

53.75 MW BUNDLED WIND POWER PROJECT IN TAMIL NADU AND KARNATAKA BY KBD GROUP, INDIA

Document Prepared By

General Carbon Advisory Services Pvt. Ltd. Mumbai

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Table of Contents

CONTENTS

1	Project Details	3
1.1	Summary Description of the Implementation Status of the Project	3
1.2	Project Proponent	10
1.3	Other Entities Involved in the Project	11
1.4	Project Start Date	11
1.5	Project Crediting Period	11
1.6	Project Location	11
1.7	Title and Reference of Methodology	17
1.8	Other Programs	17
2	Implementation Status	17
2.1	Implementation Status of the Project Activity	17
2.2	Deviations	17
2.2.1	Methodology Deviations	17
2.2.2	Project Description Deviations	17
2.3	Grouped Project	18
3	Data and Parameters	18
3.1	Data and Parameters Data and Parameters Available at Validation	18
3.2	Data and Parameters Monitored	19
3.3	Monitoring Plan	26
	Measurement Frequency	28
4	Quantification of GHG Emission Reductions and Removals	31
4.1	Baseline Emissions	32
4.2	Project Emissions	32
4.3	Leakage	32
4.4	Net GHG Emission Reductions and Removals	32
5	Additional Information	35

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The purpose of this document is to calculate Greenhouse Gas emission reductions achieved by VCS project “53.75 MW Bundled wind Power project in Tamil Nadu and Karnataka by KBD Group, India” for periodic verification.

This monitoring report covers emission reductions for the period of 01-04-2010 to 31-03-2014. The start date of the project activity is 29-09-2006. The project start date is the earliest commissioning date amongst all the WTGs in this grouped project.

The names of the project promoters, Capacity of the WTGs are as listed below.

Table 1: Details of Project Proponent and the WTGs

Owner	Number of WTG	Capacity of WTG	Installed Capacity
Sapthagiri Distilleries Private Limited	19	1500 kW	28.5 MW
Mr. D.K. Audikesavulu	19	600 kW	11.4 MW
Mrs. D.A. Sathya Prabha	5	750 kW	3.75 MW
Mr. D.A. Srinivas	4	750 kW	3.0 MW
	1	1500 kW	1.5 MW
	1	600 kW	0.6 MW
Karnataka Breweries and Distilleries Limited	4	1250 kW	5 MW
Total	53		53.75 MW

The Project has been completed as planned and the monitoring equipments were installed to monitor the parameters as described in the Project Document (PD). The Plants are in operation continuously since its commercial operations.

The project has established 53 number (Suzlon make: 20 number of 1500 kW, 20 number of 600 kW, 4 number of 1250 kW and Vestas make: 9 number of 750 kW capacity) of Wind Turbine Generators (WTG) aggregating to a total installed capacity of 53.75 MW. The electricity generated by the project will be entirely sold to the Karnataka and Tamil Nadu State Electricity Boards in the southern grid. The project will help in greenhouse gas emission reduction by using renewable resource like wind energy for generating power which otherwise would have been generated using non- renewable, carbon intensive fuels. The project is a green field project aimed at utilizing wind to produce power.

There are five individual Project participants from various industries who have set up wind turbines and are bundled in this Project. The HTSC numbers and commissioning dates of individual WTGs are given in the following Table.

Commissioning dates of the WTGs

S.N.	HTSC No.	Commissioning date
1	1312	29-Sep-06
2	1329	30-Sep-06
3	1337	30-Sep-06
4	1336	30-Sep-06
5	D 8	30-Sep-06
6	D 5	29-Sep-06
7	D 11	30-Sep-06
8	D 4	29-Sep-06
9	D 13	30-Sep-06
10	D 7	30-Sep-06
11	D 14	30-Sep-06
12	D 6	30-Sep-06
13	D 16	30-Sep-06
14	D 21	30-Dec-06
15	D 19	30-Sep-06
16	D 17	30-Sep-06
17	D 20	22-Nov-06
18	D 25	30-Dec-06
19	D 22	30-Dec-06
20	D 23	30-Dec-06
21	D 24	30-Dec-06
22	D 12	30-Sep-06
23	D 10	30-Sep-06
24	H-23	31-Mar-07

25	H-24	31-Mar-07
26	U 1441	31-Mar-07
27	2155	14-Feb-07
28	2317	30-Mar-07
29	2309	30-Mar-07
30	2310	30-Mar-07
31	2311	30-Mar-07
32	2313	30-Mar-07
33	2314	30-Mar-07
34	2315	30-Mar-07
35	2316	30-Mar-07
36	2318	30-Mar-07
37	2325	30-Mar-07
38	2319/TIN	30-Mar-07
39	2320/TIN	30-Mar-07
40	2321/TIN	30-Mar-07
41	2233/TIN	26-Mar-07
42	2232/TIN	26-Mar-07
43	2270/TIN	29-Mar-07
44	2306/TIN	30-Mar-07
45	2289 TIN	30-Mar-07
46	2307	30-Mar-07
47	D 9	30-Sep-06
48	2170	24-Feb-07
49	1440	31-Mar-2007
50	1442	31-Mar-2007
51	2312	31-Mar-2007
52	K-310	31-Mar-2007
53	K-311	31-Mar-2007

The details of major equipments of the project and suppliers are presented below:

Project technologies, products, services and the expected level of activity:

Technology: The project activity has employed Horizontal Axis WTGs of different capacities. All the WTGs deployed in the project activity are tested and ideal for Indian metrological condition.

All the WTGs deployed in project activity have been composed by WTG of three blades each (with power control) and an active system for rotor orientation. Under wind high speed, a control system keeps the power at the plant's nominal value. Under wind slow speed, a control system will optimize the energy production, selecting an optimal combination of revolutions and angle of attack.

Technical specifications of Suzlon S-66 (1250 kW) for KBDL – 4 No.s

Rotor	
Diameter	66 m
Blades	3 No.
Orientation	Upward/ horizontal axis
Rotational speed	13.8 / 20.7 rpm
Rotational direction	Clockwise
Swept area	3421 m ²
Hub height	74 m
regulation	Pitch regulated
Operational data	
Cut in wind speed	3 m/s
Rated wind speed	14 m/s
Cut off wind speed	22 m/s
Gearbox	
Type	Integrated 3 stage
Cooling	Oil cooled, forced lubrication
Generator	
Type	Asynchronous, 4/6 pole
Rated voltage	690 V
Frequency	50 Hz

Cooling	Air cooled
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Technical specifications of Suzlon S-82 (1500 kW) for SDPL – 4 + 14 No.s and DA Srinivas – 1 No.

Rotor	
diameter	82 m
blades	3 No.
Orientation	Upward/ horizontal axis
Rotational direction	Clockwise
Swept area	5281 m ²
Hub height	80 m
regulation	Pitch regulated
Operational data	
Cut in wind speed	4 m/s
Rated wind speed	12.5 m/s
Cut off wind speed	20 m/s
Gearbox	
Type	Integrated 3 stage
Generator	
Type	Asynchronous, 4 pole
Rated voltage	690 V
Frequency	50 Hz
Cooling	Air cooled

Technical specifications of Suzlon S-52 (600 kW) for DK Audikesavulu - 19 No.s

Rotor	
diameter	52 m
blades	3 No.
Orientation	Upward/ horizontal axis
Rotational direction	Clockwise

Swept area	2124 m ²
Hub height	75 m
regulation	Pitch regulated
Operational data	
Cut in wind speed	3.5 m/s
Rated wind speed	12 m/s
Cut off wind speed	25 m/s
Gearbox	
Type	Integrated 3 stage
Cooling	Oil cooled, forced lubrication
Generator	
Type	Asynchronous, 4 pole
Rated voltage	690 V
Frequency	50 Hz
Cooling	Air cooled

Technical specifications of Vestas NM48/750 kW for DA Satyaprabha- 5 No.s and DA Srinivas – 4 No.

