6(P)	Poomalaikundu,	Theni	Theni	N 9° 53' 19.2''	E 77° 26' 23.4''
Vestas	637	SF No. 637/5A(P), 648/2(P), 648/4	Poomalaikundu,	Theni	Theni	N 9°53'39.0"	E 77°26'89.1"

Vestas	122	SF No. 122/1B(P), 122/1C(P), 122/1D, 123/1(P)	Vallalnathi	Andipatti	Theni	N 9°56'07.5"	E 77°32'58.8"
Vestas	147	SF No.147/2A(P), 147/3A, 147/3B, 148/2(P)	G.Usilampatti	Andipatti	Theni	N 9°56'01.0"	E 77°32'58.8"
Suzlon	R - 142	540/1(P),540/2(P), 540/3(P),541/1, 541/2(P),542/2B(P)	Udhayathoor	Radhapuram	Tirunelveli	N 08°15'21.3"	E 77°45'10.5"
Suzlon	R-300	300/4A(P),300/4B, 300/4C(P),300/4D(P), 300/4E,300/4F, 300/4G,300/4H, 300/4I,300/4J, 300/4K,300/4L, 300/4M(P), 300/4N(P),300/4S(P), 300/4T(P)	Thiruvambalapuram	Radhapuram	Tirunelveli	N 08°15'01.4"	E 77°43'31.0"
Suzlon	R-432	203/1(P)	Kasthurirengapuram	Radhapuram	Tirunelveli	N 08°16'59.1"	E 77°46'42.6"
Suzlon	R-435	433/2A(P),433/2B, 433/2C,433/2D, 433/2E(P),433/2H(P), 433/2I,433/2J, 433/2K(P)	Udhayathoor	Radhapuram	Tirunelveli	N 08°14'23.6"	E 77°44'25.7"
Suzlon	R-436	492/1B(P)	Udhayathoor	Radhapuram	Tirunelveli	N 08°15'0.8"	E 77°44'13.1"
*(P) indicates Part							

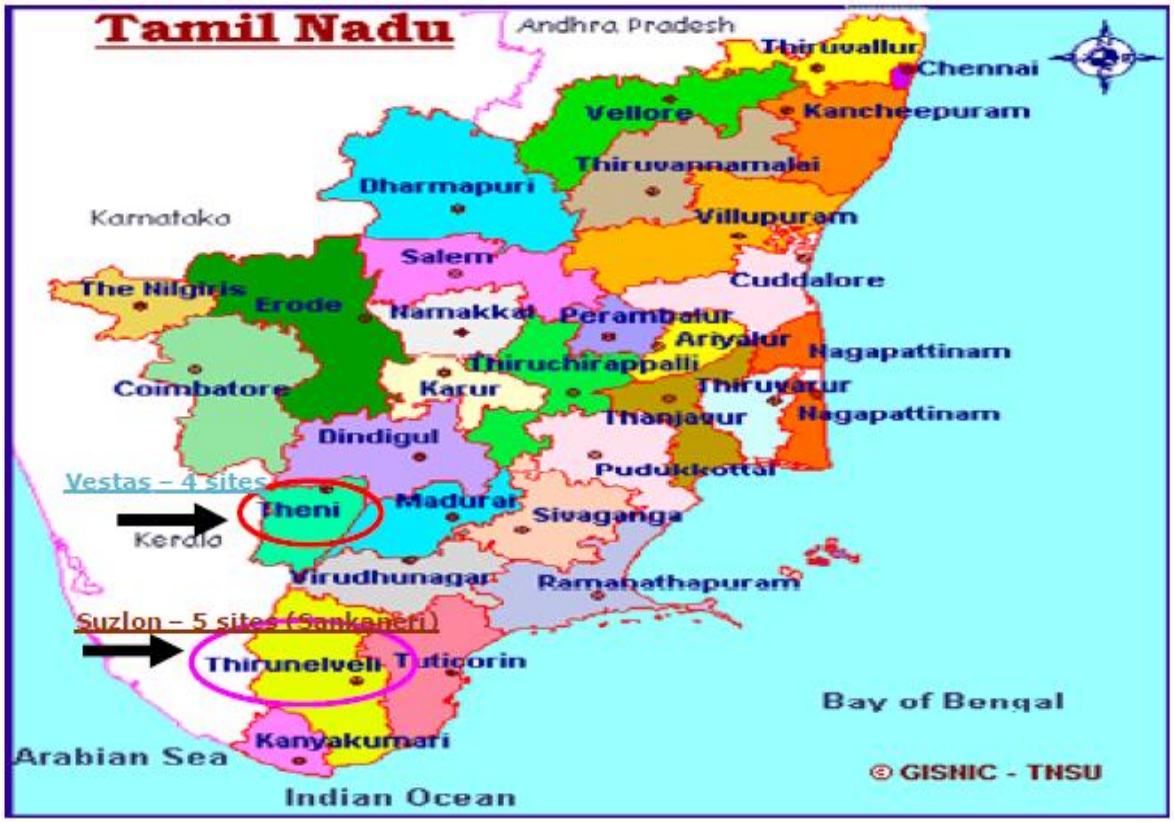


Figure 1: Project Location

1.8 Title and Reference of Methodology

Title : Grid connected renewable electricity generation
Reference : AMS.I-D: Version 13.0
Type I : Energy industries (renewable / non-renewable sources)

Tools referred with above methodology and applicable for project activity are:

- Tool to calculate the emission factor for an electricity system - Version 01.1 [1]
- Methodological Tool- Tool for the demonstration and assessment of additionally - Version 07.0.0 (EB 70, Annex 08)[2].

