



VOLUNTARY CARBON STANDARD 2007.1

VERIFICATION REPORT

**BUNDLED WIND POWER PROJECT IN TAMIL NADU,
INDIA, CO-ORDINATED BY TAMIL NADU SPINNING
MILLS ASSOCIATION (TASMA-V1)**

Monitoring Period: 2006-04-01 to 2008-12-31

Report No: 53802908 - 08/660

Date: 2011-03-16

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Name of Verification company:	Date of the issue:
TÜV NORD CERT GmbH	2011-03-16
Report Title:	Approved by:
Bundled Wind power project in Tamil Nadu, India, co-ordinated by Tamil Nadu Spinning Mills Association (TASMA-VI)	Mr. Winter Rainer
Client:	Project Title:
M/s. Tamilnadu Spinning Mills Association.	Bundled Wind power project in Tamil Nadu, India, co-ordinated by Tamil Nadu Spinning Mills Association (TASMA-VI).
Summary:	
M/s.Tamilnadu Spinning Mills Association has commissioned the TÜV NORD JI / CDM Certification Program to carry out the verification of the Project “Bundled Wind power project in Tamil Nadu, India, co-ordinated by Tamil Nadu Spinning Mills Association (TASMA-VI)” in Tamilnadu, India with regard to the requirements of VCS 2007.1 Standard. The project activity is generation of electricity by Wind Turbine Generators generating electricity which displaces electricity generated in the Southern grid of India, thus achieves GHG emission reduction. Reporting period: From 2006-04-01 to 2008-12-31 (incl. both days) In the course of the verification 5 Corrective Action Requests (CARs), 3Clarification Requests (CLs) were raised and successfully closed out. The verification is based on the validated VCS PD, Monitoring Report, revised monitoring report, and the monitoring plan as set out in the validated PD, the validation report, emission reduction calculation spreadsheet and supporting documents made available to the TÜV NORD JI/CDM CP by the project participant. As the result of the 1st periodic verification, the verifier confirms that the GHG emission reductions are calculated without material mis-statements in a conservative and appropriate manner. TÜV NORD JI/CDM CP herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows: Emission reductions : 248,351 tCO2 equivalents	
Work carried out by:	Number of pages:
Mr. Ma. Paa.Puratchikkanal Mr. B.J.M Amarnath Mr.S.Stalin Ms.A.Kirthika	70

Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CL	Clarification Request
CO₂	Carbon dioxide
CO₂e	Carbon dioxide equivalent
CP	Certification Program
DNA	Designated National Authority
EB	CDM Executive Board
EIA	Environmental Impact Assessment
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MR	Monitoring Report
QC/QA	Quality control/Quality assurance
TASMA	Tamil Nadu Spinning Mill Association
TNEB	Tamil Nadu Electricity Board.
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Carbon Standard
VCS - PD	VCS - Project Description
VCU	Voluntary Carbon Unit
VVM	Validation and Verification Manual

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1 INTRODUCTION

The M/s. Tamilnadu Spinning Mills Association has commissioned the TÜV NORD JI/CDM Certification Program to carry out the verification of the project:

“Bundled Wind power project in Tamil Nadu, India, co-ordinated by Tamil Nadu Spinning Mills Association (TASMA-VI)”

with regard to the relevant requirements of the Voluntary Carbon Standard 2007.1^{VCS/}. The verifiers have reviewed the implementation of the monitoring plan (MP) in the registered VCS project for the monitoring period 2006-04-01 to 2008-12-31, (both days inclusive).

The applied monitoring methodology is in accordance with ACM0002 “Consolidated Baseline Methodology for grid connected electricity generation from renewable sources”. Version 10.

1.1 Objective

The purpose of this verification, by independent checking of objective evidence, is as follows:

- to verify that the project is implemented as described in the project design document;
- to assess the implementation of the monitoring plan (MP) content in the VCS-PD;
- to assess the project's compliance with other relevant rules, including the host country (India) legislation;
- to confirm that the monitoring system is implemented and fully functional to generate voluntary emission reductions (VERs / VCUs) without any double counting; and
- to establish that the data reported are accurate, complete, consistent, transparent and free of material error or omission by checking the monitoring records and the emissions reduction calculation.

1.2 Scope and Criteria

The verification of this project is based on the validated project design document ^{/VCS-PD/}, the monitoring report ^{/MR/}, emission reduction calculation spread sheet ^{/XLS/}, supporting documents made available to the verifier and information collected through performing interviews and during the on-site assessment. Furthermore publicly available information was considered as far as available and required.

The TÜV NORD JI/CDM CP has employed a risk-based approach in the verification, focusing on the identification of significant risks and reliability of project monitoring and generation of emission reductions.

1.3 VCS Project Description

1.3.1 Project Characteristics

Essential data of the project is presented in the following Table 1-1.

Table 1-1: Project Characteristics

Item	Data
Project title	Bundled Wind power project in Tamil Nadu, India, co-ordinated by Tamil Nadu Spinning Mills Association (TASMA-VI)
Project owner	Tamilnadu Spinning Mills Association
Any specific project categories	☐ Mega project ($> 10^6$ t CO _{2eq} / a) ☒ Project (> 5000 t CO _{2eq} / a and $> 10^6$ t CO _{2eq} / a) ☐ Micro project (< 5000 t CO _{2eq} / a) ☐ AFOLU project ☐ Grouped project ☐ No specific project category
VCS PD dated	Draft: 2009-06-07 Final: 2009-10-31
Applied Methodology	ACM 0002 "Consolidated Baseline Methodology for grid connected electricity generation from renewable sources" -Version 10
Project starting date	2005-03-05
Crediting period	Crediting Period (10 y)
Start of crediting period	2006-04-01

1.3.2 Project Location

The details of the project location are given in table 1-2:

Table 1-2: Project Location

No.	Project Location
Host Country	India
Region:	Tamilnadu.
Project location address:	Coimbatore, Tirunelveli and Kanyakumari Districts
Latitude:	Refer Table 1.2.a
Longitude:	Refer Table 1.2.a

Table 1.2.a -Latitude and Longitude of the WTGs involved in the project activity:

COMP. CODE NO	NAME OF THE MILLS / COMPANIES	WTG NO	CAPACITY (in KW)	HTSC. NO	LATITUDE (N)			LONGITUDE (E)		
					Deg	Min	Sec	Deg	Min	Sec
V001	Anugraha Valve Casting Ltd	1	1250	493	8	13	23	77	39	44
V002	Arun Excello Urban Infrastructure Pvt. Ltd.,	1	225	546	8	12	37	77	34	42
V002	Arun Excello Urban Infrastructure Pvt. Ltd.,	2	225	547	8	12	52	77	34	41
V003	Arunachala Gounder Textile Mills Pvt. Ltd.,	1	600	597	10	53	56	77	14	56
V003	Arunachala Gounder Textile Mills Pvt. Ltd.,	2	600	2496	8	14	45	77	44	47
V004	Classic Spinning Mills Pvt. Ltd.,	1	225	314	10	54	35	77	18	2
V004	Classic Spinning Mills Pvt. Ltd.,	2	225	314	10	55	4	77	18	0
V004	Classic Spinning Mills Pvt. Ltd.,	3	225	314	10	55	11	77	18	4
V004	Classic Spinning Mills Pvt. Ltd.,	4	225	314	10	54	58	77	17	54

