



GRID-CONNECTED WIND ELECTRICITY GENERATION PROJECT IN TAMIL NADU, INDIA



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Project title	Grid- Connected wind Electricity Generation Project in Tamil Nadu, India
Project ID	VCS 498
Monitoring period	01-January-2016 to 31-December-2019 (First and last day included)
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Prepared by	EKI Energy Services Limited

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PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project activity under consideration has been promoted by National Enterprises, referred to as the project proponent throughout this document. The project activity involves the setting up of two numbers of WTGs of cumulative capacity of 3.3 MW (2 X 1.65 MW). The envisaged net electricity generation quantum from the project to the tune of 7,938 MWh on an annual basis exported to the nearest grid substation of Tamil Nadu Electricity Board, a part of Indian Regional Electricity Grid of India. The basic purpose of the initiative is to generate clean energy through renewable energy source and supply the power to the grid. The power generated by the project displaces an equivalent quantity of power generated by grid by a majority of fossil fuel combustion, thus contributing to the cause of conservation of the conventional sources of energy.

Sl.No.	Capacity (MW)	WTG Supplier	HTSC Number	Date of Commissioning	WTG Location
1	1.65	Vestas	2570	30-March-2008	Samugarangapuram Village
2	1.65		2595	31-March-2008	

The amount of emission reductions achieved during this Verification period i.e., from 01-January-2016 to 31-December-2019 is 21,476 tCO₂e.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Verification	01-January - 2010 to 31-December - 2015	VCS	LGAI Technological Center, S.A. (Applus+ Certification)	6 Years
Verification	01-January- 2016 to 31-December-2019	VCS	Earthood Services Private Limited	4 Years

1.3 Sectoral Scope and Project Type

Sectoral scope¹	1 - Energy industries (renewable- /non-renewable sources).
Project activity type	Type I – Renewable Energy Projects

¹ Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: <https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes>

1.4 Project Proponent

Organization name	National Enterprises
Contact person	Mr. Charanjit Singh Grewal
Title	Proprietor
Address	National Enterprises P.O.-Box No.44 Barabil, Keonjhar, Orissa Pin-758035
Telephone	06767-275521
Email	gapl_sponge@yahoo.co.in , gurgaongrewalgroup@gmail.com

1.5 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultant
Contact person	Manish Dabkara
Title	Managing Director
Address	Office no. 201, Plot 48, Scheme 78 Part 2, Behind Vrindavan Hotel, Vijay Nagar, Indore - 452010 (M.P, India) Website- www.enkingint.org
Telephone	+91-99075534900
Email	manish.dabkara@enkingint.org / registry@enkingint.org

1.6 Project Start Date

Project start date	30-March-2008
Justification	The first project WTG under the project was commissioned and power generation started on 30-March-2008 (Considered as the date of commissioning of the WTG's

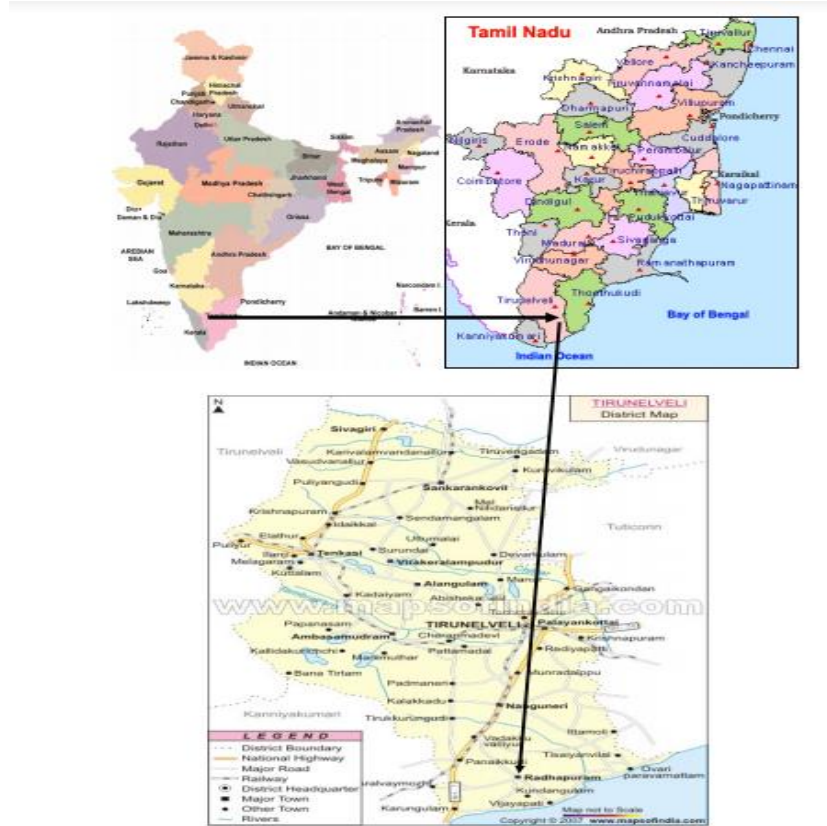
1.7 Project Crediting Period

Crediting period	<input type="checkbox"/> Seven years, twice renewable <input type="checkbox"/> Ten years, fixed <input checked="" type="checkbox"/> Other (The project activity adopts renewable crediting period of 10 years period which can be renewed for maximum 2 times, As per relevant guidelines of Verified Carbon Standard Version 3.2.)
Start and end date of first or fixed crediting period	01-January-2010 to 31-December-2019