1.9 Participation under other GHG Programs

The project proponent has participated under CDM mechanism at UNFCCC. The UN reference ID 3035[3] and can be referred to cdm.unfccc.int. The project activity claimed under CDM are as follows:

The first monitoring period is considered from 14-March-2010 to 30-September-2010.
The second monitoring period is considered from 01-October-2010 to 30-September-2011.

[1] CDM: Tool to calculate the emission factor for an electricity system (unfccc.int)

[2] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf

[3] CDM: 14.1 MW grid connected wind energy project in Tamil Nadu by ITC Limited (unfccc.int)

The PP has submitted undertaking stating that there is no double accounting for current monitoring period other than VCS.

1.10 Other Forms of Credit

- Emission Trading Programs and Other Binding Limits: Net GHG emission reductions or removals generated by the Project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions in any Emission Trading program or other binding limits.

- Other Forms of Environmental Credit: The project proponent hereby confirms that the project has not sought or received any other GHG related environmental credit. The projects are not registered under the REC mechanism of India and the same can be cross-checked at https://recregistryindia.nic.in.

1.11 Sustainable Development Contributions

Ministry of Environment and Forests has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. The project contributes to sustainable development using the following ways.

- **Social well-being**: The project is helping to generate employment opportunities during the construction and operation phases. The project activity is leading to development in infrastructure in the region like development of roads and also may promote business with improved power generation.
- **Economic well-being**: The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits the project activity is also helping to reduce the demand supply gap in the state.
- **Technological well-being**: The successful operation of project activity is leading to promotion of Wind based power generation and would encourage other entrepreneurs to participate in similar projects.
- **Environmental well-being**: Wind being a renewable source of energy, it reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. Due to its zero emission the Project activity also helps in avoiding significant amount of GHG emissions. The project activity generates power using zero emissions Wind-based power generation which helps to reduce GHG emissions and specific pollutants like SO_x, NO_x, and SPM associated with the conventional thermal power generation facilities.

Table 1: Sustainable Development Contributions

Row number	Q Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	7.2.1: Renewable energy share in the total final energy consumption	Implemented activities to increase	About **149,601 MWh** renewable electricity has been supplied to Indian grid during the reported period that helps to increase the renewable energy share in the energy mix.	Since commissioning **149,601 MWh** renewable electricity has supplied to Indian grid that helps to increase the renewable energy share in the energy mix.
2)	8.5	8.5.2 Unemployment rate, by sex, age and persons with disabilities	Implemented activities to decrease	Total **6 people** are employed during this monitoring period. Total 1 training was provided during the current monitoring period ITC has an agreement with O&M Contractor. The employment & training sessions are conducted by O&M contractor, the O&M agreement will be provided to auditor.	Employment to 6 peoples and 1 training has provided.
3)	13.0	13.0 Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	By supplying **149,601 MWh** clean electricity to Indian grid, the project avoided release of **138,703** tCO_2 into the atmosphere during the reporting period	The project has avoided emission of **138,703 tCO2** in the atmosphere.

2 SAFEGUARDS

2.1 No Net Harm

There is no harm identified form the project and hence no mitigations measures are applicable.

2.2 Local Stakeholder Consultation

Local stakeholder consultation has already done during registration of project activity. The stakeholder consultation meeting was conducted on 23 Oct 2008 at project site at Tirunelveli District. The Stakeholders of the project activity were invited through submission of the invitation letter and Public Notice to attend the stakeholder meeting at the project site. The meeting was attended by Local community, Local village administration, Technology suppliers, Local vendors and representatives of PPs.

The representative were explained about the project activity and the various benefits arising out of the project activity. A discussion was held in which the views of the local stakeholders were addressed. No negative comments received.

Nevertheless, PP is open for the continuous stakeholder interaction and formed a grievance/suggestion register and a grievance box placed at the project site for the comments at any point of time during the project crediting period. PP has explained this mechanism for on-going communication to the local stakeholders and transparently kept the notice mentioning the grievance register and box at the project site.

The accounting of all and any input received during ongoing communication should be taken in consideration to take the appropriate measure to resolve the grievance.

Discussions with Local stakeholders is being carried out at periodic intervals. There are no negative comments received for the project. In line with VCS requirements all the processes has been implemented to receive comments from local stakeholders as well as communicate with them at periodic intervals.

However, no negative feedback received during the current monitoring period.

2.3 AFOLU-Specific Safeguards

Not applicable as this is not an AFOLU project activity.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

In this process there is no consumption of any fossil fuel and hence the project does not lead to any greenhouse gas emissions. Thus, electricity would be generated through sustainable means without causing any negative impact on the environment.