COMP. CODE NO	NAME OF THE MILLS / COMPANIES	WTG NO	CAPACITY (in KW)	HTSC. NO	LATITUDE (N)			LONGITUDE (E)		
					Deg	Min	Sec	Deg	Min	Sec
V004	Classic Spinning Mills Pvt. Ltd.,	5	225	314	10	55	4	77	17	53
V004	Classic Spinning Mills Pvt. Ltd.,	6	500	258	10	56	50	77	19	6
V004	Classic Spinning Mills Pvt. Ltd.,	7	500	625	10	56	50	77	19	6
V005	Classic Wind Farms	1	225	255	10	53	49	77	9	24
V005	Classic Wind Farms	2	225	255	10	53	38	77	9	22
V005	Classic Wind Farms	3	500	259	10	56	42	77	19	9
V005	Classic Wind Farms	4	500	627	10	53	38	77	9	22
V005	Classic Wind Farms	5	500	626	10	53	49	77	9	24
V006	Deffree Engineering (P) Ltd.,	1	800	1059	10	41	43	77	26	16
V007	Dhanalakshmi Controls & Equipments	1	225	726	10	40	38	77	21	37

COMP. CODE NO	NAME OF THE MILLS / COMPANIES	WTG NO	CAPACITY (in KW)	HTSC. NO	LATITUDE (N)			LONGITUDE (E)		
					Deg	Min	Sec	Deg	Min	Sec
V008	Frontier Processing Mills	1	500	1723	8	24	26	77	34	10
V009	Jayakrishna Flour Mills Pvt. Ltd.,	1	225	477	8	13	56	77	34	14
V009	Jayakrishna Flour Mills Pvt. Ltd.,	2	225	518	8	13	55	77	34	23
V009	Jayakrishna Flour Mills Pvt. Ltd.,	3	225	623	8	13	59	77	34	54
V009	Jayakrishna Flour Mills Pvt. Ltd.,	4	225	781	8	13	52	77	34	49
V009	Jayakrishna Flour Mills Pvt. Ltd.,	5	225	782	8	13	59	77	33	54
V009	Jayakrishna Flour Mills Pvt. Ltd.,	6	225	1463	8	14	13	77	33	5
V009	Jayakrishna Flour Mills Pvt. Ltd.,	7	225	1769	8	14	21	77	33	7
V010	K.G. Entertainment Company (P) Ltd.,	1	350	1328	10	36	19	77	19	16
V011	Kaleesuwari Refinery Pvt. Ltd.,	1	500	609	8	18	4	77	34	58

COMP. CODE NO	NAME OF THE MILLS / COMPANIES	WTG NO	CAPACITY (in KW)	HTSC. NO	LATITUDE (N)			LONGITUDE (E)		
					Deg	Min	Sec	Deg	Min	Sec
V011	Kaleesuwari Refinery Pvt. Ltd.,	2	600	603	8	18	11	77	34	38
V012	Lakshmi Narayan Govrishankar Enterpriser Pvt. Ltd.,	1	500	561	10	56	3	77	15	46
V012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	2	250	663	10	56	58	77	15	13
V012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	3	250	664	10	56	59	77	15	5
V012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	4	250	665	10	56	55	77	15	6
V012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	5	250	666	10	56	4	77	15	58
V012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	6	250	252	10	56	57	77	15	21
V012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	7	250	252	10	56	2	77	15	20
V012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	8	250	252	10	56	6	77	15	18
V012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	9	250	260	10	56	3	77	15	12

COMP. CODE NO	NAME OF THE MILLS / COMPANIES	WTG NO	CAPACITY (in KW)	HTSC. NO	LATITUDE (N)			LONGITUDE (E)		
					Deg	Min	Sec	Deg	Min	Sec
V012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	10	250	261	10	56	3	77	15	4
V012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	11	250	444	10	56	10	77	15	15
V012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	12	250	445	10	56	9	77	15	7
V012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	13	500	516	10	56	58	77	15	51
V013	Lotus Agency	1	750	1956	9	28	1	77	18	20
V014	M.S. Transports Raja (Wind Mill Division)	1	800	1063	10	42	59	77	27	15
V015	Poombukar Process	1	225	592	10	40	16	77	19	48
V016	Poomer Hosieries	1	225	984	10	40	20	77	19	53
V017	Power Link System Pvt. Ltd.,	1	230	281	7	55	40	11	47	49
V018	Prime Tex	1	225	574	8	13	50	77	36	45

COMP. CODE NO	NAME OF THE MILLS / COMPANIES	WTG NO	CAPACITY (in KW)	HTSC. NO	LATITUDE (N)			LONGITUDE (E)		
					Deg	Min	Sec	Deg	Min	Sec
V018	Prime Tex	2	225	574	8	13	46	77	36	41
V018	Prime Tex	3	225	552	8	13	55	77	36	46
V018	Prime Tex	4	225	552	8	13	53	77	36	34
V018	Prime Tex	5	225	552	8	13	49	77	36	31
V018	Prime Tex	6	225	320	10	40	46	77	20	11
V018	Prime Tex	7	225	318	8	40	55	77	20	10
V019	Rangasayee Alloy Castings	1	230	407	10	36	28	77	18	44
V019	Rangasayee Alloy Castings	2	350	1203	10	36	28	77	18	44
V020	S.N.Q.S. International	1	330	1180	10	36	19	77	24	35
V021	S.S.K. Textiles	1	600	58	10	56	58	77	15	41

COMP. CODE NO	NAME OF THE MILLS / COMPANIES	WTG NO	CAPACITY (in KW)	HTSC. NO	LATITUDE (N)			LONGITUDE (E)		
					Deg	Min	Sec	Deg	Min	Sec
V021	S.S.K. Textiles	2	250	446	8	14	27	77	35	53
V022	Santhi Casting Works	1	500	608	8	14	18	77	35	36
V023	Seyad Home Industries Pvt. Ltd.,	1	500	607	8	12	44	77	33	51
V024	Seyad Shariat Finance Ltd.,	1	225	645	8	13	0	77	34	27
V025	Seyadu Beedi Company	1	500	417	8	13	0	77	34	27
V026	Shanmugapriya Textiles Pvt. Ltd.,	1	750	536	8	15	35	77	39	12
V027	Shriram City Union Finance Ltd.,	1	1250	584	8	15	36	77	39	30
V027	Shriram City Union Finance Ltd.,	2	1250	585	8	15	46	77	39	10
V027	Shriram City Union Finance Ltd.,	3	1250	586	8	58	43	77	20	55
V028	Shriram Investments Ltd.,	1	750	640	8	58	59	77	20	53

COMP. CODE NO	NAME OF THE MILLS / COMPANIES	WTG NO	CAPACITY (in KW)	HTSC. NO	LATITUDE (N)			LONGITUDE (E)		
					Deg	Min	Sec	Deg	Min	Sec
V028	Shriram Investments Ltd.,	2	750	641	8	58	49	77	20	54
V028	Shriram Investments Ltd.,	3	750	641	8	58	41	77	20	54
V028	Shriram Investments Ltd.,	4	750	641	8	58	50	77	20	56
V028	Shriram Investments Ltd.,	5	750	641	8	58	58	77	20	56
V028	Shriram Investments Ltd.,	6	750	641	8	58	46	77	20	43
V028	Shriram Investments Ltd.,	7	750	641	8	58	46	77	20	10
V028	Shriram Investments Ltd.,	8	750	642	10	42	44	77	27	52
V029	SNQS International Socks Pvt. Ltd.,	1	230	290	10	41	51	77	21	45
V030	Soundararaja Mills Ltd.,	1	1250	862	8	10	15	77	39	45
V030	Soundararaja Mills Ltd.,	2	1250	888	8	9	54	77	39	5