1.8 Project Location

The details pertaining to the location of each individual WTG installed under the project activity has been provided in the following table:

District	Site	HTSC No.	Latitude	Longitude	Local grid sub station
Tirunelveli	Samugarangapuram Village	2570	8°19'32.7"	77°40'59.2"	TNEB 33 kV (Tirunelveli)
		2595	8°19'59.4"	77°019'27.4"	



1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	AMS –I.D.	Grid Connected Renewable Electricity Generation'	15 ²

1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

Yes No

² https://cdm.unfccc.int/filestorage/7/Q/QX/7QXAZ5036WN8BEYKUDFRPJGL21V4I9/EB50_repan29_AMS-I.D_ver15.pdf?t=TzJ8cXZ1dXJrfDAY8s7oZsQG38kVpKNRrcej

If yes, provide required evidence of no double issuance as outlined by the VCS Standard.

1.10.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

Yes No

If yes, provide the registration number and all relevant details.

1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.11.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

Yes No

If yes, provide all required evidence of no double claiming as outlined by the VCS Standard.

1.11.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

Yes No

If yes, provide all required evidence of no double claiming as outlined by the VCS Standard.

1.11.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

Yes No

1.12 Sustainable Development Contributions

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

- Clean power generation by harnessing a renewable natural resource i.e., wind power
- Abatement of GHG emissions for power generation from combustion of nonrenewable sources of energy
- Increased proportion of renewable energy directly in the regional electricity grid and indirectly in the national electricity grid

- Contribution to the causes of fossil-fuel conservation, climate change mitigation and energy security

Contribution of the Project Activity to Sustainable Development:

The contribution of the project activity to the sustainable development can be substantiated as follows:

1. Social Well Being:

- Harnessing renewable energy by means of a clean power generation technology
- No requirement of relocation or rehabilitation as there is no human displacement attributable to the project activity
- Provision of employment and business opportunities for local populace during installation, commissioning and operational phases
- Development of road network, transportation facilities and other infrastructure development initiatives

2. Economic Well Being:

- Contribution towards grid stability and abridging the demand-supply gap in the Indian Electricity Grid
- Creation of business opportunities for local stakeholders

3. Technological Well Being:

- Employment of clean power generation technology by harnessing wind energy potential
- Reduction in transmission and distribution losses from power plants in the grid to remote areas

4. Environmental Well Being:

- GHG abatement by displacement of electricity generated by the fossil fuel dominated grid-mix
- Contribution to causes of mitigation of climate change and global warming
- No environmental disturbance or ecological imbalance caused to the surroundings, over total project lifetime
- Contribution towards reduction in the levels of SO_x, NO_x, and SPM associated with combustion of fossil fuels for power generation

Table 1: Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
<i>Sequential row number</i>	<i>SDG Target number</i>	<i>Number and text of SDG indicator or, if no official SDG indicator is applicable, user-defined indicator</i>	<i>Indicate the project's contribution to the SDG Indicator (implemented activities to increase or decrease)</i>	<i>Brief description of the quantifiable impact of the project's activities related to the SDG indicator, during the monitoring period.</i>	<i>Brief description of the cumulative quantifiable impact of the project's activities related to the SDG indicator, over the project lifetime.</i>
1)	7.2	7.2.1: Renewable energy share in the total final energy consumption	Implemented activities to increase	About 23,093.5 MWh renewable electricity has supplied to Indian grid during the reported period that helps to increase the renewable energy share in the energy mix.	Overall 55,918.5 MWh (32,825+23,093.5) renewable electricity has supplied to Indian grid throughout the project lifetime that helps to increase the renewable energy share in the energy mix.
2)	13.0	Total greenhouse gas emissions per year	Implemented activities to increase	By supplying 23,093.5 MWh clean electricity (generated through Solar PV) to Indian grid, the project avoided release of 21,476 tCO ₂ e in to the atmosphere during the reporting period.	Overall prevented the release of 51,102(29,626+21,476) tCO ₂ e into the atmosphere since project commissioning.

3)	4.4	4.4.1 Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill	Implemented activity to increase	Together with the technology supplier the project participant Conducted 6 trainings during the current monitoring period. Training related to technical & soft skills.	Overall, 6 trainings provided during over project lifetime. As this SDG indicator was not reported earlier, therefore the current and overall contribution are same.
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1.13 Commercially Sensitive Information

Not applicable. No commercially sensitive information has been excluded from the public version of the project description. There is no commercially sensitive information.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Since none of the stakeholders have been changed since validation and all the identified stakeholders were involved and no new group of stakeholders are to be included for this ongoing verification. Therefore, this section is not applicable.