The details of the project are mentioned in the table:

Project Investors Name	WEG-HTSC No.	Commissioning Date	Capacity (MW)	Location (Village /Tehsil/District)
ITC Limited	2666	20-September-2008	1.5	Village: Kasthurirengapuram, Tal: Radhapuam, District Tirunelveli
	2665	20-September-2008	1.5	Village: Udhayathoor, Tal:- Radhapuram, District Tirunelveli
	2672	24-September-2008	1.5	Village: Udhayathoor , Tal:- Radhapuram, District Tirunelveli
	2682	26-September-2008	1.5	Village: Thiruvambalapuram, Tal: Radhapuram, District Tirunelveli
	2687	27-September-2008	1.5	Village: Udhayathoor, Tal: Radhapuram, District Tirunelveli
	T04	23-September-2008	1.65	Village Vallalnathi, Tal:- Andipatti & District Theni
	T05	23-September-2008	1.65	Village G.Usilampatti, Tal:- Andipatti & District Theni
	T06	30-September-2008	1.65	Village: Poomalaikundu, Tal:- Theni & District Theni
	T07	30-September-2008	1.65	Village: Poomalaikundu, Tal:- Theni & District Theni

The technical specification of the WTG is as follows:

Model:	Suzlon S 82/1500kW
Capacity	1.5 MW
Diameter	82 m
No of Rotor Blades	3
Orientation	Upwind / Horizontal axis
Rotational Direction	Clockwise
Rotor Blade material	GRP
Rotor Swept area	5281 m2
Hub Height	78.5 m

Regulations	Pitch regulated
Cut in wind speed	4 m/sec
Rated wind speed	14 m/sec
Cut out wind speed	20 m/sec
Model:	**V 82/1650kW**
Capacity	1.65 MW
Diameter	82 m
Area swept	5281 m
Nominal revolutions	14.4 rpm
Number of blades	3
Rotor Blade material	
Air brake	Full blade pitch by Separate hydraulic pitch cylinders
Cut in wind speed	3.5 m/sec
Nominal wind speed	13 m/sec
Cut out wind speed	20 m/sec

Emission Reductions from anthropogenic sources:

The wind power generated from the Project will be displacing the electricity generated from thermal power stations feeding into Indian grid and will be replacing the usage of diesel generators for meeting the power demand during shortage periods. Since the wind power is Green House Gas (GHG) emissions free, the power generated will prevent the anthropogenic GHG emissions generated by the fossil fuel based thermal power stations comprising coal, diesel, furnace oil and gas. The estimation of GHG reductions by this project is limited to carbon dioxide (CO2) only.

The project shall result in replacing anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 138,703 tCO2e, thereon displacing 149,601 MWh amount of electricity during this monitoring period of 1991 days. In absence of the project activity that would have been generated through fossil fuel-based power plant. The project activity is in continue operation since commissioning. There is no such event occurred during this monitoring period which may impact the GHG emission reductions or removals and monitoring.

3.2 Deviations

3.2.1 Methodology Deviations

There has been no methodology deviation applied during this monitoring period of the project activity.

3.2.2 Project Description Deviations

During current monitoring period a deviation has taken on account in metering calibration. As per the TNERC & Tamilnadu Generation and Distribution Corporation Ltd instructions, the calibration frequency

has changed once in a year to once in five years[4]. It is to be noted that the TANGEDCO is the sole entity responsible for calibration of meters and the PP don't have any control over the same. The project activity doesn't have any deviations for the previous monitoring reports.

For WEG HTSC No. 2687, main meter serial number 04941038 has fixed on 27 September 2008, which has been replaced with by pre-calibrated meter (serial number 14190248) dated 11-February-2014 with accuracy 0.2s which is better accuracy than previous one.

For WEG HTSC No. 2666, main meter serial number 04940883 has fixed on 20 September 2008, which has been replaced by pre-calibrated meter (serial number 14190303) dated 11-February-2014 with accuracy of 0.2s which is better accuracy than previous one.

For WEG HTSC No. 2666, check meter serial number 04954765 has fixed on 25 June 2009, which has been replaced by pre-calibrated meter (serial number 14190334) dated 11-February-2014 with accuracy 0.2s which is better accuracy than previous one.

The deviation of the said project activity doesn't not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario, and the project remains in compliance with the applied methodology.

3.3 Grouped Projects

The project activity is not a grouped project activity.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{OM,y}$
Data unit	tCO_2 /MWh
Description	Operating margin emission factor for Indian grid.
Source of data	CO_2 baseline database (Version 04) published by CEA on September-2008[5]
Value applied	0.9985
Justification of choice of data or description of measurement methods and procedures applied	This value is calculated by taking weighted average of Simple Operating Margin of recent three years for Indian grid as per the "Tool to calculate the emission factor for an electricity system", version 01.1

[4] Memo.No.CE/Comml/EE/R&C/AEE2/F.MP.No.18/2012/D43/dt.07.03.14

[5] http://www.cea.nic.in/planning/c%20and%20e/database_publishing_ver4.zip

Purpose of Data	For the calculation of Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{BM, y}$
Data unit	tCO_2 /MWh
Description	Build margin emission factor for Indian grid
Source of data	CO_2 baseline database (Version 04) published by CEA on September-2008
Value applied	0.713
Justification of choice of data or description of measurement methods and procedures applied	This value is calculated by taking weighted average of Simple build Margin of recent three years for Indian grid as per the "Tool to calculate the emission factor for an electricity system", version 01.1
Purpose of Data	Calculation of Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	Baseline emission factor (combined margin)
Data unit	tCO_2 /MWh
Description	Combined margin emission factor for Indian grid connected power generation in year y calculated using the latest version of "Tool to calculate the emission factor for an electricity system", version 01.1
Source of data	CO_2 baseline database (Version 04) published by CEA on September-2008
Value applied	0.92718
Justification of choice of data or description of measurement methods and procedures applied	This value is calculated using OM and BM values as per "Tool to calculate the emission factor for an electricity system", version 01.1
Purpose of Data	For calculation of Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