Rotor	
diameter	48.2 m
blades	3 No.
Orientation	Upward/ horizontal axis
Rotational direction	Clockwise
Hub height	55 m
Operational data	
Cut in wind speed	< 3.5 m/s
Cut off wind speed	25 m/s
Gearbox	
Cooling	Splash lubrication

Generator	
Nominal power	750/ 200 kW
Rotational speed (synchronous)	1500/ 1000 rpm
Insulation class	F

Technical specifications of Suzlon S-52 (600 kW) for DK Audikesavulu - 19 No.s and DA Srinivas – 1 No.

Rotor	
diameter	52 m
blades	3 No.
Orientation	Upward/ horizontal axis
Rotational direction	Clockwise
Swept area	2124 m ²
Hub height	75 m
regulation	Pitch regulated
Operational data	
Cut in wind speed	3.5 m/s
Rated wind speed	12 m/s
Cut off wind speed	25 m/s
Gearbox	
Type	Integrated 3 stage
Cooling	Oil cooled, forced lubrication
Generator	
Type	Asynchronous, 4 pole
Rated voltage	690 V
Frequency	50 Hz
Cooling	Air cooled

The technology used in the project is environment friendly and safe to operate. The transfer of technology is not involve, as the technology employed in the project activity and know how is well developed in India.

Technology Provider: The WTGs in the project activity are provided by:

- Suzlon make: 600 kW, 1250 kW and 1500 kW
- Vestas make: 750 kW

Expected level of activity: The major equipment in wind based power generation project is WTG, the useful life of the WTGs are 20 Years. The comprehensive O & M agreement covers all types of overhauling costs during the life of the project i.e. 20 Years.

Sectoral Scope and Project Type

Sectoral Scope : 01 Energy industries (renewable - / non-renewable sources)

Type: This project activity plant is a wind energy project supplying electricity to the south grid of India.

1.2 Project Proponent

Organization name	Sapthagiri Distilleries Private Limited
Contact person	P.S.Chakarapani
Title	Financial Advisor
Address	17, Sankey Road, Bangalore, Karnataka
Telephone	+91 80-23447993 / 23364732
Email	paniconsultancy@yahoo.com; kdbldtd@hotmail.com

This is the project proponent. They are responsible for completing the monitoring report form (VCS-MR).

The Karnataka Breweries and Distilleries (KBD) Group of companies, a leader in manufacturing of sugar and distillery products, also has business interests in other sectors like Properties, Healthcare and Steel in Karnataka. Under the leadership of Sapthagiri Distilleries Private Limited (SDPL), the group, with a view to align itself with sustainable development policies of India, has undertaken this project to produce green power using wind as an energy source. The projects are located in the existing barren land available in the states of Karnataka and Tamil Nadu.

The group includes the following participants;

1. Mr. D.K. Audikesavulu
2. Mrs. D.A. Sathya Prabha
3. Mr. D.A. Srinivas
4. Karnataka Breweries and Distilleries Limited

The details like capacity and number of WTGs has been included in section 1.1 of the MR.

1.3 Other Entities Involved in the Project

No other parties are involved in the project.

1.4 Project Start Date

Starting date: 29/09/2006

(The project start date is the earliest commissioning date amongst all the WTGs in this grouped project)

1.5 Project Crediting Period

10 years

Crediting period: 01/10/2006 to 30/09/2016

PP has option of renewable of the crediting period once considering project life of 20 years, as per the registered VCS-PD.

1.6 Project Location

The project sites are well connected by road and railways. The location of the project sites are furnished in table below:

Table 2: Project Location

<i>Village</i>	<i>District</i>
Range: Palladam	
Pushpathoor	Dindigul
Palappampatti	Coimbatore
Kundadam	Erode
Ponnapuram	Erode
Range: Sankeneri	
Udaythoor	Tirunelveli
Vijayapathi	Tirunelveli
Range: Surandai	
Azhagiapandiapuram	Tirunelveli
Sambavarvadakarai	Tirunelveli
Navaneetha krishnapuram	Tirunelveli
Keelakalangal	Tirunelveli
Range: Hassan North	