Stakeholder Identification	Not Applicable
Legal or customary tenure/access rights	Not Applicable
Stakeholder diversity and changes over time	Not Applicable
Expected changes in well-being	Not Applicable
Location of stakeholders	Not Applicable
Location of resources	Not Applicable

2.1.2 Stakeholder Consultation and Ongoing Communication

Ongoing consultation	As a part of continual improvement process, feedback from the associated stakeholders is vital, therefore a dedicated Visitor register cum grievance register has been placed at the project site which is accessible to stakeholders to provide their feedback on the project.
Date(s) of stakeholder consultation	24-Novmber-2009
Communication of monitored results	The monitoring results are communicated from the concerned individuals (stakeholders) to PP, through the

	grievance register. The site officials acknowledge and address the comments, suggestions, or grievances submitted by stakeholders, resolving issues as needed.
Consultation records	Registers is used to records the grievances and feedback. Grievance register is placed at the main gate of site office and is accessible to everyone.
Stakeholder input	No any grievances received during the current monitoring period; therefore, no any mitigation measures were required. In case of grievances, the nature of probable resolution is discussed with the plant head office and implemented by the site in-charge.

2.1.3 Free, Prior, and Informed Consent

Consent	The project secured consent through inclusive community consultations, involving Indigenous Peoples (IPs), Local Communities (LCs), and customary right holders. Extensive engagement, transparent information sharing, and acknowledgment of customary rights were key. Consent was documented in clear agreements accessible to all stakeholders. Conflict resolution mechanisms and ongoing engagement ensure a responsive approach. Continuous monitoring and evaluation demonstrate the commitment to transparency and positive community outcomes. The absence of ongoing conflicts reflects the project's success in aligning with stakeholder interests and maintaining a harmonious relationship with the community.
Outcome of FPIC	The Free, Prior, and Informed Consent (FPIC) process for the project resulted in a positive outcome. Transparent agreements were reached with Indigenous Peoples (IPs), Local Communities (LCs), and customary rights holders. Information disclosed included project details, potential impacts, and benefits, ensuring stakeholders' understanding. Assurance is provided that the project adheres to ethical standards - no encroachment on existing land occurred, and no forced physical or economic displacement took place. The project utilized unused, greenfield land, and the absence of relocation signifies the commitment to responsible and sustainable development practices.

2.1.4 Grievance Redress Procedure

The stakeholders are also requested to share their experiences and grievances on continuous basis. Registers is used to records the grievances and feedback. Grievance register is placed at the main gate of site office and is accessible to everyone. During the current monitoring period, positive feedbacks had been received regarding site operation. No any grievances received

during the current monitoring period, therefore, no any mitigation measures were required. In case of grievances, the nature of probable resolution is discussed with the plant head office and implemented by the site in-charge.

Grievances received	Resolution and outcome
NA	NA

2.1.5 Public Comments

No negative comments have been received on project activity from any of the local stakeholders consulted. As all comments were very positive about the project, no further action is required. There were no further comments raised by the stakeholders and they were totally in support for setting up of these kinds of projects in the region. The local stakeholders expressed their support to the project

Summary of comments received	Actions taken
NA	NA

2.2 Risks to Stakeholders and the Environment

	Risk identified	Mitigation or preventative measure taken
Risks to stakeholder participation	No risk to stakeholder participation is anticipated	There are no exclusions, lack of communication or barriers in the project activity, that might prevent stakeholders from engaging or participating.
Working conditions	No risk identified	There are no risks related to working conditions of the employees in the project activity, due to comprehensive safety training programs for the workers/employees.
Safety of women and girls	No risk identified	The project activity has no negative impact over the safety of women and girls. Also, the safety concerns of the women and girls are addressed through the interactions with the stakeholders and resolved as per requirement. Moreover, the project strictly adheres to the laws for the women and girls, demonstrating the commitment to address any threat related to the safety of the women/girls of the project location.

<p>Safety of minority and marginalized groups, including children</p>	<p>No risk identified</p>	<p>No threats to the safety of minority and marginalized groups, including children have been identified. The PP duly diligently follows the legal and human rights of the children, minorities and marginalized groups, and hence, the project poses no negative effects on them.</p>
<p>Pollutants (air, noise, discharges to water, generation of waste, release of hazardous materials)</p>	<p>No risk identified</p>	<p>There is no risk due to generation of pollutants (noise, discharges to water, generation of waste, and release of hazardous materials), due to project activity. The project rather improves air quality by preventing fossil fuel burns and mitigates climate change by producing electricity from a clean source of energy, i.e. wind energy.</p>