4.2 Data and Parameters Monitored

Data / Parameter	EG_y
Data unit	MWh
Description	Net electricity supplied to the grid by the Project
Source of data	Electricity supplied to the grid as per the joint meter readings
Description of measurement methods and procedures to be applied	Net electricity supplied to grid is measured by main meter (export and import) at the metering point. The monthly generation data is issued by TNEB which contains details of export and import & any TNEB issued statement are used for computation of energy generation. The TNEB

	generation report are primary document relating to actual number of units fed into the grid. Further, the daily generation report is made available online by Vestas/Suzlon to ITC which contains data on grid availability, machine availability, and generation of electricity.
Frequency of monitoring/recording	Monthly
Value monitored	149,601
Monitoring equipment	. Electricity supplied can be recorded in the energy meters of 0.2s / 0.5s accuracy class installed by Tamil Nadu Generation and Distribution corporation Limited (TANGEDCO) and the meters will be calibrated as per TNEB schedule (state electricity utility). The readings are recorded every month by the authorized representative of TNEB in presence of the representative of PP. The net electricity exported to the grid is calculated and issued by TANGEDCO as a "Monthly Energy Generation statement".
QA/QC procedures to be applied	The quantity of electricity generation is mainly used for the captive consumption. The project activity is wheeling of power to the industrial facility of ITC Limited connected to Tamil Nadu grid, which is a part of NEWNE grid . Wheeling charges in the form of percentage of electricity transmitted through the network. The fee in the state of Tamil Nadu is 5% of the transmitted electricity, which will be paid by ITC for the electricity volume, evacuated using transmission facility & 5% of levy (subjective change as per Government norms) of electricity for extending the banking facility to ITC for non-real time consumption of electricity. The same is cross verified with the JMR and HT Bill issued from TNEB. Calibration Frequency: Energy meters are calibrated as per the scheduled by TNEB. Further change of accuracy and details of calibration has given in Appendix-1
Purpose of the data	The Data/Parameter is required to calculate the baseline emission.
Calculation method	N/A
Comments	For calculation of baseline emission

4.3 Monitoring Plan

The project activity falls in the technology measure as described in the paragraph 1 of the indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. The applicable simplified baseline and monitoring methodology for selected small scale CDM project activities AMS I.D. version 13 requires monitoring of the following;

- Metering the electricity generated by the renewable technology
- In the case of co-fired plants, the amount of biomass and fossil fuel input consumed.

Further, wind-based electricity generation is not associated with any kind of leakages. Hence, the sole parameter for monitoring is the electricity supplied to the grid. The Project is operated and managed by Suzlon and Vestas. They follow the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind

resource assessment, logistics, finance, construction, commissioning and operation of the wind power project. The accuracy of monitoring parameter is ensured by adhering to the calibration and testing procedure as set in the power purchase agreement. The project will adhere to all the mandatory regulatory and statutory requirements at the state as well as national level.

Internal audit and inspection is being done periodical interval and detail report submitted by engineering team of ITC. During the monitoring period, there are no non-conformities has been observed during inspection and audit. Sample report for the year 2015, 2016 & 2017 are enclosed for reference.

The operational and management structure implemented by ITC along with Suzlon and Vestas (Internal Audit) is as follows-

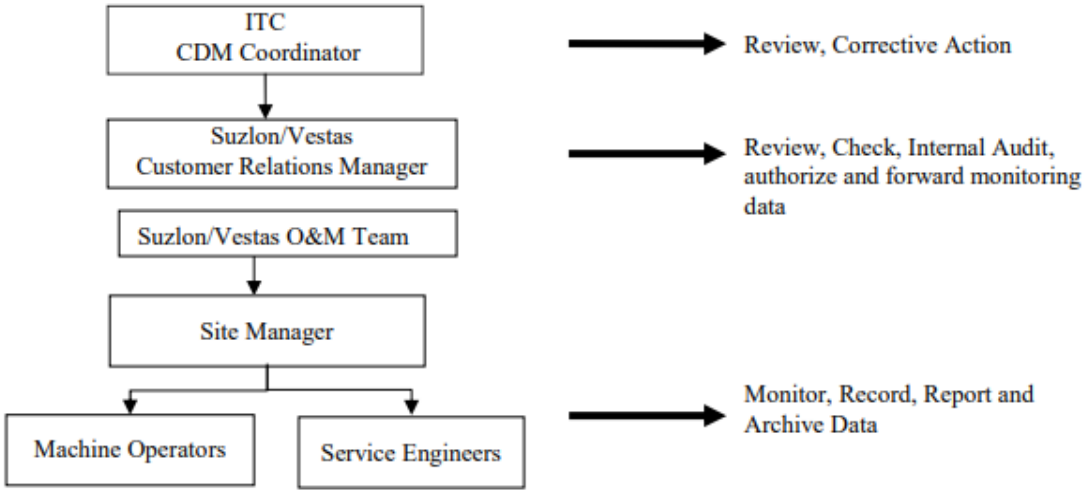


Figure 1: Monitoring Plan

The daily generation report is sent to ITC by Suzlon and Vestas relationship manager. The daily generation report contains data on grid availability, machine availability and generation of electricity. ITC reviews the machine availability (which is complied with the SCADA control unit) from the generation report and initiates the forward corrective action request to Suzlon and Vestas in case the performance is not as per agreed O&M terms.