Rangapurakavalu	Hassan
Range: Kapathguda	
Keluru	Gadag

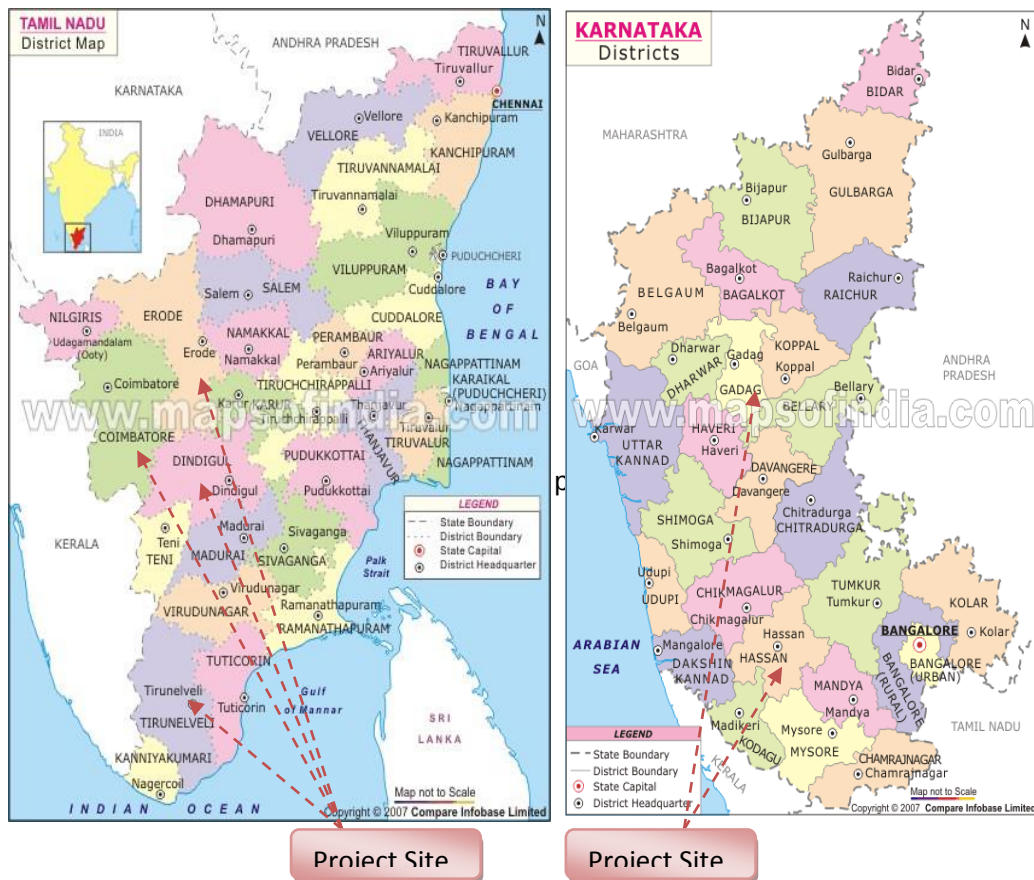


Table 3: Location details of the WTGs

1) WTGs owned by KBDL

S.No	Unique ID	HT SC No.	Capacity (kW)	SF No.	Latitude	Longitude	Taluka
1	Q 195	1312	1250	709, Kundadam	N10 ⁰ 50' 07.9"	E77 ⁰ 25' 58.7"	Palladam
2	Q 211	1329	1250	804/1(P), 2(P), 805(P), Kundadam	N10 ⁰ 48' 59.1"	E77 ⁰ 25' 54.9"	Palladam
3	G 81	1337	1250	178(P) Chinna pudhur	N10 ⁰ 44' 30.9"	E77 ⁰ 25' 40.6"	Palladam
4	G 89	1336	1250	136(P)	N10 ⁰ 43' 31.0"	E77 ⁰ 25' 51.5"	Palladam

2) WTGs owned by SDPL

Sr.No.	Unique ID	HT SC No.	Capacity (kW)	SF No.	Latitude	Longitude	Taluka
5	G 936	1442	1500	576/2D(P).2E(P)	N10 ⁰ 33' 46.0"	E77 ⁰ 19' 19.0"	Palladam
6	G 938	1440	1500	2(P)	N10 ⁰ 33' 45.4"	E77 ⁰ 19' 47.1"	Palladam
7	G 953	U 1441	1500		N10 ⁰ 33' 32.4"	E77 ⁰ 18' 34.8"	Palladam
8	R73	2155	1500	69/2A(Part)/69/2B9(Part) Udayathoor	N8 ⁰ 17.383'	E77 ⁰ 44.084'	Sankaneri
9	R166	2317	1500	414/1B (Part) Udayathoor	N8 ⁰ 14.466'	E77 ⁰ 44.764'	Sankaneri
10	R104	2309	1500	75/ 3B(Part), 132/1(Part) Udayathoor	N8 ⁰ 17.343'	E77 ⁰ 44.865'	Sankaneri
11	R116	2310	1500	153/3A(P), 3B(P), 3C(P), 3D(P) Udayathoor	N8 ⁰ 16.728'	E77 ⁰ 45.629'	Sankaneri

12	R124	2311	1500	179/5 (Part) Udayathoor	N8 ⁰ 16.024'	E77 ⁰ 45.860'	Sankaneri
13	R134	2312	1500	175/5(p), Udayathoor	N8 ⁰ 16.036'	E77 ⁰ 45.513'	Sankaneri
14	R138	2313	1500	218/2 (Part) Udayathoor	N8 ⁰ 15.610'	E77 ⁰ 45.302'	Sankaneri
15	R173	2314	1500	153/1 (Part) Vijaypathy	N8 ⁰ 14.014'	E77 ⁰ 45.702'	Sankaneri
16	R180	2315	1500	144/1 (Part) Vijay pathy	N8 ⁰ 13.753'	E77 ⁰ 45.703'	Sankaneri
16	R178	2316	1500	87/1 (Part) Vijaypathy	N8 ⁰ 13.681'	E77 ⁰ 45.199'	Sankaneri
18	R187	2318	1500	5 (Part) Vijaypathy	N8 ⁰ 13.397'	E77 ⁰ 43.764'	Sankaneri
19	R181	2325	1500	10/2 (Part) Vijaypathy	N8 ⁰ 13.627'	E77 ⁰ 43.759'	Sankaneri

WTGs in Karnataka

S r. No.	Location No.	RR No.	Capacity (kW)	SF No.	Latitude	Longitude	Taluka
20	H23	HSN/TL&SS/WF/H23 /04	1500	1 Rangapura kavalu	N 13 ⁰ 10' 81.6"	E 76 ⁰ 11' 50.6"	Arasikere
21	H24	HSN/TL&SS/WF/H23 /04	1500		N 13 ⁰ 10' 95.8"	E 76 ⁰ 11' 44.3"	Arasikere
22	K310	GDG/TL&SS/WF/SD PLK/K-311/89	1500	72, 77 Keluru	N15 ⁰ 08' 38.6"	E 75 ⁰ 46' 49.8"	Mundargi
23	K311	GDG/TL&SS/WF/SD PLK/K-311/89	1500		N15 ⁰ 08' 18.3"	E 75 ⁰ 47' 15.5"	Mundargi

3) WTGs owned by DK Audikesavulu

S.No.	Unique ID	HT SC No.	Capacity (kW)	SF No.	Latitude	Longitude	Taluka
24	G 335	D 8	600	357 Muthu Naicken Patti	N10 ⁰ 35' 40.2"	E77 ⁰ 24' 26.2"	Palladam

25	G 344	D 5	600	227 Muthu Naicken Patti	N10 ⁰ 35' 30.9"	E77 ⁰ 25' 01.9"	Palladam
26	G 369	D 11	600	311/2	N10 ⁰ 35' 05.4"	E77 ⁰ 25' 13.8"	Palladam
27	G 340	D 4	600	341/4 Muthu Naicken Patti	N10 ⁰ 35' 21.5"	E77 ⁰ 24' 41.6"	Palladam
28	G 342	D 13	600	356 Muthu Naicken Patti	N10 ⁰ 35' 34.9"	E77 ⁰ 24' 39.2"	Palladam
29	G 374	D 7	600	386/1 Muthu Naicken Patti	N10 ⁰ 35' 01.3"	E77 ⁰ 24' 20.5"	Palladam
30	G 367	D 14	600	408/1B Muthu Naicken Patti	N10 ⁰ 35' 01.7"	E77 ⁰ 24' 44.2"	Palladam
31	G 366	D 6	600	352/2	N10 ⁰ 35' 05.9"	E77 ⁰ 24' 33.1"	Palladam
32	G 541	D 16	600	494/1C Kozhumankon dam	N10 ⁰ 34' 42.6"	E77 ⁰ 26' 54.1"	Palladam
33	G 543	D 21	600	500/3 Melakaraipatti	N10 ⁰ 34' 33.9"	E77 ⁰ 26' 55.6"	Palladam
34	G 545	D 19	600	494/1C Kozhumankon dam	N10 ⁰ 34' 26.9"	E77 ⁰ 27' 07.8"	Palladam
35	G 546	D 17	600	143 Kozhumankon dam	N10 ⁰ 34' 24.3"	E77 ⁰ 26' 54.4"	Palladam
36	G 438	D 20	600	233/1(P), 288/1(P). 2C1(P) Kozhumankon dam	N10 ⁰ 33' 38.3"	E77 ⁰ 26' 13.1"	Palladam
37	G 476	D 25	600	500/1C(P), 2C(P) Kozhumankon dam	N10 ⁰ 32' 51.3"	E77 ⁰ 26' 08.0"	Palladam
38	G 460	D 22	600	495/2A(P), 2B(P), 492/2(P) Kozhumankon dam	N10 ⁰ 33' 11.9"	E77 ⁰ 26' 22.6"	Palladam