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

<p>Discrimination and sexual harassment</p>	<p>PP has provided declaration that no discrimination or sexual harassment has occurred or will occur. PP shall oblige to create a workplace free of sexual harassment and no discrimination as per local law and same will be demonstrated during validation assessment process.</p>
<p>Management experience</p>	<p>The project showcases management expertise in renewable energy initiatives and effective community engagement. With a proven track record, the team emphasizes transparent communication, relationship-building, and culturally sensitive approaches. Strategic partnerships are forged to fill expertise gaps, and a dynamic recruitment strategy is in place for skill diversification.</p>
<p>Gender equity in labor and work</p>	<p>PP has provided declaration that it does not discriminate in workers with respect to gender in providing jobs and also there is no discrimination in respect to wages between genders. This will be demonstrated by the project proponent during validation assessment process.</p>
<p>Human trafficking, forced labor, and child labor</p>	<p>PP has provided declaration that project activity does not and will not use victims of human trafficking, forced labor, and child labor. This will be demonstrated by the project proponent during validation assessment process.</p>

2.3.2 Human Rights

The following demonstrations show how the project is committed to safeguard the rights of IPs, LCs, and customary right holders, while following the international human rights law³, the UNDRIP⁴ and ILO Convention 169-

- **Free, Prior, and Informed Consent (FPIC):** The project activity has obtained the FPIC from the local stakeholders including the IPs, LCs and customary right holders, ensuring their unforced consent before the project operation, respecting their right to make decisions.
- **Non-discriminatory Participation in the Project Activity-** The implementation of project activity has led to providing employment to the local stakeholders without any cultural or social biases, safeguarding the rights of IPs, LCs, and customary rights holders to be free from discrimination.
- **Employment due to the Project Activity-** The project activity also leads to the employment from the IPs, LCs and customary right holders, enabling them to exercise their right to fair treatment in employment and salary.

2.3.3 Indigenous Peoples and Cultural Heritage

The project activity does not impact the tangible or intangible cultural heritage or the indigenous people nearby.

2.3.4 Property Rights

Disputes over rights to territories and resources	N/A
Respect for property rights	The land / property for the project activity belongs to the project proponent and, it can be supported through the relevant documents. Additionally, the project activity has obtained the free, prior and informed consent of the stakeholders (including the IPs, LCs, and customary rights holders). This ensures that their lands are property rights are protected and respected.

2.3.5 Benefit Sharing

Summary of the benefit sharing plan	Since the above section 2.3.4 is not applicable, hence this section is also not applicable .
Benefit sharing during the monitoring period	N/A

³ <https://www.ohchr.org/sites/default/files/Documents/Publications/fs9Rev.2.pdf>

⁴ https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf

2.4 Ecosystem Health

	Risk identified	Mitigation or preventative measure taken during the monitoring period
Impacts on biodiversity and ecosystems	No risk identified	This project activity doesn't result in adverse effects; instead, it positively impacts on the biodiversity and ecosystem by decreasing air pollution and mitigating climate change.
Soil degradation and soil erosion	No risk identified	This project activity keeps check of the soil degradation and soil erosion by periodic monitoring.
Water consumption and stress	No risk identified	This project activity is a wind power project and does not have any negative impacts on water consumption or does not lead to water stress in any way.
Usage of fertilizers	No risk identified	Since, this is a wind power project activity, hence it does not account for any adverse impacts associated with the use of fertilizers.

2.4.1 Rare, Threatened, and Endangered species

Species or habitat	The project activity has not adversely impacted habitats for rare, threatened, or endangered species during the monitoring period
...	...

2.4.2 Introduction of species

Species introduced	Classification	Justification for use	Adverse effects and mitigation
Not applicable (NA)	NA	NA	NA

Existing invasive species	Mitigation measures to prevent spread or continued existence of invasive species
NA	NA