COMP. CODE NO	NAME OF THE MILLS / COMPANIES	WTG NO	CAPACITY (in KW)	HTSC. NO	LATITUDE (N)			LONGITUDE (E)		
					Deg	Min	Sec	Deg	Min	Sec
V030	Soundararaja Mills Ltd.,	3	1250	889	8	9	53	77	39	22
V030	Soundararaja Mills Ltd.,	4	1250	890	8	9	59	77	39	42
V031	SRG Apparels Private Ltd.,	1	225	575	8	13	56	77	36	37
V031	SRG Apparels Private Ltd.,	2	225	575	8	13	52	77	36	58
V031	SRG Apparels Private Ltd.,	3	225	554	8	13	46	77	36	38
V031	SRG Apparels Private Ltd.,	4	225	554	8	13	38	77	36	37
V031	SRG Apparels Private Ltd.,	5	225	554	8	13	57	77	36	37
V031	SRG Apparels Private Ltd.,	6	225	319	10	40	50	77	19	59
V031	SRG Apparels Private Ltd.,	7	225	319	10	40	58	77	19	59
V032	Sri Alamelu Ammal Mills India Pvt. Ltd.,	1	600	63	10	49	07	77	26	15

COMP. CODE NO	NAME OF THE MILLS / COMPANIES	WTG NO	CAPACITY (in KW)	HTSC. NO	LATITUDE (N)			LONGITUDE (E)		
					Deg	Min	Sec	Deg	Min	Sec
V033	Sri Senthilandavar Cotton Mills Pvt. Ltd.,	1	750	519	9	0	17	77	33	33
V034	Sri Venkatram Spinners Pvt. Ltd.,	1	1650	1683	8	12	7	77	40	33
V035	Sugavaneswara Spinning Mills Pvt. Ltd.,	1	1250	2273	8	12	53	77	33	36
V036	Super Spinning Mills Ltd.,	1	1250	611	8	13	7	77	34	17
V037	Suresh Textiles	1	250	613	10	55	49	77	19	59
V038	T.E.S. Fathu Rabbani	1	225	447	8	18	7	77	33	18
V039	T.E.S. Naina Mohamed	1	225	754	10	45	11	77	21	54
V040	The Prem Dyeing Works	1	500	424	8	24	42	77	34	8
V041	The United Yarn Processors	1	500	1224	8	24	34	77	34	9
V042	Thriveni Earth Movers Pvt. Ltd.,	1	225	1470	10	56	39	77	30	47

COMP. CODE NO	NAME OF THE MILLS / COMPANIES	WTG NO	CAPACITY (in KW)	HTSC. NO	LATITUDE (N)			LONGITUDE (E)		
					Deg	Min	Sec	Deg	Min	Sec
V043	Unifront Driers	1	500	1715	10	41	21	77	23	21
V044	Unifront Textiles Processors Pvt. Ltd.,	1	500	1763	10	41	14	77	23	30
V045	V.R. Foundries	1	850	602	10	55	45	77	13	47
V046	Veena Fabrics Pvt. Ltd.,	1	250	1257	10	55	59	77	13	41
V046	Veena Fabrics Pvt. Ltd.,	2	250	1244	10	40	24	77	18	37
V047	Vetal Hi-Tech Industries	1	250	267	10	36	30	77	19	28
V048	Vetal Textiles & Electronics Pvt. Ltd.,	1	250	266	8	12	6	77	36	41
V049	Victus Dyeings	1	750	384	10	56	36	77	15	37
V050	Vigneshkumar Spinning Mills Pvt. Ltd.,	1	350	2201	8	57	21	77	26	45
V050	Vigneshkumar Spinning Mills Pvt. Ltd.,	2	350	1315	8	57	21	77	26	45

1.3.3 Technical Project Description

The project activity involves supply, erection, and commissioning and operation 109 nos. of Wind Turbine Generators (WTGs) of different capacities varying from 225kW to 1.65 MW, aggregating to a total installed capacity of 51.595 MW. The project activity comprises generation of electricity using renewable energy based on wind power and its supply to the Southern grid. It hence displaces the electricity which would have otherwise been generated from the power plants connected to the grid. The electricity thus generated from the above wind turbines is being sold to the grid and wheeling to their industrial units under power purchase/wheeling agreement with Tamil Nadu Electricity Board. The project activity is in operation since commissioning period and is located at Kanyakumari, Tirunelveli and Coimbatore districts of Tamil Nadu. The emission reduction is based on net electricity exported to TNEB in the southern regional grid from the project activity. The validated ex-ante emission factor (0.92694742 tCO_{2e}/MWh) is in accordance with ACM0002^{2/ACM0002/} version10 which refers "Tool to calculate emission grid emission 1.1". The value has been sourced from the carbon dioxide database (CEA Version 4). The net electricity exported from WTG's is calculated based on the difference between the total electricity exported to the grid from the project activity and the total electricity imported from the grid to the project activity.

The key parameters of the project are given in Table 1-3:

Table 1-3a: Technical data of the project

NEPC-225KW

Cut in Wind Speed	4 m/s
Rated Wind Speed	15 m/s
Cut Out Wind Speed	25 m/s
Tip Speed	56.5 m/s
Hub Height	45 m
Survival Wind Speed	60 m/s at 2 sec. gust
Rotor revolutions	37.5/25 RPM
Nacelle tilt angle	5
Regulation	Stall
Gearbox	

Make	Kirloskar / Elecon
Gear ratio	1:40
No. of steps	2
Generator	
Type	Asynchronous, three phase
Rotation Speed	1500/1000, 4/6 pole
Rated Output	225/40 KW
Rated Voltage	400V
Frequency	50Hz
Tower	
Height	43.7 M, 24 edged steel plate
Material	Spray galvanized steel plate
Sections	6
Assembling	Each section bolted together longitudinal. 6 section are bolted together by lashes

Southern Wind Farms Ltd: CWEL: 225KW

Nominal Power	225 KW
Power limitation	Stall
Start up, wind speed	3 m/s
Cut-in, wind speed	4 m/s
Cut-out, wind speed	25 m/s
Hub Height	31.5/41.5/50 m
Rotor speed	37.5 RPM
YAW SYSTEM	
Type	Electrical yaw gear with friction brakes
Yaw Drives	2Ele, Motors, Combined Planetary and parallel gears
Control	Wind vane
ROTOR	
No. of blades	3
Blade type	LM 13.4

Rotor diameter	29.2 m
Swept area	670 m ²
WIND TURBINE CONTROLLER	
Type	Microprocessor
Power factor	Cos phi>0.95
Gearbox	
Type	3 Step, helical
Ratio	1:39.4q
Lubrication	Forced
Oil volume	80L
Other	Out door, gear control, Thyristors Wind speed and direction
Generator	
Type	4/6 Pole asynchronous
Nominal power	225kW
Voltage	415 V
RMP	1512/1012
Protection	IP 55
BREAK SYSTEM	
Mechanical brake	Dices brakes
Position	High-speed shaft
Aerodynamic brake	Turnable blade tips(Hydraulic)