The monitored data will be maintained as hard copies in the form of photo copies of generation report, issued by TNEB every month showing export and import of energy. The copies of such TNEB generation report are primary document relating to actual number of units fed to the grid and will be maintained for 7+2 years (crediting + 2 years). Daily generation reports from Suzlon and Vestas would be compiled into monthly reports and saved electronically for 7+2 years (crediting + 2 years). Details of the meter reading are available in Annex. 4

The monitoring plan is developed in accordance with the modalities and procedures for CDM project activities and is proposed for wind energy power project. The monitoring plan, which will be implemented by the project participant describes about the monitoring organization, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data rests with the project participant. PP proposed the following structure for data monitoring, collection, data archiving and calibration of equipment's for this project activity. The team comprises of the following members:

Data Measurement

The electricity supplied or transmitted is sourced from "Deviation Settlement Account document" and is cross checked from "Monthly Generation Reports". "Deviation Settlement Account document" which are publicly available documents issued by the 'Southern Regional Power Committee[10]. Readings of meters are taken on monthly basis by authorized officer of SEB in the presence of PP or representative of PP. Based on the Meter Reading Statement, invoices are raised. These invoices can be used for cross checking the meter readings taken for the respective project activity.

Data collection and archiving

The records are checked periodically by the Plant Manager and discussed thoroughly with the plant supervisor. The period of storage of the monitored data will be 2 years after the end of crediting period or till the last issuance of VCU's for the project activity whichever occurs later.

Emergency preparedness

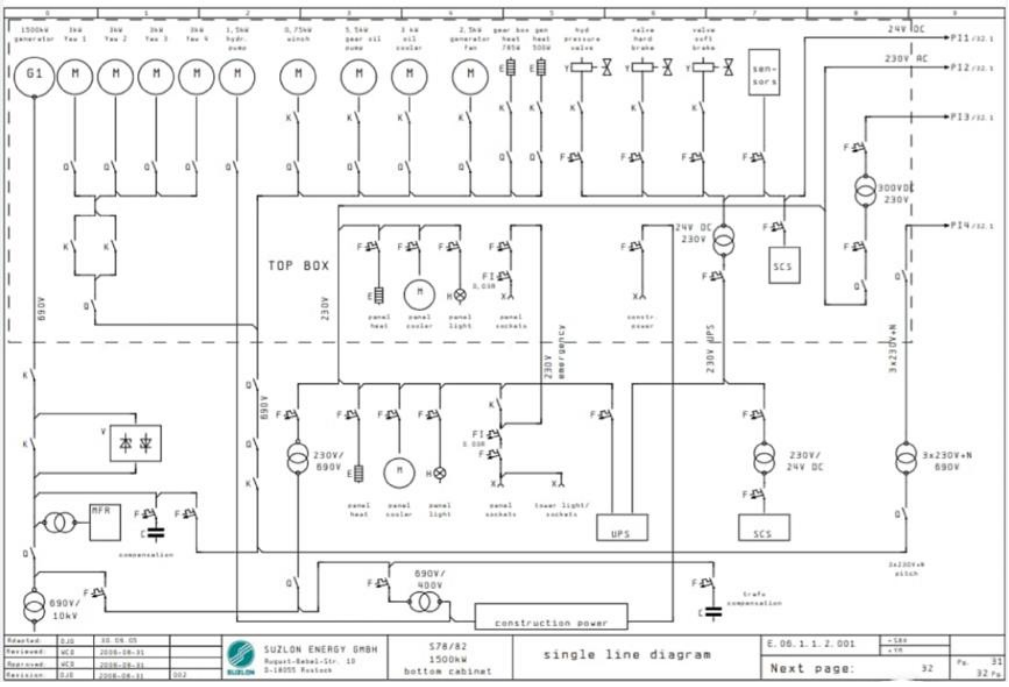
The project activity has not resulted in any unidentified activity that can result in substantial emissions from the project activity. No need for emergency preparedness in data monitoring is visualized.

Personnel training

In order to ensure a proper functioning of the project activity and a properly monitoring of emission reductions, the staff is trained. The plant helpers are trained in equipment operation, data recording, reports writing, operation and maintenance and emergency procedures in compliance with the monitoring plan.