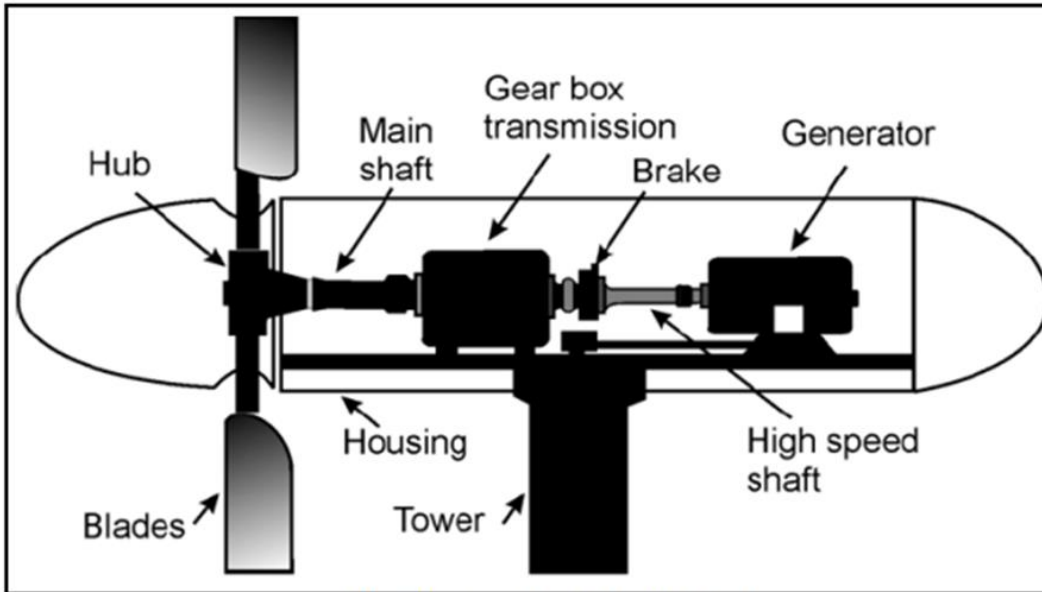
2.4.3 Ecosystem conversion

Since, the project activity is neither ARR, ALM, WRC nor ACoGS, hence this information is **not applicable**.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

In wind energy generation, kinetic energy of wind is converted into mechanical energy and subsequently into electrical energy. Wind has considerable amount of kinetic energy when blowing at high speeds. This kinetic energy when passes through the blades of the wind turbines, it is converted into mechanical energy and rotates the wind blades. When the wind blades rotate, the connected generator also rotates, thereby producing electricity.



Major Mechanical Parts of a Wind Turbine

Technical specification of the Wind Turbines Generator (V 82 – 1650 kW) used in the project activity has been detailed below:

Features of WTG		
Sr.No.	Particulars	Specifications
Main Specifications		
1.	Rotor diameter	82 m
2.	Number of blades	3
3.	Power Control	Active Stall
4.	Rotational Speed (Synchronous)	14.4 rpm
5.	Rotor position	Upwind
6.	Nominal Power	1650 KW
7.	Hub height	78 m
Rotor		
8.	Rotor Diameter	82 m
9.	Tilt Angle	5°
10.	Swept Area	5281 m ²
Blade		
11.	Material	Fibre/Epoxy/Wood
12.	Blade Length	40 m

13.	Blade Profile	FFA – W3, NACA 63.4
14.	Air Brake	Full Blade
Hub		
14.	Type	Spherical
15.	Material	EN-GJS-400-18U-LT
Main Shaft		
16.	Type	Forged shaft and flange
17.	Material	34 CrNiMo6
Main Bearings		
18.	Front Bearings	Spherical roller bearings
Main Gear box		
19.	Gear Ratio	1:70.2
20.	Mechanical Power	1800 kW
Couplings		
21.	Gearbox/Generator	Flexible
Generator		
22.	Nominal Power	1650 kW
23.	Rotational Speed (Synchronous)	1012 rpm at rated power
24.	Insulation class	F/B
25.	Protection class (IEC529)	IP 54
Machine Frame		
26.	Type	Casted front end
27.	Material	EN-GJS-400-18U-LT
Yawing System		
28.	Yaw bearing	Ball bearing, internal gearing
29.	Yaw Motor	6 Nos.
30.	Yaw gear	6 pcs
31.	Gearing ratio	1:1666
32.	Yaw brake	Hydraulic disc brakes, 6 pcs
Tower		
33.	Type	Conical tubular
34.	Height	75.5 m
35.	Corrosion Protection	Acc. To ISO 12944:C5 I
Control System		
36.	Manufacturer	Vestas Control systems
37.	Type	Microprocessor based

The expected level of performance in terms of electricity generation from the project activity, along with the GHG abatement by the project activity is provided below:

- Installed power generation capacity: 3.3 MW
- Plant Load Factor (PLF) 27.46 %

- Net electricity export to the grid per annum: 7,938 MWh
- GHG abatement potential per annum: 7,402 tCO_{2e}

The commissioning details of the project activity is mentioned in section 1.1 of this monitoring report. The project has been under operation since commissioning, without any major breakdowns. The plant is running smoothly since commissioning with scheduled maintenance. No events or situations happened expect the normal breakdowns for the reported monitoring period that can alter the applicability of the applied methodology.

3.2 Deviations

3.2.1 Methodology Deviations

The project activity has been implemented as described in the VCS-PD and there was no methodological deviation applied during the monitoring plan.

3.2.2 Project Description Deviations

Deviation 1:

The registered VCS PD mentioned about 10 years of crediting period but not mentioned about renewable type and VCS Validation report mentioned about 10 years crediting period renewal twice as per Verified Carbon Standard Version 3.2.

Hence a project description deviation is requested for 10 years crediting period with renewal twice, as per VCS standard v 3.2, the same is mentioned in the section 1.6.

Deviation 2:

The registered VCS PD mentioned start date of crediting period as 30-March-2008. PP wants to start VCS verification period from 01-January- 2010 onwards,

Hence a project description deviation is requested to change in the start date of crediting period from 30-March-2008 to 01-Jan-2010.