VESTAS RRB: 225KW

Description	Specifications
Tower height	50 m
Rotor diameter	47 m
Installed electrical output	200kW
Cut-in wind speed	4 m/s
Rated wind speed	12.5 m/s
Cut-out wind speed	25 m/s
Rotor swept area	1735 m ²

Rotor speed	26 rpm
Regulation	Pitch
Generator	Single wound asynchronous
Rated output	500 kW
Revolution	1527 rpm
Operating voltage	690 V
Frequency	50 Hz
Protection	IP55
Insulation class	F
Gear box	Planetary-helical
Manufacturer	Vestas
Gear ratio	1:58
Type of cooling	Splash lubrication
Yaw drive system	Slewing system with gear motors yawing
Aerodynamic break	Full feathering of break
Mechanical break	Disc break
Control unit	Microprocessor based

Technical and Operational Data of Enercon E-30 (230 KW) Make:

Rated output 300 KW (older plants 230 KW)
Rotor diameter 30 m
Hub height to 50 m
Switching on wind velocity 2,5m/s
Switching off wind velocity 28-34m/s

Pioneer Wincon 250 KW

GENERAL Data	
Rated Power	250 kW
Power Regulation	Stall
Cut-in, wind speed	3 m/s
Rated power, wind speed	15 m/s
Cut-out, wind speed	25 m/s

Hub Height	50 m
Rotor speed	38.5 RPM
YAW SYSTEM	
Type	Ball bearing
Yaw brakes	Electrical motors and permanent friction brakes
Yaw Drives	2 electrical motors, planetary-worm gears
Control	Wind vane
ROTOR	
No. of blades	3
Blade type	LM 13.4
Rotor diameter	29 m
Swept area	660.2 m ²
Gearbox	
Type	3 Step, helical
Ratio	01:39.5
Lubrication	Splashed
Oil volume	87 ltrs
Generator	
Type	6 pole/4 pole asynchronous
Rated power	60kW/250 kW(Dual)
Voltage	415 V
RMP	1000/1500
Protection class	IP 55
Slip	1%
BREAK SYSTEM	
Mechanical brake	Dices brakes
Position	High-speed shaft
Aerodynamic brake	Pivotable blade tips

Technical and Operational Data of CWEL(250 KW):

Rotor:	
--------	--

Diameter	28.5 m
Area of swept circle	638 m ²
Speed (rated) High / low	39.8 / 26.5 rpm
Speed (max.)	46 rpm
Shaft inclination	6 deg
Alignment	Upwind
Rotor blades:	
Material	GRP
No. Of blades	3
Weight of blade	750 kg each
Gear:	
Type	Planetary gear
Ratio	1:38.16
Generator:	
Type	Asynchronous
Pole changing	6 / 4
Rated output	80 / 250 KW
Speeds	1000 / 1500 rpm
Main voltage	400 V
Frequency	50 Hz
Yawing system:	
This system consists of	Wind vane
Rotating mechanism and gearing with a ratio of 1 and braking and retaining with 2 brake callipers	1000
Braking system:	
Operating system	Electrical by throsoft - regulation
Mechanical brakes:	
Brake disc (slow speed side) 2 brake callipers	spring-actuated, hydraulically released
Brake disc (high speed side) 1 brake caliper	spring-actuated, hydraulically released
Performance data:	

Rated wind speed	14 m/s
Cut-in wind speed	3 m/s
Cut-out wind speed	23 m/s
Max. Coefficient of performance	Cp max. = 0.44
Tower - Lattice tower:	
Construction	Bolted
Corrosion protection	Galvanized
Height of tower	40 M
Hub height	41.2
Accessible from inside up to the Nacelle by ladder	

Enercon :330KW

Rated power:	330 kW
Rotor diameter:	33.4 m
Hub height:	37 - 50 m
Wind class (IEC):	IEC/NVN I and IEC/NVN II (depending on hub height)
Turbine concept:	Gearless, variable speed, variable pitch control
Rotor	
Type:	Upwind rotor with active pitch control
Direction of rotation:	Clockwise
Number of blades:	3
Swept area:	876 m ²
Blade material:	Fibreglass (epoxy resin); integrated lightning protection
Rotational speed:	Variable, 18 - 45 rpm
Pitch control:	ENERCON blade pitch system, one independent pitching system per rotor blade with allocated emergency supply
Drive train with generator	
Hub:	Rigid
Main bearings:	Single-row cylindrical roller bearings

Generator:	ENERCON direct-drive synchronous annular generator
Grid feeding:	ENERCON converter
Braking systems:	- 3 independent blade pitch systems with emergency supply - Rotor brake - Rotor lock
Yaw control:	Active via adjustment gears, load-dependent damping
Cut-out wind speed:	28 - 34 m/s (with ENERCON storm control)
Remote monitoring:	ENERCON SCADA

Suzlon 350KW

Rotor Diameter	33.4 m
Hub Height	50/60/70 m
Installed Electrical Output	350 KW
Cut – in Wind Speed	3.5 m/s
Rated Wind Speed	14 m/s
Cut – out Wind Speed	25 m/s
Survival Wind Speed	67 m/s
Rotor Blade	LM 15.4 NACA 63.2 XX
Swept Area	876.13 m ²
Rotational Speed	24/32 rpm
Rotor Material	Glass Fibre Reinforced Plastic
Regulation	Stall – Regulated
Generator	Asynchronous Generator, 8/6 Pole
Rated Output	100/350 KW
Rotational Speed	756/1006 rpm
Frequency	50 Hz
Gear Box	Integrated 3 Stage Helical Spur Splash Lubricated
Gear Ratio	31.5:1
Type of Cooling	Oil Cooling System

Yaw Drive System	2 Active Electrical Yaw Motors
Yaw Bearing	Polyamide Slide Bearings
Aerodynamic Break	Hydraulic Control of the Blade Tip
Electrical Break	Spring Applied Hydraulically Released Disc Break
Mechanical Break	Centrifugally Operated Hydraulic Valve
Control Unit	Microprocessor Based; Indicating Actual Operation Conditions;
	Remote Control Option
Tower	Freestanding, Lattice Tower; Hot Dip Galvanized
Erection	With Crane

Vestas RRB 500KW

Description	Specifications
Tower height	50 m
Rotor diameter	47 m
Installed electrical output	500 kW
Cut-in wind speed	4 m/s
Rated wind speed	12.5 m/s
Cut-out wind speed	25 m/s
Rotor swept area	1735 m ²
Rotor speed	26 rpm
Regulation	Pitch
Generator	Single wound asynchronous
Rated output	500 kW
Revolution	1527 rpm
Operating voltage	690 V
Frequency	50 Hz
Protection	IP55
Insulation class	F
Gear box	Planetary-helical
Manufacturer	Vestas

Gear ratio	1:58
Type of cooling	Splash lubrication
Yaw drive system	Slewing system with gear motors yawing
Aerodynamic break	Full feathering of break
Mechanical break	Disc break
Control unit	Microprocessor based

Enercon E44/600KW

Rated power:	600 kW
Rotor diameter:	44 m
Hub height:	50 m
Wind class (IEC):	IEC/NVN I and IEC/NVN II (depending on hub height)
Turbine concept:	Gearless, variable speed, variable pitch control
Rotor	
Type:	Upwind rotor with active pitch control
Direction of rotation:	Clockwise
Number of blades:	3
Swept area:	876 m ²
Blade material:	Fibreglass (epoxy resin); integrated lightning protection
Rotational speed:	Variable, 18 - 45 rpm
Pitch control:	ENERCON blade pitch system, one independent pitching system per rotor blade with allocated emergency supply
Drive train with generator	
Hub:	Rigid
Main bearings:	Single-row cylindrical roller bearings
Generator:	ENERCON direct-drive synchronous annular generator
Grid feeding:	ENERCON converter
Braking systems:	3 independent blade pitch systems with emergency supply