Metering Arrangement

Line diagram with metering arrangement for the wind project activity is shown below: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690V
230V
24V DC
230V AC
PI1
PI2
PI3
PI4
SCS
UPS
690V/
10kV
690V/
400V
230V/
690V
230V/
24V DC
3x230V+N
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construction power
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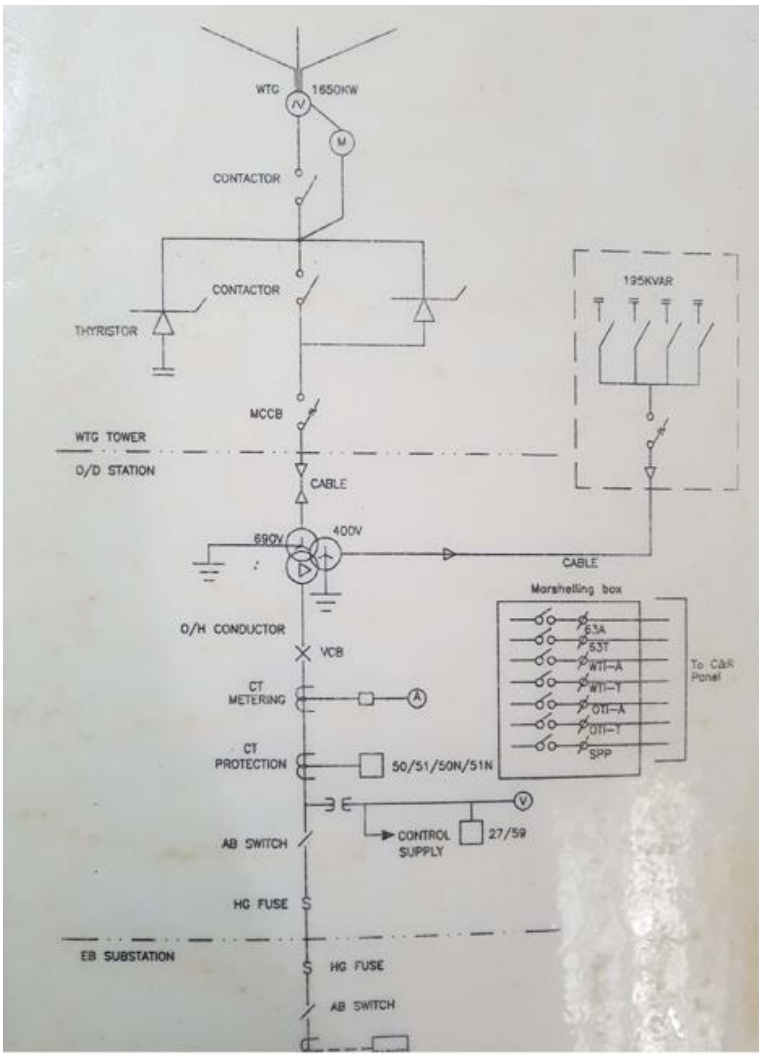

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

As per description earlier under this document:

$BE_y = EG_y \times EF_y$

Where:

BE_y : Baseline emissions in year y(tCO_2e/yr)

EG_y : Net Electricity supplied to grid by the project (MWh/year)

$EF_{,y}$: 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" (tCO_2/MWh) (i.e., 0.92718 tCO_2/MWh).

Here,
EF_y = 0.92718
EG_y = 149,601
BE_y = 149,601 * 0.92718 = 138,703 tCO_2e **(Rounded Down value)**

Note: - PP has considered HT bill and net export values (ie., minimum of both) which are used as conservative values for ER calculation

5.2 Project Emissions

The project activity involves in harnessing Wind power. So, the emissions from the project are zero.

5.3 Leakage

No leakage emissions have been considered and hence the leakage emission is zero.

5.4 Net GHG Emission Reductions and Removals

As per the applied methodology, emission reductions are calculated as follows:
$ER_y = BE_y - PE_y$

Where,
ER_y = Emission Reduction in tCO_2/year
BE_y = Baseline emission in tCO_2/year
PE_y = Project emissions in tCO_2/year

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
1-October-2011 to 31-Dec-2011	3591	0	0	3591
1-January-2012 to 31-December-2012	35009	0	0	35009
1-January-2013 to 31-December-2013	26393	0	0	26393
1-January-2014 to 31-December-2014	24483	0	0	24483
1-January-2015 to 31-December-2015	17651	0	0	17651

1-January-2016 to 31-December-2016	28343	0	0	28343
1-January-2017 to 13-March-2017	3233	0	0	3233
Total	138,703	**0**	**0**	138,703

Note:- The project billing cycle of every site is not measured monthly i.e., from 1st to 30th, rather it varies in every month. So, calculation of vintage wise net generation and emission reductions is not possible for the project proponent. However as per VERRA guidelines, the presentation of vintage wise emission reduction is mandatory, thus the Apportioning procedure have been followed yearly to suffice the requirement.

Further, the comparison for estimated emission reductions as per validated CDM PDD and actual observed are detailed below. The emission reductions are lower than the estimated value.

Parameters	tCO_2e
Estimated Annual Emission Reduction	36,182
Emission Reductions for the monitoring period (1991 days)	197,365
Emission reductions achieved in monitoring period	138,703
Percentage of variation when compared with estimated ERs in CDM PDD	-29.72%

Considering the annual average emission reductions as per the registered PDD which is 36,182 tCO2e per year, the number of days covered during the current monitoring period comes out to be 1991 days, based upon which the estimated emission reductions attributed to this monitoring period comes out to be 197,365 tCO2e values whereas the actual emission reductions achieved during the current monitoring period is 138,703. The actual VER is 29.72% lesser than the estimated VER.