Deviation 3:

For the entire monitoring period Main Meter is used for billing purpose for this monitoring practice check meter is not installed at the site, since the meters are under the custody of state electricity board PP has no role in it. Hence, PP has requested deviation in this regard.

Deviation4:

During this monitoring period, the meter has been replaced on 18 -May -2017 with meter accuracy class 0.2s having meter S.No. TNG63575 & TNG63704. So, the new meters accuracy class has been changed to 0.2s which was earlier 0.5s which is more conservative. The details of the new meters are mentioned in appendix 2 of the MR. The meters are under the custody of state electricity board, PP has no role in it. Hence, PP has requested deviation in this regard.

The above-mentioned deviations are of permanent nature and does not have any impact on the project applicability, baseline scenario and additionality.

3.3 Grouped Projects

Not applicable as the project is non-grouped.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

- Yes No

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	Operating margin emission factor (inclusive of imports) - $EF_{grid,OM,y}$
Data unit	tCO ₂ / MWh
Description	Operating Margin CO ₂ emission factor of the grid
Source of data	CO ₂ Baseline Database for the Indian Power Sector, User Guide (Version 5, Date: November, 2009)
Value applied	0.97 (Value pertaining to the year 2008-2009)
Justification of choice of data or description of measurement methods and procedures applied	Information available from authorized government agencies – National standard value has been calculated by Central Electricity Authority (CEA) as per guidelines of the ‘Tool to calculate the emission factor for an electricity system
Purpose of data	<i>To calculate Baseline Emission</i>
Comments	The parameter has been calculated ex-ante and are remain fixed for the entire duration of the crediting period of the project activity. The relevant data are recorded in electronic form and the same can be archived for two years beyond the crediting period.

Data / Parameter	Build margin emission factor - $EF_{grid,BM,y}$
Data unit	tCO ₂ / MWh
Description	Build Margin CO ₂ emission factor of the grid
Source of data	CO ₂ Baseline Database for the Indian Power Sector, User Guide (Version 5, Date: November, 2009)
Value applied	0.82 (Value pertaining to the year 2008-2009)
Justification of choice of data or description of measurement methods and procedures applied	Information available from authorised government agencies – National standard value has been calculated by Central Electricity Authority (CEA) as per guidelines Tool to calculate the emission factor for an electricity system’
Purpose of data	To calculate Baseline Emission

Comments	The parameter has been calculated ex-ante and remains fixed for the entire duration of the crediting period of the project activity. The relevant data are recorded in electronic form and the same can be archived for two years beyond the crediting period.
Data / Parameter	Combined Margin Emission Factor - $EF_{grid,CM, y}$
Data unit	tCO ₂ / MWh
Description	Combined Margin CO ₂ emission factor of the Indian regional Grid of India
Source of data	CO ₂ Baseline Database
Value applied	0.93
Justification of choice of data or description of measurement methods and procedures applied	Information available from authorized government agencies – National standard value has been calculated by Central Electricity Authority (CEA) as per guidelines Tool to calculate the emission factor for an electricity system'
Purpose of data	To calculate Baseline Emission
Comments	The parameter has been calculated ex-ante and remains fixed for the entire duration of the crediting period of the project activity. The relevant data are recorded in electronic form and the same can be archived for two years beyond the crediting period.

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{BL,y}$
Data unit	MWh
Description	Net Electricity Exported by the two WTGs to the Indian Regional Electricity Grid
Source of data	Monthly Electricity Export Invoices raised to regional electricity utility company for the two WTGs
Description of measurement methods and procedures to be applied	The data is calculated using certain measured and estimated parameters. (Measured parameters viz. import of electricity from the grid, export of electricity to the grid and the reactive power generated and estimated parameters viz. transmission losses) in a way as described in section 3.4 of PD. The Energy Meters (Tri vector meter of accuracy class 0.2s) installed at the WTG switch yard measures the variable on a continuous basis. The only main meter is installed at WTG end for the billing purpose for both WTGs which have accuracy class 0.2s. The detail regarding meter'S.No. Calibration Details, Accuracy Class has been mentioned in Appendix 2 of the Monitoring report. These are two-way meters.