	Rotor -Rotor lock	brake
Yaw control:	Active via adjustment load-dependent damping	gears,
Cut-out wind speed:	28 - 34 (with ENERCON storm control)	m/s
Remote monitoring:	ENERCON SCADA	

Suzlon 600KW

1	Cut In Wind Speed	3.5m/s
2	Cut out wind speed	25m/s
3	Hub Height	75m
4	Gearbox Type	Integrated 3 stage 1 planetary & 2 Helical
5	Gear Ratio	1:63.633
6	Rated Power Output	600KW
7	Tower Type	Free standing, lattice tower, hot dip galvanized
8	Tower Height	75m
9	No of blades	3
10	Rotor Diameter	52m
11	Brake System	Aerodynamic
12	Manufacturer	Suzlon Energy Limited

VESTAS RRB 600KW

ROTOR		
1.	Diameter	47 meter
2.	No. of Rotor Blade	3
3.	Orientation	Upwind/Horizontal Axis
4.	Rotational Speed	26.2 RPM
5.	Rotational direction	Clock Wise
6.	Swept Area	1735 m ²
7.	Hub Height	75 meter

OPERATIONAL DATA		
8.	Cut in Wind Speed	4 meter/sec
9.	Survival Wind Speed	70meter/sec
10.	Cut out Wind Speed	25 meter/sec
11.	Tip Speed	64 meter/sec
12.	Nacelle tilt angle	50
GEAR BOX		
13.	Gearbox	Planetary/Helical
14.	Gear Ratio	01:58.2
15.	No of steps	3
GENERATOR		
16.	Generator	Single Wound Asynchronous
17.	Rotational Speed	1527 RPM
18.	Rated Output	600 KW
19.	Rated Voltage	690 V
20.	Frequency	50 Hz
Brake System		
21.	Aerodynamic Brake	Full feathering of blade
22.	Mechanical	Disc Brake
23.	Yaw System	Slewing system with gear motors yawing
TOWER		
24.	Type	Lattice
25.	Height (Optional)	48.1m
26.	Material	Steel
27.	Sections	6/9

NEG MICON/VESTAS: 750KW

Operational Data	
Nominal Output	750 KW
Power Regulation	Stall
Cut-In Speed	4 m/s

Cut-Out Speed	25 m/s
Rotor	
Rotor Diameter	48.2 m
Rotor Swept Area	1824 cm ²
Number of Blades	3 Numbers
Brake System	
Blade Tip Air Brake	Hydraulic, fail safe
Disc Brake	Hydraulic
Drive Train	
Gear Type	Planetary – parallel axle
Ratio	1:67.5 – 50 Hz
Main Shaft	High Quality forged shaft
Main Bearing	Spherical roller bearing
Cooling	Closed Circuit liquid cooling
Generator	
Type	Asynchronous
Nominal Voltage	690 V
Nominal Frequency	50 Hz
Name Plate Rating	750 / 200 KW
Cooling	Closed Circuit Liquid Cooling
Yaw	
Type	Ball Bearing
Drive Mechanism	4 Electrical Planetary Gears
Tower	
Type	Conical, Steel, PU Painted
Hub Height	According to type approvals
Controller	
Type	Computer Controlling
Capacitor Bank	No Load Compensated

Enercon 800KW

Model	E – 48
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Rated Capacity	800 KW
Rotor Diameter	48 m
Hub Height	56.85 m and 74.85 m
Rotor with Pitch Control 800kw	
Type	Upwind rotor with active pitch control
Direction of Rotation	Clockwise
Number of Blades	3
Length of Blades	20.7 m
Swept Area	1810 m ²
Blade material	Fiber glass (Reinforced epoxy) with integral lightning protection
Rotor Speed	Variable, 16 – 31.5 rpm
Tip Speed	41 – 78 m/s
Pitch Control	Three synchronized blade pitch system with battery back - up
Generator	Synchronous
Hub	Rigid
Bearings	Tapered roller bearings
Grid Feeding	AC – DC – AC through converter – Inverter
Braking System	3 independent aero brakes with emergency back up supply
Yaw Control	Active through adjustment gears, friction damping
Cut - in Wind Speed	2 m/s
Rated Wind Speed	14 m/s
Tower	Steel Tubular / Concrete

Pioneer Asia Wind Turbine 850KW:

Sr. no.	Item	Description
1.	Model no.	G58
2.	Rating in KW	850
3.	Rotor diameter	58 m

4.	Rotor Swept area	2.642 m ²
5.	Type of tower	Tubular
6.	No of blades	3
7.	Voltage	690 V ac
8.	Frequency	50 Hz/ 60 Hz
9.	Protection class	IP 54
10.	Rotational speed	Rated 1.620 rpm
11.	Rated Stator Current	670 A @ 690 V
12.	Gearbox Type	1 planetary stage / 2 helical stages
13.	Length of the blade	28.3 m
14.	Total Blade weight	2,400 Kg
15.	Airfoils	NACA 63.XXX + FFA-W3

Suzlon 1250KW:

Model	S 66
Rated Capacity	1.25 MW
Hub Height	65 m
Orientation	Upwind/Horizontal axis
Cut in wind speed	3 m/s
Cut off wind speed	22 m/s
Rated wind speed	14 m/s
Survival wind speed	67 m/s
Gear Box Type	Integrated 3 stage 1 planetary & 2 helical
Generator	Asynchronous 4/6 pole
Tower Type	Lattice
No. of Blades	3
Rotor Diameter	66 m
Swept Area	3421 m ²
Brake System	Aerodynamic
Mechanical	Hydraulic fail safe disc brake system
Yaw System	Active electrical yaw motors
Controls	Microprocessor control with graphic backlit LCD display indicating operation conditions.

VESTAS/NEG MICON 1650KW

Sl. No	Particulars	Specifications
1.	Cut in wind speed	3.5 m/s
2.	Cut out wind speed	20 m/s
3.	Hub Height	70m to 80m
4.	Regulation	Active Stall Pitch Regulation
5.	Gearbox Type	Planetary/Helical
6.	Gear ratio	1:70.28
7.	Rated power output	1650 kW
8.	Tower Type	Tubular
9.	Tower Height	78m
10.	No of blades	3
11.	Rotor Diameter	82m
12.	Brake system	Hydraulic

Table 1-3b: Make, capacity and number of WTGs

SL. NO	MAKE	CAPACITY (KW)	NO.OF MACHINES	TOTAL CAPACITY (MW)
1	NEPC	225	24	5.4
2	Southern Wind Farms Ltd.,	225	1	0.225
3	VESTAS RRB	225	12	2.70
4	ENERCON	230	3	0.690
5	Chiranjeevi Wind Energy Ltd.,	250	2	0.500
6	PIONEER WINCON	250	15	3.750
7	ENERCON	330	1	0.330
8	SUZLON	350	4	1.400
9	VESTAS RRB	500	16	8.00
10	ENERCON	600	1	0.600
11	SUZLON	600	2	1.200
12	VESTAS RRB	600	2	1.200
13	NEG MICON/VESTAS	750	12	9.00
14	ENERCON	800	2	1.600
15	PIONEER ASIA WIND TURBINES	850	1	0.850
16	SUZLON	1250	10	12.500
17	NEG MICON/VESTAS	1650	1	1.650
	TOTAL		109	51.595