39	G 420	D 23	600	478/2A(P) Kozhumankon dam	N10 ⁰ 32' 43.7"	E77 ⁰ 26' 31.5"	Palladam
40	G 471	D 24	600	20/1B(P), 2B(P), 21/1B(P) Puspathur	N10 ⁰ 32' 54.5"	E77 ⁰ 25' 00.3"	Palladam
41	G 536	D 12	600	114/8A, 8B Puspathur	N10 ⁰ 32' 57.1"	E77 ⁰ 24' 40.6"	Palladam
42	G 407	D 10	600	123/11 Puspathur	N10 ⁰ 33' 04.3"	E77 ⁰ 24' 33.3"	Palladam

4) WTGs owned by DA Satyaprabha

S. N.	Uniqu e ID	On Board at site	HT SC No.	Capaci ty (kW)	SF No.	Latitude	Longitude	Taluka
43	55255	G 897/10	2319/TI N	750	178/7, Sampavarvada karai	N9 ⁰ 01' 29.2"	E77 ⁰ 24' 00.6"	Surandai
44	55257	G 897/18	2320/TI N	750	125/7 (p),/8 (p)/9(p)10(p), Sampavarvada karai	N9 ⁰ 00' 58.1"	E77 ⁰ 24' 44.4"	Surandai
45	55258	G 897/19	2321/TI N	750	44/2,3,4(P), Sampavarvada karai	N9 ⁰ 01' 06.3"	E77 ⁰ 22' 45.5"	Surandai
46	55253	G 897/8	2233/TI N	750	287/(p), Alagiapandiap uram	N9 ⁰ 01' 23.9"	E77 ⁰ 31' 34.8"	Surandai
47	55254	G 897/9	2232/TI N	750	210/1a(p), Alagiapandiap uram	N9 ⁰ 01' 05.6"	E77 ⁰ 30' 29.7"	Surandai

5) WTGs owned by DA Srinivas

S.No.	Unique ID	HT SC No.	Capacity (kW)	SF No.	Latitude	Longitude	Taluka
48	55244	2270/TIN	750	145/10, 11, 12, 13, 14, 15, 16(P) Navaneethakrishnapuram	N8 ⁰ 56' 27.6"	E77 ⁰ 38' 06.4"	Surandai

49	55250	2306/TIN	750	144/3, 4 Navaneethakrishnapuram	N9° 01' 25.9"	E77° 32' 01.5"	Surandai
50	55245	2289 TIN	750	415/1A, 1B, 2 Keelakalangal	N8° 56' 26.8"	E77° 38' 41.9"	Surandai
51	55252	2307	750	378/ 2(P), 3(P) Keelakalangal	N9° 01' 13.7"	E77° 30' 28.8"	Surandai
52	G 399	D 9	600	72/2B (P)	N10° 33' 24.3"	E77° 24' 02.9"	Palladam
53	R107	2170	1500	133/1(part) Udayathoor	N8° 17.297'	E77° 45.182'	Sankaneri

1.7 Title and Reference of Methodology

Sectoral Scope: 01 Energy industries (renewable - / non-renewable sources)

Baseline and monitoring methodology: ACM0002 - Consolidated baseline methodology for grid-connected electricity generation from renewable sources. Version-09

Reference: <http://cdm.unfccc.int/methodologies/PAmethodologies/approved>

1.8 Other Programs

The project has not been involved in any other GHG program.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The Project has been completed as planned and the monitoring equipments were installed to monitor the parameters as described in the Project Document (PD). The Plants are in operation continuously since its commercial operations.

The project activity has supplied **354,459** MWh electricity to the southern grid during the monitoring period.

The starting date of operation of the project activity – 01/10/2006

2.2 Deviations

2.2.1 Methodology Deviations

Not applicable

Any deviation in methodology was not applied to this monitoring period.

2.2.2 Project Description Deviations

Not applicable

Any deviation was not applied to this monitoring period.

2.3 Grouped Project

Not Applicable.

3 DATA AND PARAMETERS

3.1 Data and Parameters Data and Parameters Available at Validation

Data / Parameter	EF _{OM,y}																				
Data unit	tCO ₂ e/MWh																				
Description	Operating margin emission factor of Southern regional electricity grid																				
Source of data	“CO ₂ Baseline Database for Indian Power Sector” published by the Central Electricity Authority, Ministry of Power, Government of India. The “CO ₂ Baseline Database for Indian Power Sector” version-4 is available at www.cea.nic.in																				
Value applied:	<table><tr><th colspan="3">Operating margin emission factor (Southern Grid) in tCO₂/GWh</th></tr><tr><th>Year</th><th>Simple OM</th><th>Net generation in OM (GWh)</th></tr><tr><td>2005-06</td><td>1.0056</td><td>100,978</td></tr><tr><td>2006-07</td><td>0.9991</td><td>109,116</td></tr><tr><td>2007-08</td><td>0.9906</td><td>114,702</td></tr><tr><td colspan="2">3 year generation weighted average OM</td><td>0.9982</td></tr></table>			Operating margin emission factor (Southern Grid) in tCO ₂ /GWh			Year	Simple OM	Net generation in OM (GWh)	2005-06	1.0056	100,978	2006-07	0.9991	109,116	2007-08	0.9906	114,702	3 year generation weighted average OM		0.9982
Operating margin emission factor (Southern Grid) in tCO ₂ /GWh																					
Year	Simple OM	Net generation in OM (GWh)																			
2005-06	1.0056	100,978																			
2006-07	0.9991	109,116																			
2007-08	0.9906	114,702																			
3 year generation weighted average OM		0.9982																			
Justification of choice of data or description of measurement methods and procedures applied	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002.																				
Purpose of the data	Baseline Emission Calculations																				
Comments	-																				

Data / Parameter	EF _{BM,y}
Data unit	tCO ₂ e/MWh
Description	Build margin emission factor of Southern regional electricity grid

Source of data	“CO₂ Baseline Database for Indian Power Sector” published by the Central Electricity Authority, Ministry of Power, Government of India. The “CO₂ Baseline Database for Indian Power Sector” is available at www.cea.nic.in
Value applied:	0.7133
Justification of choice of data or description of measurement methods and procedures applied	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002
Purpose of the data	Baseline Emission Calculation.
Comments	

Data / Parameter	EF _y
Data unit	tCO ₂ e/MWh
Description	Combine Margin CO ₂ emission factor of southern grid
Source of data	Estimated figure based on 75% of OM and 25% of BM values calculated using data obtained from CEA database on CO ₂ baseline emission factor for Indian Power Sector
Value applied:	0.9269
Justification of choice of data or description of measurement methods and procedures applied	The National data can be used .The Combine margin has been calculated as per guidelines of ACM0002
Purpose of the data	Baseline Emission Calculation.
Comments	-

3.2 Data and Parameters Monitored

For TN:

Data / Parameter	EG _y
Data unit	MWh
Description	Net electricity supplied to Southern grid by the project activity in this monitoring period
Source of data	Total of the readings from the main meter installed by State Electricity Board at individual WTGs under this project activity
Description of measurement	Metering system for the project activity consists of one

methods and procedures to be applied	main (tri-vector) meter of accuracy class 0.5. Net electricity supplied to grid will be measured through meter readings of this two-way export/ import meter installed by TNEB. The procedures for metering and meter reading will be as per the provisions of the power purchase agreement. Regular monitoring on the power generation is also done through the Central Monitoring System (for Suzlon WTGs) by the O&M agency.
Frequency of monitoring/recording	The daily generation details of individual WTG will be maintained at the wind farms in respective wind farm's electricity meter log books by the O&M team. The reading from the main meter (JMR) is recorded on monthly basis by the official from the state electricity board in the presence of a representative of the PP.
Value monitored:	301,930 (Adjusted with maximum possible error)
Monitoring equipment	Metering system for the project activity consists of one main (tri-vector) meter of accuracy class 0.5. Net electricity supplied to grid will be measured through meter readings of this two-way export/ import meter installed by TNEB..
QA/QC procedures to be applied	The readings of main meter are cross-checked against the readings of check meter. In case of failure/error in the main meter, readings of check meter will be considered and the main meter will be replaced/ calibrated immediately by EB officials.
Purpose of the data	The data is used to calculate the baseline emission
Calculation method	The meter is connected with all the WTGs located in the region (other than the WTGs involved in the project activity). Net generation = $EG_{Export,y} - EG_{Import,y}$
Comments	-

. For Karnataka:

Data / Parameter	Total Energy (TEG _y)
Data unit	MWh
Description	Total electricity generated by the project activity (i.e. Export)/ in this monitoring period
Source of data	Joint Meter Readings taken at the metering points. Please note that the value from JMR is used for

	estimating emission reductions.
Description of measurement methods and procedures to be applied	Each WTG is connected to an electricity substation measuring system having a dedicated main meter and a check meter. The meters are sealed and are in the custody of CESC Mysore/ HESCOM.¹ Utility officials in the presence of representative/s of project proponent take the readings (Joint Meter Readings) of the meters on a monthly basis. Joint meter reading of one metering point gives the readings of each wind turbine connected to that metering point. While taking JMR, it is possible to record electrical parameters such as export, import etc. JMR gives the readings of both main meter and check meter separately. For each parameter, there is an initial reading and a final reading. In case of electricity exported, initial reading gives the meter reading of 'Export' at the first day of the previous month whereas; final reading gives the meter reading of 'Export' at the first day of the present month. The difference between initial and final reading gives the 'Export' for the last month. Total electricity generated (or exported) by the project activity is arrived at by adding the 'Export' readings of all metering points of the project activity.
Frequency of monitoring/recording	Utility officials in the presence of representative/s of project proponent take the readings (Joint Meter Readings) of the meters on a monthly basis.
Value monitored:	53,215 (Adjusted with maximum possible error)
Monitoring equipment	The main meter and check meters are used to measure the reading. The main meter readings are cross checked using check meters. The meters (main meter and check meters) are sealed and are in the custody of CESC Mysore/ HESCOM. ²
QA/QC procedures to be applied	The readings of main meter are cross-checked against the readings of check meter. In case of failure/error in the main meter, readings of check meter will be considered and the main meter will be replaced/ calibrated immediately by CESC Mysore /HESCOM officials.
Purpose of the data	The data is used to calculate the baseline emission

¹ The meters have the capability of recording and storing half hourly readings of all the electrical parameters for a minimum period of 35 days with digital output.

² The meters have the capability of recording and storing half hourly readings of all the electrical parameters for a minimum period of 35 days with digital output.

Calculation method	The meter is connected with all the WTGs located in the region (other than the WTGs involved in the project activity). Net generation = $EG_{\text{Export},y} - EG_{\text{Import},y}$ The line loss is deducted in the $EG_{\text{Export},y}$. $EG_{\text{Export},y} = \text{Total Export generation} - \% \text{ Line Loss}$
Comments	-

Data / Parameter	Energy (EGT-I)
Data unit	MWh
Description	Transmission loss (or line loss) incurred by the project activity during import of electricity
Source of data	Invoice of electricity sale to HESCOM/CESC Mysore.
Description of measurement methods and procedures to be applied	Invoices are raised based on the joint meter readings taken at each metering point as well as joint meter readings taken at the respective sub-stations. Details of transmission loss can be obtained from the invoice copy which gives details of export, import, transmission loss & net generation.
Frequency of monitoring/recording	Utility officials in the presence of representative/s of project proponent take the readings (Joint Meter Readings) of the meters on a monthly basis.
Value monitored:	41.89 (Adjusted with maximum possible error)
Monitoring equipment	The main meter and check meters are used to measure the reading. The main meter readings are cross checked using check meters. The meters (main meter and check meters) are sealed and are in the custody of CESC Mysore/ HESCOM. ³
QA/QC procedures to be applied	The readings of main meter are cross-checked against the readings of check meter. In case of failure/error in the main meter, readings of check meter will be considered and the main meter will be replaced/ calibrated immediately by CESC Mysore /HESCOM officials.

³ The meters have the capability of recording and storing half hourly readings of all the electrical parameters for a minimum period of 35 days with digital output.

Purpose of the data	The data is used to calculate the baseline emission
Calculation method	EGT-I is calculated by using the following formula: $\text{EGT-I} = 0.15 \times \text{EGI}$ HESCOM/CESC Mysore charges project proponent for the transmission losses incurred during import of electricity to an extent of 115%.
Comments	-

Data / Parameter	Energy (EG _{T-E})
Data unit	MWh
Description	Transmission loss (or line loss) incurred by the project activity during export of electricity.
Source of data	Invoice of electricity sale to HESCOM/CESC Mysore.
Description of measurement methods and procedures to be applied	The metering points of the project activity with the metering points of others are connected to 2 different sub-stations: Harogeri sub-station and Bagewadi sub-station at Kappathguda. The metering points of the project activity are connected to the respective sub-station at Hassan. The evacuation arrangement from wind farm to the respective sub-station is done through two separate lines viz Line 1 (L1) & Line 2 (L2). These lines serve as stand by in the exigencies & during the period of the maintenance. The load is divided between L1 & L2. Each line is connected with a dedicated Bulk meter. There are thus 4 Bulk meters installed - two at the Harogeri sub-station (for L1 & L2) and two at the Bagewadi substation (for L1 & L2). Each bulk meter contains a main meter and a check meter. These meters are also sealed and are in the custody of HESCOM. Utility officials in the presence of representative/s of project proponent take the readings (Joint Meter Reading) of the meters on a monthly basis. Bulk meters are installed for the purpose of determining transmission loss (or line loss). It also gives the total electricity exported and imported by all the wind turbines connected to the sub-station. The readings for total electricity exported or imported are given by the main and check meters in a manner as explained above.

Frequency of monitoring/recording	Utility officials in the presence of representative/s of project proponent take the readings (Joint Meter Readings) of the meters on a monthly basis.
Value monitored:	1276.31 (Adjusted with maximum possible error)
Monitoring equipment	The main meter and check meters are used to measure the readings. The main meter readings are cross checked using check meters. The meters (main meter and check meters) are sealed and are in the custody of CESC Mysore/ HESCOM. ⁴
QA/QC procedures to be applied	The readings of main meter are cross-checked against the readings of check meter. In case of failure/error in the main meter, readings of check meter will be considered and the main meter will be replaced/ calibrated immediately by CESC Mysore /HESCOM officials.
Purpose of the data	The data is used to calculate the baseline emission
Calculation method	Transmission loss is calculated by using the formula: $Z = (X - Y) / X \times 100$ Where, Z is the percentage transmission loss which is common for all wind turbines located in the same area and connected to the same sub-station. X is the total electricity supplied/exported by all the wind turbines connected to the sub-station.⁵ Y is the reading of the bulk meter installed at the sub-station. The above formula gives transmission loss as a percentage. By multiplying the percentage of transmission loss with electricity exported by the project activity, the transmission loss incurred by the project activity can be arrived at. Invoice copy contains this figure. Invoices are raised based on the joint meter readings taken at each metering point as well as joint meter

⁴ The meters have the capability of recording and storing half hourly readings of all the electrical parameters for a minimum period of 35 days with digital output.