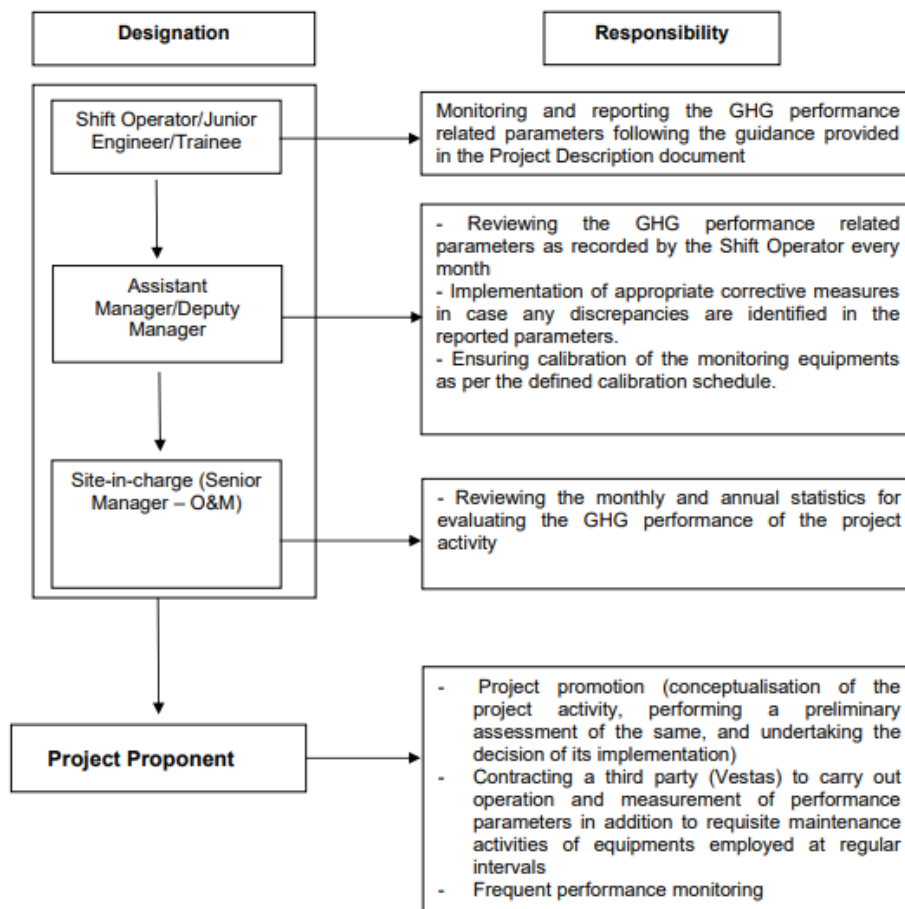
	<p>Utility officials take the readings (joint meter reading) on these meters on monthly basis and the same reading is used to determine the net power exported to the grid and determine the extent of mitigation of GHG over a period of time. A detail on metering and measurement methods is given in section 3.4 of the PD.</p> <p>Metering equipment: Tri vector Energy Meter</p> <p>Accuracy Class: 0.2s</p> <p>Data type: Estimated (using meter readings)</p> <p>Archiving: Electronic</p> <p>Recording Frequency: Monthly</p> <p>Responsibility: The O&M operator is responsible for the regular recording of data.</p> <p>Calibration Frequency: As per the registered PD the meter calibration is annual. The details of energy meter calibration applicable in this monitoring period has been provided in Appendix 2 of this monitoring report.</p>
Frequency of monitoring/recording	Monthly & continuously.
Value monitored	23,039.5
Monitoring equipment	Tri vector Energy Meter
QA/QC procedures to be applied	<p>The project activity emission reductions are based on the net electricity supplied ($EG_{BL,y}$) by the individual WTG. $EG_{BL,y}$ is referred from the monthly invoice raised by the PP to State Utility Department based on the monthly JMR Report issued by State Electricity Department to the Project Proponent. The main meter at the sending end of the sub-station is sealed by and are in the custody of State Electricity Department. The main meter is used for the monitoring purpose of the said parameter and the same is in line with the State electricity regulatory commission guideline.</p>
Purpose of the data	To calculate Emission Reduction
Calculation method	NA
Comments	The relevant data are recorded in electronic form and the same along with the electricity bills can be archived for two years beyond the crediting period.

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 15 requires monitoring of the following.

- Metering the electricity generated by the renewable technology
- 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 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 adheres to all the mandatory regulatory and statutory requirements at the state as well as national level. The operational and management structure implemented by National Enterprises along with Vestas is as follows:-



The daily generation report is sent to National Enterprises by Vestas. The daily generation report contains data on grid availability, machine availability and generation of electricity. National Enterprises reviews the machine availability from the generation report. The monitored data is maintained both as soft and 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 are maintained for 10 + 2 (crediting + 2 years) years. Daily generation reports from Vestas are compiled into monthly reports and saved electronically for 10+2 years (crediting + 2 years).

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The baseline emissions are calculated using the following formula:

$$BE_y = E_{GBL,y} \times EFCO_2$$

Where:

BE_y = Baseline Emissions.