Table 1-3c: Parameters confirmed during verification

NAME OF THE MILLS / COMPANIES	CAPACITY IN KW	HTSC. NO	METER SERIAL NO.
Anugraha Valve Casting Ltd	1250	493	2307255
Arun Excello Urban Infrastructure Pvt. Ltd.,	225	546	4954776
Arun Excello Urban Infrastructure Pvt. Ltd.,	225	547	4954778
Arunachala Gounder Textile Mills Pvt. Ltd.,	600	597	4862911
Arunachala Gounder Textile Mills Pvt. Ltd.,	600	2496	4890006
Classic Spinning Mills Pvt. Ltd.,	225	314	5038734
Classic Spinning Mills Pvt. Ltd.,	225	314	5038734
Classic Spinning Mills Pvt. Ltd.,	225	314	5038734

Classic Spinning Mills Pvt. Ltd.,	225	314	5038734
Classic Spinning Mills Pvt. Ltd.,	225	314	5038734
Classic Spinning Mills Pvt. Ltd.,	500	258	2307259
Classic Spinning Mills Pvt. Ltd.,	500	625	4863666
Classic Wind Farms	225	255	4863749
Classic Wind Farms	225	255	4863749
Classic Wind Farms	500	259	2307312
Classic Wind Farms	500	627	4863665
Classic Wind Farms	500	626	4863664
Deffree Engineering (P) Ltd.,	800	1059	4721889
Dhanalakshmi Controls & Equipments	225	726	4691212
Frontier Processing Mills	500	1723	4804447
Jayakrishna Flour Mills Pvt. Ltd.,	225	477	4681391
Jayakrishna Flour Mills Pvt. Ltd.,	225	518	2307309
Jayakrishna Flour Mills Pvt. Ltd.,	225	623	2329664
Jayakrishna Flour Mills Pvt. Ltd.,	225	781	208320648
Jayakrishna Flour Mills Pvt. Ltd.,	225	782	4954962
Jayakrishna Flour Mills Pvt. Ltd.,	225	1463	4719849
Jayakrishna Flour Mills Pvt. Ltd.,	225	1769	4804465
K.G. Entertainment Company (P) Ltd.,	350	1328	4804552
Kaleesuwari Refinery Pvt. Ltd.,	500	609	2318661
Kaleesuwari Refinery Pvt. Ltd.,	600	603	2329663
Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	500	561	4804497
Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	663	4865540
Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	664	4865541
Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	665	4865542
Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	666	4865553
Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	252	4889970
Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	252	4889970
Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	252	4889970
Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	260	2307299
Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	261	2307300
Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	444	4697400
Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	445	4697401

Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	500	516	4804498
Lotus Agency	750	1956	4804667
M.S. Raja Transports (Wind Mill Division)	800	1063	4725675
Poombukar Process	225	592	2378018
Poomer Hosieries	225	984	4721858
Power Link System Pvt. Ltd.,	230	281	2278207
Prime Tex	225	574	4939508
Prime Tex	225	574	4939508
Prime Tex	225	552	2307481
Prime Tex	225	552	2307481
Prime Tex	225	552	2307481
Prime Tex	225	320	2329699
Prime Tex	225	318	2345904
Rangasayee Alloy Castings	230	407	5038732
Rangasayee Alloy Castings	350	1203	4804565
S.N.Q.S International	330	1180	4804368
S.S.K. Textiles	600	58	4865515
S.S.K. Textiles	250	446	4691186
Santhi Casting Works	500	608	2318664
Seyad Home Industries Pvt. Ltd.,	500	607	4880991
Seyad Shariat Finance Ltd.,	225	645	4902013
Seyadu Beedi Company	500	417	4959676
Shanmugapriya Textiles Pvt. Ltd.,	750	536	2307291
Shriram City Union Finance Ltd.,	1250	584	2318777
Shriram City Union Finance Ltd.,	1250	585	2318776
Shriram City Union Finance Ltd.,	1250	586	2329670
Shriram Investments Ltd.,	750	640	4865222
Shriram Investments Ltd.,	750	641	2329601
Shriram Investments Ltd.,	750	641	2329601
Shriram Investments Ltd.,	750	641	2329601
Shriram Investments Ltd.,	750	641	2329601
Shriram Investments Ltd.,	750	641	2329601
Shriram Investments Ltd.,	750	641	2329601
Shriram Investments Ltd.,	750	642	4955072
SNQS International Socks Pvt. Ltd.,	230	290	4931810
Soundararaja Mills Ltd.,	1250	862	208320346
Soundararaja Mills Ltd.,	1250	888	208320348
Soundararaja Mills Ltd.,	1250	889	208320347
Soundararaja Mills Ltd.,	1250	890	208320349
SRG Apparels Private Ltd.,	225	575	2329217
SRG Apparels Private Ltd.,	225	575	2329217

SRG Apparels Private Ltd.,	225	554	2307499
SRG Apparels Private Ltd.,	225	554	2307499
SRG Apparels Private Ltd.,	225	554	2307499
SRG Apparels Private Ltd.,	225	319	2329700
SRG Apparels Private Ltd.,	225	319	2329700
Sri Alamelu Ammal Mills India Pvt. Ltd.,	600	63	4881026
Sri Senthilandavar Cotton Mills Pvt. Ltd.,	750	519	2307277
Sri Venkatram Spinners Pvt. Ltd.,	1650	1683	TNB 03411
Sugavaneswara Spinning Mills Pvt. Ltd.,	1250	2273	TNB 02257
Super Spinning Mills Ltd.,	1250	611	2329023
Suresh Textiles	250	613	4862857
T.E.S. Fathu Rabbani	225	447	B221086
T.E.S. Naina Mohamed	225	754	4901466
The Prem Dyeing Works	500	424	4691116
The United Yarn Processors	500	1224	208320453
Thriveni Earth Movers Pvt. Ltd.,	225	1470	4901310
Unifront Driers	500	1715	4804460
Unifront Textiles Processors (P) Ltd.,	500	1763	4804459
V.R. Foundries	850	602	4862855
Veena Fabrics	250	1257	5031970
Veena Fabrics	250	1244	4804782
Vetal Hi-Tech Industries	250	267	2332452
Vetal Textiles & Electronics Pvt. Ltd.,	250	266	2346023
Victus Dyeings	750	384	2345908
Vigneshkumar Spinning Mills Pvt. Ltd.,	350	2201	4865492
Vigneshkumar Spinning Mills Pvt. Ltd.,	350	1315	4862879

1.3.4 Appointment of team members and technical reviewer

On the basis of a competence analysis a verification team was appointed. Furthermore also the personnel for the technical review and the final approval was determined.

The list of involved personnel, the tasks assigned and the qualification status are summarized in the table 1-4 below.