⁵ With $X = X_1 + X_2 + \dots + X_n$ where, X_n is the reading of 'n' number of wind turbines connected to the sub-station; the value 'X' can be verified against the export readings of individual metering points.

	readings taken at the respective sub-stations. Details of transmission loss can be obtained from the invoice copy which gives details of export, import, transmission loss & net generation.
Comments	-

Data / Parameter	Energy (EG _y)
Data unit	MWh
Description	Net electricity supplied to the regional electricity grid/ in this monitoring period
Source of data	Invoice of electricity sale to CESC Mysore/HESCOM.
Description of measurement methods and procedures to be applied	Invoices are raised based on the joint meter readings taken at each metering point as well as joint meter readings taken at the sub-station. Invoice copy thus provides details of export, import, transmission losses & net generation. Payments are made on the basis of the net electricity supplied to the grid.
Frequency of monitoring/recording	Utility officials in the presence of representative/s of project proponent take the readings (Joint Meter Readings) of the meters on a monthly basis.
Value monitored:	52,529 (Adjusted with maximum possible error)
Monitoring equipment	The main meter and check meters are used to measure the readings. The main meter readings are cross checked using check meters. The meters (main meter and check meters) are sealed and are in the custody of CESC Mysore/ HESCOM. ⁶
QA/QC procedures to be applied	The readings of main meter are cross-checked against the readings of check meter. In case of failure/error in the main meter, readings of check meter will be considered and the main meter will be replaced/ calibrated immediately by CESC Mysore /HESCOM officials.
Purpose of the data	The data is used to calculate the baseline emission
Calculation method	Net electricity supplied to the regional electricity grid will be calculated using the formula: $EG_y = TEG_y - EG_I - EG_{T-E} - EG_{T-I}$

⁶ The meters have the capability of recording and storing half hourly readings of all the electrical parameters for a minimum period of 35 days with digital output.

Comments	-
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3.3 Monitoring Plan

Monitoring Plan

This project activity uses renewable energy i.e. wind, as a source for power generation. No other fossil/non fossil fuels are involved and no fuel preparation or combustion takes place. Therefore, the net electricity supplied by the project activity to grid is the only parameter that needs to be monitored. Metering system for the project activity consists of one main (tri-vector) meter (for WTGs in Tamil Nadu and Karnataka) and one check meter near the WTG and also at the sub-station (for the WTGs in Karnataka). Net electricity supplied to grid will be measured through meter readings of the two-way export/ import meter installed by TNEB and CESC Mysore/ HESCOM. The procedures for metering and meter reading will be as per the provisions of the power purchase agreement.

Structuring for Monitoring

The project activity is operated and managed by the project proponents with the O & M contractors those are also the suppliers of the wind turbines – M/s Suzlon Energy Limited and M/s. Vestas.

The proposed project activity requires evacuation facilities for sale and the evacuation facility is essentially maintained by the state power utility.

Monitoring Procedure

Monitoring plan for the state of Tamil Nadu

The data to be monitored is the net generation of electricity supplied to the grid. The Project has individual main meter at each WTG installed and owned by the State electricity board. These meters are tri-vector meters of 0.5s accuracy class. The reading from the main meter (JMR) is recorded on monthly basis by the official from the state electricity board in the presence of a representative of the PP.

The main meter owned by the state electricity board will be calibrated by TNEB officials, according to the frequency and the maintenance schedule as per the TNEB procedures and the PPA signed with the PP or as per the UNFCCC guidelines (paragraph 12.c, EB- 41 Annex- 20).

The daily generation details of individual WTG will be maintained at the wind farms in respective wind farm's electricity meter log books by the O&M team. The reading from the main meter (JMR) is recorded on monthly basis by the official from the state electricity board in the presence of a representative of the PP.

The receipt of the sales to grid is cross-checked with the data recorded by the central monitoring system for each individual meter to avoid any differences. The Joint Meter Readings (JMR) taken will be sent to individual PP every month. Each PP will then raise an invoice to the Tamil Nadu Electricity Board with respect to the electricity exported to the grid by the WTG(s). The same data will be used for the emission reduction calculation.

The entire operations of the WTGs are monitored continuously with the help of the Central Monitoring System (CMS) for each WTG by M/s. Suzlon Infrastructure Services Ltd. Vestas as

applicable. The total electricity generation will also be cross checked with the invoices raised for the particular month.

All the relevant data & reports for maintaining accuracy in future monitoring and reporting of GHGs emission reduction is with Sapthagiri Distilleries Private Limited (SDPL).

Monitoring Plan for the state of Karnataka

The WTGs in Kappathguda are situated on hills and CMS set up takes care of particular hills. The Sapthagiri WTGs are situated on Hill number 9 and 10.

For the two WTGs (H23 & H24) at Hassan, there is one common meter (consisting a main meter and a check meter) installed at metering site (along with a group of WTGs) and same is followed for Kappathguda (for K310 & K311). The metering equipment is electronic trivector system. The accuracy class of these meters is 0.2s as required by the PPA. This is different from the other machines in Tamil Nadu as those PPAs require accuracy class of 0.5s. The accuracy class of meters are determined by the respective state's Electricity Regulatory Commission and hence the conditions in PPA become the regulatory requirement (over and above any national level Guidance).

Procedure for Monitoring and Recording

The JMR taken at one metering point will give the readings of each WEG connected to that metering point. With a main meter & a check meter installed at each metering point, the JMR taken at any one metering point will give readings of both main meter and check meter. However, it is reading of the main meter which is considered for calculations. The readings of main meter are cross-checked against the readings of check meter. In case of failure/error in the main meter, readings of check meter will be considered and the main meter will be replaced/ calibrated immediately by CESC Mysore /HESCOM officials.

Both Main & Check meter monitor all possible electrical parameter such as export, import etc. The meters monitor & record these parameters independently. The meters also display an initial reading and a final reading for each parameter that is being monitored. For example, if we need to calculate the amount of electricity supplied/exported by all WTGs connected to a particular metering point for the month of September 2008, the initial reading of 'Export' displayed by the main meter should be subtracted from the final reading of the meter. With initial reading being the meter reading of 'Export' as on 1 Sept 08 at 0:00 hrs and the final reading being the meter reading of 'Export' as on 1 Oct 08 at 0.00 hrs, the difference between initial and final reading will give the exact units exported during the month of September 2008.

Bulk meter installed at sub-station is mainly for determining transmission loss (or line loss). It also gives the total electricity exported and imported by all the wind turbines connected to the sub-station.

The monitoring instruments owned by the state electricity board will be calibrated by KPTCL officials, according to the frequency and the maintenance schedule as per the KPTCL procedures and the PPA signed with the PP or as per the UNFCCC guidelines (paragraph 12.c, EB- 41 Annex- 20).