APPENDIX 1: METER DETAILS OF WTG

	Energy Meters - Kamachipuram and Kandamanur substation							
WEG HTSC No (Location No.)	Type	Make	Serial No.	Accuracy Class	Calibrating Agency	Calibration Date	Meter fixed on	Frequency*[6]
2687 (R142)	Main Meter	Elster	04941038	0.5s	TNEB	14-September-2011 01-October-2012[7] 14-September-2013	27-September-2008	*The calibration frequency is yearly till 2013. From the year 2014 onwards the frequency for calibration has changed from once in a year to once in every 5 year. (the copy of
		L&T	14190248[8]	0.2s	TNEB	-	11-February-2014	
	Check Meter	Elster	04954747	0.5s	TNEB	14-September-2011 01-October-2012 14-September-2013	27-September-2008	
		L&T	1419030[9]	0.2s	TNEB	-	11-February-2014	
2682 (R300)	Main Meter	Elster	04940888	0.5s	TNEB	14-September-2011	26-September-2008	
		Premier	TN903759[10]	0.2s	TNEB	14-September-2013[11]	30-May-2012	
	Check Meter	Premier	TNB04617	0.5s	TNEB	14-September-2011	14-February-2011	

[6] Memo.No.CE/Comml/EE/R&C/AEE2/F.MP.No.18/2012/D43/dt.07.03.14

[7] There was delay in calibration from 14-September-2012 to 30-September-2012, For this period error factor has applied in the ER sheet.

[8] Meter no. 04941038 has been replaced with batter accuracy class (0.2s) and pre calibrated meter no. 14190248 dated 11-February-2014 as per TENGEDCO memo, Memo.No.CE/Comml/EE/R&C/AEE2/F.MP.No.18/2012/D43/dt.07.03.14.

[9] Meter no. 04954747 has been replaced with batter accuracy class (0.2s) and pre calibrated meter no. 1419030 dated 11-February-2014 as per TENGEDCO memo, Memo.No.CE/Comml/EE/R&C/AEE2/F.MP.No.18/2012/D43/dt.07.03.14.

[10] Meter no. 04940888 has been replaced with batter accuracy class (0.2s) and pre calibrated meter no. TN903759 dated 30-May-2012 as per TENGEDCO memo, Memo.No.CE/Comml/EE/R&C/AEE2/F.MP.No.18/2012/D43/dt.07.03.14..

[11] There was delay in calibration from 29-May-2013 to 13-September- 2013, For this period error factor has applied in the ER sheet.

		Premier	TN903784[12]	0.2s	TNEB	14-September-2013	30-May-2012	memo addressed in foot note)
2672 (R435)	Main Meter	Elster	04941044	0.5s	TNEB	14-September-2011 01-October-2012[13]	24-September-2008	
		Premier	TN903272[14]	0.2s	TNEB	14-September-2013	11-December-2012	
	Check Meter	Elster	04954859	0.5s	TNEB	14-September-2011 01-October-2012	25-June-2009	
		Premier	TN903293[15]	0.2s	TNEB	14-September-2013	11-December-2012	
2666 (R432)	Main Meter	Elster	04940883	0.5s	TNEB	14-September-2011 01-October-2012[16] 14-September-2013	20-September-2008	
		L&T	14190303[17]	0.2s	TNEB	-	11-February-2014	
	Check Meter	Elster	04954765	0.5s	TNEB	14-September-2011 01-October-2012 14-November-2013	25-June-2009	

[12] Meter no TNB04617 has been replaced with batter accuracy class (0.2s) and pre calibrated meter no. TN903784 dated 30-May-2012

[13] There was delay in calibration from 14-September-2012 to 30-Sept.-2012, For this period error factor has applied in the ER sheet.

[14] Meter no 04941044 has been replaced with batter accuracy class (0.2s) and pre calibrated meter no. TN903272 dated 11-December-2012 as per TENGEDCO memo, Memo.No.CE/Comml/EE/R&C/AEE2/F.MP.No.18/2012/D43/dt.07.03.14.

[15] Meter no 04954859 has been replaced with batter accuracy class (0.2s) and pre calibrated meter no. TN903293 dated 11-December-2012 as per TENGEDCO memo, Memo.No.CE/Comml/EE/R&C/AEE2/F.MP.No.18/2012/D43/dt.07.03.14.

[16] There was a delay in calibration from 13-September-2012 to 30-Septemeber-2012, For this period error factor is applied in the ER sheet.

[17] Meter no 04940883 has been replaced with batter accuracy class (0.2s) and pre calibrated meter no. 14190303 dated 11-February-2014 as per TENGEDCO memo, Memo.No.CE/Comml/EE/R&C/AEE2/F.MP.No.18/2012/D43/dt.07.03.14.