Table 1-4: Involved Personnel

	Name	Company	Function ¹⁾	Qualification Status ²⁾	Scheme competence	Technical competence ⁴⁾	Host country Competence	Team Leading competence
☒ Mr. ☐ Ms.	Ma .Paa. Puratchikkanal	TUV India Pvt. Ltd	TL	SA	☒	T	☒	☒
☒ Mr. ☐ Ms.	B.J.M Amarnath	TUV India Pvt. Ltd	TM	A	☒	T	☒	☒
☒ Mr. ☐ Ms	S.Stalin	TUV India Pvt. Ltd	TM	E	☒	T	☒	☐
☐ Mr. ☒ Ms.	A.Kirthika	TUV India Pvt. Ltd	TM	E	☒	T	☒	☐
☒ Mr. ☐ Ms	Klein Ingo	TN CERT	TR ³⁾	A	☒	T	☐	☒
☒ Mr. ☐ Ms	Rainer Winter	TN CERT	FA	SA	☒	T	☐	☒

¹⁾ TL: Team Leader; TM: Team Member, TR: Technical review; FA: Final approval

²⁾ GHG Auditor Status: A: Assessor; E: Expert; SA: Senior Assessor; T: Trainee; TE: Technical Expert

³⁾ No team member

⁴⁾ As per S01-MU03 or S01-VA070 A2 (such as A, B, C.....)

1.4 Level of Assurance

The verification has been planned and organized to achieve a

☒ reasonable level of assurance

☐ limited level of assurance.

The verification report is based on VCS PD^{/VCS-PD/} and Monitoring report^{/MR/}, supporting documents made available to the verifier and information collected through performing interviews and during the on-site assessment.

2 METHODOLOGY

The verification of the project consisted of the following steps:

- Contract review
- Appointment of team members and technical reviewers
- Publication of the monitoring report
- Desk review of the Monitoring Report^{/MR/} submitted by the client and additional supporting documents.
- Verification planning,
- On-Site assessment,
- Background investigation and follow-up interviews with personnel of the project developer and its contractors,
- Draft verification reporting
- Resolution of corrective actions (if any)
- Final verification reporting
- Technical review
- Final approval of the verification.

The sequence of the verification is given in the table 2.1 below:

Table 2.1: Verification sequence

Topic	Time
Assignment of verification	2008-11-15
On-site visit	2009-07-20 to 2009-07-26
Draft reporting finalised	2009-12-21
Technical review on draft reporting finalised	-
Final reporting finalised	2010-04-15
Technical review on final reporting finalised	2011-03-10
Final corrections	2011-03-16

The main verification steps are described below.

2.1 Review of Project Documentation

The VCS PD ^{/VCS-PD/} and supporting background documents related to the project design and baseline were reviewed.

Furthermore, the verification team used additional documentation by third parties like host party legislation, technical reports referring to the project design or to the basic conditions and technical data.

The references used in the course of this verification are summarized in section 5.

2.2 On-Site Assessment

2.2.1 Review of Performance Records

As most essential part of the verification exercise it is indispensable to carry out an inspection on site in order to verify that the project is implemented in accordance with the applicable criteria. Furthermore the on-site assessment is necessary to check the monitoring data with respect to accuracy to ensure the calculation of emission reductions. The main tasks covered during the site visit include, but are not limited to:

- The on-site assessment included an investigation of whether all relevant equipment is installed and works as anticipated.
- The operating staff was interviewed and observed in order to check the risks of inappropriate operation and data collection procedures.
- Information processes for generating, aggregating and reporting the selected monitored parameters were reviewed.
- The duly calibration of all metering equipment was checked.
- The monitoring processes, routines and documentations were audited to check their proper application.
- The monitoring data were checked completely.
- The data aggregation trails were checked via spot sample down to the level of the meter recordings.

The on-site audit was carried out on 2009-07-20 to 2009-07-26. The complete verification team attended the site visit.

2.2.2 Follow-up Interviews

The verification team has carried out interviews in order to assess the information included in the project documentation and to gain additional information regarding the compliance of the project with the relevant criteria applicable for the VCS.

During verification, the verification team has performed interviews to confirm selected information and to resolve issues identified in the document review. The main topics of the interviews are summarized in Table 2-2.

Table 2-2: Interviewed persons and interview topics

Interviewed Persons / Entities	Interview topics
Project proponent representatives ^{/IM01/}	- General aspects of the project - Technical equipment and operation - Changes since validation - Monitoring and measurement equipment - Calibration procedures - Quality management system - Involved personnel and responsibilities - Training and practice of the operational personnel - Implementation of the monitoring plan - Monitoring data management - Data uncertainty and residual risks - GHG calculation - Procedural aspects of the verification - Maintenance - Environmental aspects - Editorial issues of the Monitoring Report
Project consultant ^{/IM02/}	

A comprehensive list of all interviewed persons is part of section 5: Table 5-4: List of interviewed persons.

2.2.3 Collection of Measurements

The main parameters to measure are the electricity exported to the grid, electricity imported from the grid and net electricity generated. The evacuation facility of the project activity to deliver the power to grid is maintained by the TNEB. In the project activity total electricity generated is being measured by energy meter, which is jointly monitored by the project participant and TNEB. The measuring devices are well known and state of the art. For the metering purpose, there are individual sealed meters for every wind electric generator also common sealed meter for group of WTGs (for the same project promoters). The meter readings recorded once in every month for all the WTGs.

2.2.4 Observation of established practices and testing of the accuracy of monitoring equipment

All required instruments including stand by and operating procedures for the same have been implemented in an appropriate manner. Calibration procedures and test reports of the all online energy meters covering the reported monitoring period were verified for their frequency and traceability to industry standards. The energy meters have been calibrated by the TNEB officials. Calibration records of all installed meter

were checked by the verification team The monitoring system is in compliance with the applied monitoring methodology (ACM 0002 version 10) “

2.3 Determination of the reductions in GHG emissions

The procedure for determining emission reductions from baseline emissions, project emissions and leakage emissions is found as per the algorithm and formulae presented as per ACM 0002 version 10 in the validated PD^{VCS-PD}. The calculation of emission reductions is based on subtracting project emissions and leakage from the baseline emissions. As the WTGs runs exclusively with wind energy without any usage of fossil fuel, the project emissions is considered as zero. Leakage is considered to be zero as per applied methodology. For the calculation of baseline emissions the ex-ante and validated value of baseline parameters, i.e., Southern Grid Emission Factor is taken into account which is a validated and registered value.

2.4 Review of additional data from other sources if appropriate

The Project activity is wind based power generation and the grid emission factor and net electricity supplied are the only data used to determine the emission reductions. The electricity supplied is based on the generation statements given by TNEB and the emission factor has been fixed ex-ante for the entire crediting period in the Validated VCS PD. Hence the review of additional data from other sources is not applicable for this project activity.

2.5 Review of monitoring results and verification of the correct application of monitoring methodologies

The verification team has carried out interviews in order to assess the information included in the project documentation and to gain additional information regarding the compliance of the project with the relevant criteria applicable for the VCS.

2.6 Resolution of any material discrepancy

Material discrepancies identified in the course of the verification are addressed either as CARs, CLs or FARs.

A **Corrective Action Request (CAR)** is established where:

- mistakes have been made in assumptions, application of the methodology or the project documentation which will have a direct influence the project results,
- the requirements deemed relevant for verification of the project with certain characteristics have not been met or

- there is a risk that the project would not be registered or that emission reductions would not be able to be verified and certified.

A **Clarification Request (CL)** will be issued where information is insufficient, unclear or not transparent enough to establish whether a requirement is met.

A **Forward Action Request (FAR)** will be issued when certain issues related to project implementation should be reviewed during the first verification.

A detailed list of the CARs CLs and FAR raised and discussed in the course of this verification is included in the next section 3 of this report.