$E_{GBL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the VCS project activity in year y (MWh)

$EFCO_2$ = CO₂ Emission Factor in year y; t CO₂e/MWh

$$BE_y = 23,093.5 \text{ MWh} \times 0.93 \text{ tCO}_2\text{e/MWh}$$

$$BE_y = 21,476 \text{ tCO}_2\text{e (Vintage wise Rounded Value)}$$

5.2 Project Emissions

As the project activity is a wind power project, there are no anthropogenic emissions by sources of GHGs within the project boundary as a result of the project activity. Hence there are no project emissions to be considered. $PE_y = 0$

5.3 Leakage Emissions

There are no anthropogenic emissions identified by sources outside the project boundary due to the project activity. Furthermore, the equipment's (WTGs) used by the project activity are newly procured and hence not transferred from another project. Thus, there are no leakage emissions attributable to the project activity. Hence, $LE_y = 0$

5.4 GHG Emission Reductions and Carbon Dioxide Removals

Quantify the net GHG emission reductions and removals achieved for this monitoring period, summarizing the key results using the table below. Specify breakdown of GHG emission reductions and removals by vintages where the intent is to issue each vintage separately in the VCS registry system.

The Formula used to calculate the net emission reduction for the project activity is:-

$$ER_y = BE_y - PE_y - LE_y$$

Where,

ER_y = Emission Reduction in tCO₂/year

BE_y = Baseline emission in tCO₂/year

PE_y = Project emissions in tCO₂/year

LE_y = Leakage Emissions in tCO₂/year

For the project activity during the current monitoring period, as per section 6.2,

BE_y = 21,476 tCO_{2e}, PE_y = 0 tCO_{2e} , LE_y = 0 tCO_{2e}.

Vintage period	Baseline emissions (tCO _{2e})	Project emissions (tCO _{2e})	Leakage emissions (tCO _{2e})	Reduction VCU (tCO _{2e})	Removal VCU (tCO _{2e})	Total VCU (tCO _{2e})
01-January-2016 to 31-December-2016	4,508	0	0	4,508	0	4,508
01-January-2017 to 31-December-2017	5,930	0	0	5,930	0	5,930
01-January-2018 to 31-December-2018	6,058	0	0	6,058	0	6,058
01-January-2019 to 31-December-2019	4,980	0	0	4,980	0	4,980
Total	21,476			21,476	0	21,476

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
01-January-2016 to 31-December-2016	7,402	4,508	-39.10%	Lower generation
01-January-2017 to 31-December-2017	7,402	5,930	-19.90%	Lower generation
01-January-2018 to 31-December-2018	7,402	6,058	-18.18%	Lower generation
01-January-2019 to 31-December-2019	7,402	4,980	-32.75%	Lower generation

Total	29,628	21,476	-27.51%	
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APPENDIX 1: COMMERCIALY SENSITIVE INFORMATION

No commercially sensitive information has been provided

APPENDIX 2: < METER CALIBRATION DETAILS>

For WTG NE 1 (HTSC No. 2595)

Meter Type	Meter Make	Meter S.No.	HTSC No.	Meter Accuracy class	Date of Calibration	Due date of Calibration
Main	L&T	14191074	2595	0.5s	16-March-2016	15-March-2017
Main	L&T	14191074	2595	0.5s	08-February-2017	07-February-2018
Main	Secure	TNG63575	2595	0.2s	18-May-2017	17-May-2018
Main	Secure	TNG63575	2595	0.2s	21-July-2020	20-July-2021

For WTG NE 2 (HTSC No 2570)

Meter Type	Meter Make	Meter S.No.	HTSC No.	Meter Accuracy class	Date of Calibration	Due date of Calibration
Main	L&T	14191057	2570	0.5s	16-March-2016	15-March-2017
Main	L&T	14191057	2570	0.5s	08-February-2017	07-February-2018
Main	Secure	TNG63704	2570	0.2s	18-May-2017	17-May-2018
Main	Secure	TNG63704	2570	0.2s	21-July-2020	20-July-2021

Note- The meter calibration was carried out on 16 -March-2016 for both WTGs NE 1 & NE 2 having meter S.No. 14191074 & 14191057 with meter accuracy class 0.5s respectively which is valid till 15 -March-2017. The meters have been calibrated for both NE 1& NE 2 again on 08-February-2017 which is valid till 07-February-2018. The meter has been replaced on 18 -May -2017 with meter accuracy class 0.2s having meter S.No. TNG63575 & TNG63704 which is valid till 17- May 2018. The new meters with accuracy class 0.2s were calibrated on 21 -July- 2020 which is valid till 20 -July-2021.

There is a delay in calibration of energy meters from Jan 2016 to March 2016.As a conservative approach error factor with meter accuracy class 0.5s has been applied in the calculation of emission reductions for complete months from January 2016 to March 2016. Further delay in calibration has been observed from 18-May- 2018 to 20-July -2020. As a conservative approach error factor with meter accuracy class 0.2s has been applied in the calculation of emission reductions for complete months from May 2018 to July 2020.

The JMR/billing reading cycle for the project activity has been updated by Tamil Nadu Electricity Board from November 2017 onwards. Initially, the JMR/billing cycle reading was started from 15th day of each month. From November 2017, the JMR/billing reading cycle started from 10th day of each month. Further, the JMR/billing cycle reading has been again updated from April-2019. Hence from April-2019, the billing cycle has been started from 1st day of each month till the end of this monitoring period.