		L&T	14190334[18]	0.2s	TNEB	-	11-February-2014	
2665 (R436)	Main Meter	Elster	04959607	0.5s	TNEB	14-September-2011	20-September-2008	
		Premier	TN903269[19]	0.2s	TNEB	14-September-2013	24-September-2012[20]	
	Check Meter	Elster	04954763	0.5s	TNEB	14-September-2011	25-June-2009	
		Premier	TN903770[21]	0.2s	TNEB	14-September-2013	24-September-2012	

	Energy meters - Udhayathoor substation							
WEG HTSC No (Loaction No)	**Type**	**Make**	**Serial No.**	**Accuracy Class**	**Calibrating Agency**	**Calibration Date**	**Meter fixed on**	**Frequency *[22]**
T04 (ITC 122)	Main Meter	Elster	04955020	0.5s	TNEB	18-September-2011 02-October-2012[23] 26-September-2013	22-August-2008	*The calibration frequency is yearly till 2013. From the year 2014 onwards the frequency
	Check Meter	Elster	TNB04029	0.5s	TNEB	18-September-2011 02-October-2012	22-August-2008	

[18] Meter no 04954765 has been replaced with batter accuracy class (0.2s) and pre calibrated meter no. 14190334 dated 11-February-2014 as per TENGEDCO memo, Memo.No.CE/Comml/EE/R&C/AEE2/F.MP.No.18/2012/D43/dt.07.03.14.

[19] Meter no 04959607 has been replaced with batter accuracy class (0.2s) and pre calibrated meter no. TN903269 dated 24-September-2012 as per TENGEDCO memo, Memo.No.CE/Comml/EE/R&C/AEE2/F.MP.No.18/2012/D43/dt.07.03.14.

[20] There was a delay in calibration from 13-September-2012 to 24-September-2012, For this period error factor is applied in the ER sheet.

[21] Meter no 04954763 has been replaced with batter accuracy class (0.2s) and pre calibrated meter no. TN903770 dated 24-September-2012 as per TENGEDCO memo, Memo.No.CE/Comml/EE/R&C/AEE2/F.MP.No.18/2012/D43/dt.07.03.14.

[22] Memo.No.CE/Comml/EE/R&C/AEE2/F.MP.No.18/2012/D43/dt.07.03.14

[23] There was a delay in calibration from 17 September-2012 to 01 October-2012, For this period error factor is applied in the ER sheet.

						26-September-2013		for calibration has changed from once in a year to once in every 5 year. (the copy of memo addressed in foot note)
T05 (ITC 147)	Main Meter	Elster	04955019	0.5s	TNEB	18-September-2011 02-October-2012[24] 26-September-2013	22-August-2008	
		Wallaby	HT02120972[25]	0.2s	TNEB	31-May-2014	31-May-2014	
	Check Meter	Easter	TNB04030	0.5s	TNEB	18-September-2011 02-October-2012 26-September-2013	22-August-2008	
T06 (ITC 234)	Main Meter	Elster	04955022	0.5s	TNEB	18-September-2011 02-October-2012[26] 26-September-2013	22-August-2008	
	Check Meter	Secure	TNB04031	0.5s	TNEB	18-September-2011 02-October-2012 26-September-2013	22-August-2008	
T07 (ITC 637)	Main Meter	Elster	04955021	0.5s	TNEB	18-September-2011 02-October-2012[27]	.22-August-2008	

[24] There was a delay in calibration from 17-September-2012 to 01 October-2012, For this period error factor is applied in the ER sheet.

[25] Meter no 04955019 has been replaced with batter accuracy class (0.2s) and pre calibrated meter no. HT02120972 dated 31-May-2014 as per TENGEDCO memo, Memo.No.CE/Comml/EE/R&C/AEE2/F.MP.No.18/2012/D43/dt.07.03.14.

[26] There was a delay in calibration from 18-September-2012 to 01 October-2012, For this period error factor is applied in the ER sheet.

[27] There was a delay in calibration from 18- September-2012 to 01-October-2012, For this period error factor is applied in the ER sheet.

						26-September-2013		
	Check Meter	Secure	TNB04032	0.5s	TNEB	18-September-2011 02-October-2012 26-September-2013	22-August-2008	

For WEG HTSC No. 2687, main meter Sr.No. 04941038 which was fixed on 27- September- 2008, replaced by pre-calibrated meter Sr. No. 14190248 of accuracy class 0.2s on dated 11-February-2014. Next due date for calibration of this meter will be 10 February 2015. However, the calibration frequency has been changed from one year to five years from 2014 onwards as per TANGEDCO memo dated 07 March 2014. For WEG HTSC No. 2687, check meter serial number 04954747 has fixed on 27 September 2008, replaced by pre-calibrated meter Sr.No. 1419030 of accuracy class 0.2s on dated 11-February-2014. Next due date for calibration of this meter will be 10 February 2015. However, the calibration frequency has been changed from one year to five years from 2014 onwards as per TANGEDCO memo dated 07 March 2014.

For WEG HTSC No. 2666, main meter Sr.No. 04940883 has fixed on 20 September 2008, replaced by pre-calibrated meter Sr.No. 14190303 of accuracy class 0.2s on dated 11-February-2014. Next due date for calibration of this meter will be 10 February 2015. However, the calibration frequency has been changed from one year to five years from 2014 onwards as per TANGEDCO memo dated 07 March 2014. For WEG HTSC No. 2666, check meter Sr. No. 04954765 has fixed on 25 June 2009, replaced by pre-calibrated meter Sr.No. 14190334 of accuracy class 0.2s on dated 11-February-2014. Next due date for calibration of this meter will be 10 February 2015. However, the calibration frequency has been changed from one year to five years from 2014 onwards as per TANGEDCO memo dated 07 March 2014.