Invoices are raised based on the joint meter readings taken at each metering point as well as at the respective sub-stations. Invoice copy thus provides details of export, import, transmission loss & net generation. However, payments are made on the basis of the net electricity supplied to the grid.

The project proponents have signed an “Operation and Maintenance” agreement with the supplier of the wind turbines – M/s Suzlon Energy Limited.

The project team has been entrusted with the responsibility of storing, recording the data related to the project activity which is measured from the meters. The project team is also responsible for calculation of actual creditable emission reduction in the most transparent and relevant manner.

Data Archiving: All the monitoring data is stored /will be recorded and kept under safe custody of the project head.

The responsibility matrix for the project team looking after the various aspects related to it is presented in the table below:

Roles and responsibilities

Designation	Responsibilities
Project Head (In charge person from Project proponent)	Registration Data storage and electronic archiving Secondary monitoring
Project Executor and Controller (WTG owner or appointed person on behalf)	Recording Verification Storage of Data
Site main Controller	Operation, Monitoring and Verification of Data Data Recording Storage of data
Operation and Maintenance Contractor	Operation and Maintenance Storage of data Data Recording

Measurement Frequency

Measurement Frequency for the State of Tamil Nadu:

Frequency of measurement by TNEB officials	Continuous with recording once in every month
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Measurement Frequency for the State of Karnataka:

Frequency of measurement by CESC Mysore /HESCOM officials	Continuous with recording once in every month
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Monitoring Parameter

With respect to the project activity the only parameters that requires a continuous monitoring is the amount of electricity (EG_y in MWh) that is generated by the project activity. Net electricity supplied to grid will be measured through meter readings of the two-way export/ import meter installed by TNEB. The meters (main meter and check meters) are sealed and are in the custody of CESC Mysore/ HESCOM. Total electricity generated by the project activity (TEG_y), Electricity imported by the project activity (EG_i), Transmission loss incurred by the project activity during import of electricity (EG_{T-i}), Transmission loss incurred by the project activity during export of electricity (EG_{T-E}) & Net electricity supplied to the regional electricity grid (EG_y) for the WEGs in Karnataka. The procedures for metering and meter reading will be as per the provisions of the power purchase agreement.

Measures to ensure the results/ uncertainty analysis

The periodical calibration of monitoring equipment shall be kept sealed by the respective Electricity Boards. The electricity generation, export, and energy import are being recorded daily and the same is being measured once in a month by the electricity board in the presence of PP and verified by the respective officials.

In case of failure of meters, it will be changed immediately. The annual calibration was not done on due date and hence as conservative assumption a calibration error is applied to all readings. The latest calibration details are given in the annex-I. This has resulted in conservative emission reduction estimate. The electricity generation, export, and import are being recorded daily and the same is being verified by the respective officials.

The monitoring period is divided into following vintages:

1. 1 April 2010 to 31 December 2010
3. 1 January 2011 to 31 December 2011
4. 1 January 2012 to 31 December 2012
5. 1 January 2013 to 31 December 2013
6. 1 January 2014 to 31 March 2014

Calibration of meters

As per the applied monitoring methodology and monitoring plan, the calibration of the meters should be done at least once in a year⁷.

⁷ The details of the meter and calibration dates have been given in separate excel sheet to DOE. The supporting documents also have been submitted to DOE.

If during verification of a certain monitoring period, the DOE identifies that the calibration has been delayed and the calibration has been implemented after the monitoring period in consideration (i.e. the results of delayed calibration are available), the DOE may conclude its verification, provided the following conservative approach is adopted in the calculation of emission reductions:

- a) Applying the maximum permissible error of the instrument to the measured values, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error; or
- b) Applying the error identified in the delayed calibration test, if the error is beyond the maximum permissible error of the measuring equipment.

But in the project activity, the result of the delayed calibration is satisfactory and doesn't show any errors in the measuring equipment and value is within the permissible limits. However due to delayed calibration, the measured values have been multiplied with maximum permissible error of the instrument till the year of the last calibration. In case of meters in Tamil Nadu, the permissible error is 0.5% while in case of meters in Karnataka meters, it is 0.2%.

The adjustments in the crediting period for each windmill are as follows

- The export values have been decreased by 0.5% for every month
 - The import values have been increased by 0.5% for every month
- The correction factor is 0.2% for Karnataka WTGs as per the accuracy of those meters.

In case of failure of meters, it will be changed immediately. The WTG will be stopped during the time of meter failure.

Table - 4: Information Used for Emission Reduction Calculations

Key information/data used for baseline	Source of data/information
Net Electricity Exported to grid	Monthly Meter Readings recorded and certified by TNEB, KSEB & plant personnel.
Baseline Emission Factor	Ministry of Power, Government of India, has estimated the operating margin and the Build margin for the Southern Grid The extract of the database in CEA Version 4.0 that has been used for the calculation of the Build Margin and Operating margin has been provided in Annexure -1. For the purpose of estimation of VERs, the Combined Margin is used for the crediting period. The combined margin EF is 926.9 tCO₂/GWh

The calibration frequency of meters was not maintained annual. So as a conservative measure, emission reductions have been adjusted to account for the delayed calibration. The same approach is adopted as that specified by UNFCCC for CDM project activities under EB 52 Annex 60: "Guidelines for Assessing compliance with the Calibration Frequency Requirements."

Calculation of Verified Emission Reductions:

The calibration of electricity meters was not done annually as discussed above. Thus, as per the UNFCCC guidelines EB 52- Annex 60, Permissible errors have been applied for the periods not carried out as detailed above during which the calibration could not be done.

✚ The maximum permissible error is 0.5% for Tamil Nadu WTGS and 0.2% for Karnataka WTGs for the energy meters used in the project activity. Since the calibration was conducted after due date, as a conservative measure, the data were adjusted by applying maximum meter calibration error as discussed in Section above.

The adjusted electricity generation for each of the windmills is given in following table. Detailed calculation is given in the Appendix-1-Emission Reduction Calculation Sheet.

Management system and quality assurance:

The meters are tested and certified periodically against an accepted laboratory standard meter in accordance with electricity standards. The meters are deemed to be working satisfactorily if the errors are within specifications for meters of i.e. its respective accuracy class.

As per the billing period, the Month wise data on electricity generation, electricity exported to grid and electricity imported from grid are presented in a separate monitoring data sheet.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

The following formula is adopted for calculating emission reductions generated by the project activity:

The emission reductions for a given year are baseline emissions minus the project emissions and leakage.

$$ER_y = BE_y - PE_y - L_y$$

Where ER_y = Emission reductions in a given year

BE_y = Baseline emissions in a given year

PE_y = Project emissions in a given year

L_y = Leakage in a given year

4.1 Baseline Emissions

Baseline Emissions

The baseline emissions are calculated as follows:

$$BE_y = EG_y \cdot EF_y$$

Where EG_y = Net electricity supplied to grid in a given year (MWh)

EF_y = Emission factor for a given year (tCO₂/MWh)

The project has considered the ex-ante emission factor for the combined margin of the Southern grid and the details are furnished below:

Table 5: Ex-Ante Emission Factor for Southern Grid

Operating Margin (OM) in t CO ₂ / GWh	0.9982
Build Margin (BM), in t CO ₂ / GWh	0.7133
Combined Margin (CM) Simple average of OM and BM in t CO ₂ / GWh	0.9269

4.2 Project Emissions

As per the registered PD, the project activity does not emit any GHGs and hence project emission is zero.

Based on the above the **PE_y (Project Emission)** for the monitoring period is: **0 tCO₂e**

4.3 Leakage

Based on above the registered PD, leakage is zero.

LE_y (Total Leakages) for the monitoring period is: **0 tCO₂e**

4.4 Net GHG Emission Reductions and Removals

Summary and cumulative emission reduction

Period	Net Energy Exported to the grid (Adjusted) by all WTGs	
	kWh	MWh
April 2010- Dec 2010	9,03,56,574	90,357
Jan 2011- Dec 2011	7,69,43,757	76,944

Jan 2012 - Dec 2012	7,41,34,338	74,134
Jan 2013 - Mar 2013	9,65,28,330	96,528
Jan 2014- Mar 2014	1,64,96,340	16,496
Total =	354,459	

Table 4: Net Electricity export and emission reduction from individual WTG owners in the project⁸

Owner	Net Electricity exported (MWh)				
	2010	2011	2012	2013	2014
KBDL	5397	6463	5018	8711	401
DA Satyaprabha	5707	5264	4679	5263	3585
DA SriEivas	8892	7561	4007	4791	735
DK Audikesavulu	16035	10458	2712	21173	1533
SDPL	54325	47196	57718	56591	10243
Total	90,357	76,944	74,134	96,528	16,496

Owner	Emission Reduction (tCO ₂)				
	2010	2011	2012	2013	2014
KBDL	4,986	5,971	4,646	8,050	366
DA Satyaprabha	5,271	4,851	4,320	4,855	3,319
DA SriEivas	8,214	6,974	4,956	5,275	691
DK Audikesavulu	14,785	9,660	2,504	19,544	1,392
SDPL	50,281	43,659	53,427	52,353	9,469
Total	83,537	71,115	69,853	90,077	15,237

⁸ Detailed generation and calculation has been given in separate spread sheet.

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)
Apr 2010 – Dec 2010	83,537	0	0	83,537
Jan 2011 – Dec 2011	71,115	0	0	71,115
Jan 2012- Dec 2012	69,853	0	0	69,853
Jan 2013- Dec 2013	90,077	0	0	90,077
Jan 2014- Mar 2014	15,237	0	0	15,237
Total	329,819	0	0	329,819

5 ADDITIONAL INFORMATION

Abbreviations in the Report

CO₂	Carbon dioxide
CEA	Central Electricity Authority
VER	Verified Emission Reduction
CDM	Clean Development Mechanism
MW	mega Watt
MWh	Megawatt hour
kW	kilo Watt
kWh	kilo Watt hour
PD	Project Description
tCO₂e	Tons of carbon dioxide equivalent
TNEB	Tamilnadu Electricity Board
HESCOM	Hubli Electricity Supply Company Limited
CESC	Chamundeshwari Electricity Supply Corporation Limited
UNFCCC	United Nations Framework Convention on Climate Change
WTGs	Wind Turbine Generators
VCS	Voluntary Carbon Standard

ANNEX-I: Calibration Details

S.N.	HTSC No.	Meter Number	Accuracy Class	Commissioning date	Latest Calibration date
1	1312	04804575	0.5	29-Sep-06	18-Feb-2014
2	1329	04863718	0.5	30-Sep-06	18-Feb-2014
3	1337	04863728	0.5	30-Sep-06	18-Feb-2014
4	1336	04862934	0.5	30-Sep-06	18-Feb-2014
5	D 8	04862938	0.5	30-Sep-06	25-Jun-2014
6	D 5	04862941	0.5	29-Sep-06	25-Jun-2014
7	D 11	TNB02872	0.5	30-Sep-06	25-Jun-2014
8	D 4	04863740	0.5	29-Sep-06	25-Jun-2014
9	D 13	04862940	0.5	30-Sep-06	25-Jun-2014
10	D 7	04862944	0.5	30-Sep-06	25-Jun-2014
11	D 14	04862943	0.5	30-Sep-06	25-Jun-2014
12	D 6	04862942	0.5	30-Sep-06	12-Apr-2014
13	D 16	04862937	0.5	30-Sep-06	02-Jul-2014
14	D 21	04804394	0.5	30-Dec-06	23-Apr-2014
15	D 19	04804577	0.5	30-Sep-06	02-Jul-2014
16	D 17	04863734	0.5	30-Sep-06	02-Jul-2014
17	D 20	04804397	0.5	22-Nov-06	02-Jul-2014
18	D 25	TNB02397	0.5	30-Dec-06	23-Apr-2014
19	D 22	04863717	0.5	30-Dec-06	02-Jul-2014
20	D 23	TNB02875	0.5	30-Dec-06	02-Jul-2014
21	D 24	04863774	0.5	30-Dec-06	25-Jun-2014
22	D 12	04901991	0.5	30-Sep-06	25-Jun-2014
23	D 10	04862886	0.5	30-Sep-06	25-Jun-2014
24	H-23	6675421(main) 6760735(check)	0.2	31-Mar-07	18-Dec-2013
25	H-24	06605124(main) 05342849(check)	0.2	31-Mar-07	18-Dec-2013
26	U 1441	04863776	0.5	31-Mar-07	18-Feb-2014

27	2155	04804766	0.5	14-Feb-07	05-Jan-2014
28	2317	04865238	0.5	30-Mar-07	02-Feb-2014
29	2309	04865230	0.5	30-Mar-07	05-Jan-2014
30	2310	04865235	0.5	30-Mar-07	05-Jan-2014
31	2311	04881083	0.5	30-Mar-07	02-Feb-2014
32	2313	04881080	0.5	30-Mar-07	02-Feb-2014
33	2314	04881086	0.5	30-Mar-07	02-Feb-2014
34	2315	04881082	0.5	30-Mar-07	02-Feb-2014
35	2316	04881084	0.5	30-Mar-07	02-Feb-2014
36	2318	04881058	0.5	30-Mar-07	02-Feb-2014
37	2325	04880982	0.5	30-Mar-07	02-Feb-2014
38	2319/TIN	04880998	0.5	30-Mar-07	29-Jan-2014
39	2320/TIN	04881092	0.5	30-Mar-07	29-Jan-2014
40	2321/TIN	4881102	0.5	30-Mar-07	29-Jan-2014
41	2233/TIN	04881001	0.5	26-Mar-07	22-Dec-2013
42	2232/TIN	04881000	0.5	26-Mar-07	22-Dec-2013
43	2270/TIN	04880997	0.5	29-Mar-07	06-Jan-2014
44	2306/TIN	04881004	0.5	30-Mar-07	06-Jan-2014
45	2289 TIN	04881107	0.5	30-Mar-07	06-Jan-2014
46	2307	04881105	0.5	30-Mar-07	06-Jan-2014
47	D 9	04804576	0.5	30-Sep-06	25-Jun-2014
48	2170	04865478	0.5	24-Feb-07	5-Jan-2014
49	1440	04863729	0.5	31-Mar-2007	18-Feb-2014
50	1442	04863730	0.5	31-Mar-2007	18-Feb-2014
51	2312	04865229	0.5	31-Mar-2007	02-Feb-2014
52	K-310	6675421(main) 6760735(check)	0.2	31-Mar-2007	22-Sep-2013
53	K-311	06605124(main) 05342849(check)	0.2	31-Mar-2007	22-Sep-2013