3 VERIFICATION FINDINGS

In this section the assessments and findings from the desk review of the VCS PD, site visit, interviews and supporting documents as well as the final assessments are summarised. Table 3-1 includes an overview of all raised CARs, CLs and FARs.

Table 3-1: Overview of CARs, CLs and FARs issued

No.	Topic / Chapter	CAR	CL	FAR
3.1	Remaining issues, including any material discrepancy	-	-	-
3.2	Project implementation	-	1	-
3.3	Completeness of monitoring	2	1	-
3.4	Accuracy of emission reduction calculations	2	1	-
3.5	Quality of evidence to determine emission reductions	1	-	-
3.6	Management and operational system	-	-	-
-	SUM	5	3	-

3.1 Remaining issues, including any material discrepancy, from previous validation

Description

All raised CARs and CLs were successfully closed during the validation of the project design. There are no remaining issues. The verification has been carried out based on the Monitoring Report, final VCS PD and VCS-Validation Report.

Related Findings

- ☒ No CARs, CLs or FARs have been identified in this context
- ☐ The following finding(s) have been addressed:

3.2 Project implementation

Description

The project activity involves generation of electricity from 109 nos. of Wind Electricity Generators which is exported to TNEB which is the part of the southern grid. The total installed capacity of the project activity is 51.595 MW. The rating of the WTG is varying from 225kW to 1.65 MW. During the monitoring period (01/04/2006 to

31/12/2008) the project activity has exported a total net electricity of 268057359 KWh and thus the total baseline emissions come to 248351tCO_{2e}.

Related Findings

- ☐ No CARs, CLs or FARs have been identified in this context
- ☒ The following finding(s) have been addressed:

Finding:	CL 3.2-1		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Provide the exact Location and date of commissioning of the WTGs in Monitoring Report as per the Validated PD.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The exact locations and the commissioning dates of the WTGs are provided in the Appendix 1 of the revised monitoring report.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The locations and commissioning dates of all WTGs involved in the project activity has been provided in Appendix 1 of the revised monitoring Report ^{/MR/} . The same has been verified during the onsite visit ^{/IM01/} and documents ^{/SC/} submitted by the project promoters. Hence CL 3.2.1 is closed.		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements		

Final Assessment

During the verification a site visit was carried out. On the basis of this site visit and the reviewed project documentation, it can be confirmed that w.r.t. the realized technology, the project equipments, as well as the monitoring and metering equipment, the project has been implemented and operated as described in the Validated PD^{/VCS-PD/}. There are no major changes in the key equipment since the validation of the project. The project uses wind power for electricity generation. Also no change is envisaged. These facts have been verified during site visit.

3.3 Completeness of monitoring

Description

The monitoring period of the project activity covers the period from 01/04/2006 to 31/12/2008. The only key monitoring parameters with influence on the calculation of the emission reductions is the power exported to the TNEB grid Data regarding the electricity exported to grid and import from grid is obtained from the statement provided by the TNEB and Meter Cards. The monitoring parameters are recorded as per the monitoring plan. The power is measured with a high accuracy and duly calibrated class 0.5 power meters. Individual meters have been provided at the time of installation of each Wind Mill. These meters are tested by TNEB before commissioning. At the time of commissioning the meter is sealed by the TNEB Officials. The meter readings are carried out once in a month by TNEB. The TNEB statements and meter cards are the basis for the commercial billing.

Related Findings

- ☐ No CARs, CLs or FARs have been identified in this context
- ☒ The following finding(s) have been addressed:

Finding:	CAR 3.3-1		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	No of WTGs, meter numbers, make and type of meter, accuracy class of connected meters, calibration details and calibration requirements is not provided in the MR.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	No of WTGs, meter numbers, make and type of meter and accuracy class of connected meters, calibration details are provided in the Appendix 2 of the revised monitoring report.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The details provided in Appendix 2 of the revised monitoring report have been cross checked with the document provided by the project promoters also during onsite visit by the verification team. The calibration records ^{/CAL/} are verified for the accuracy of connected meters, serial no, calibration details and commission certificates ^{/SC/} are verified for the installed capacity of the WTGs. All the details provided in the monitoring report is found to be correct and OK. Hence CAR 3.3.1 is closed.		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements		

Finding:	CAR 3.3-2		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	The monitoring period mentioned in section 2.2 contradicts with the cover page of the monitoring report .Correction is requested.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The period in the section 2.2 is corrected and made consistent with the cover page of the revised monitoring report.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The monitoring period is starts from 01 st April 2006 to 31 st December 2008. The same has been applied in the revised monitoring report and found consistent. Hence CAR 3.3.2 is closed.		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements		

Finding:	CL 3.3-1		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	The measurement frequency mentioned in the MR contradicts with the monitoring plan of the validated PD.Clarification requested.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The measurement frequency for the TNEB and the site in charge is monthly as per the final validated PD. The MR is corrected for this inconsistency and now the frequency is in coincidence with the PD.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The measurement frequency mentioned in the validated PD and revised monitoring report is consistent also the same has been confirmed during the onsite visit by interviewing the site in charge of the respective project promoters. Hence CL 3.3-1 is closed.		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements		

Final Assessment

The reporting ^{/MR/ /XLS/} is in line with the requirements of the validated monitoring plan

as well as with the applied methodology ACM 0002 version 10/^{ACM 0002/}. The reporting procedures reflect the requirements of the monitoring plan ^{/VCS-PD/}. Also the required monitoring systems have been installed and operational. The meters comply with appropriate quality standards applicable for the used technology. All relevant evidences^{/GR//COM//CAL/} were fully checked by the verification team during the on-site visit. All evidences are clearly identifiable and assessed to be correct. It could be evidenced that the monitoring system ensures for continuous (except some routine breakdowns or outage) operation. For the considered verification period, all indicators stated in the applicable monitoring methodology ACM0002 (Version 10) were correctly monitored and reported. Calibration of Meter is carried by state electricity board covering the reported monitoring period were verified for their frequency and traceability to industry standards/^{CAL/}. Calibration records of all installed meter were checked and found some of the WTG belongs to the project activity calibration has been delayed in this context CAR has been raised by the verification team (Ref CAR3.5.2 Section 3.5). For the delayed calibration the energy generation for the respective WTGs the correction has been applied based on the EB 52 Annex 60 to arrive the net generation. The calibration is carried out by the State electricity board as per electricity standards for each of the equipment.

3.4 Accuracy of emission reduction calculations

Description

The value of the emission reductions depends on the net electricity exported by the project activity. The baseline emissions are based on the net electricity supplied by the project, which is the difference between the electricity exported and the amount of electricity imported due to the project activity. The project emissions are zero as there is no use of any fossil fuel. Leakage is considered to be zero as per applied methodology since there is no equipment is transferred from another activity or if the existing equipment is transferred to another activity. Therefore the baseline emission equals the Emission Reductions.

$$ER_y = BE_y - PE_y - L_y$$

$$\text{Baseline Emission } BE_y = EG_y * EF_y$$

EG_y-Total Net Electricity Supplied to the Grid

EF_y- Baseline emission factor

PE_y is zero and L_y is also zero.

$$ER_y = BE_y - 0 - 0$$

= BEy

The total net electricity supplied by the 109 WTGs during the monitoring period is 268057359 KWh. The baseline emission factor has been fixed ex-ante as 0.92694742 (tCO₂/MWh) based on the CEA data base version 4.0 for Southern Grid^{/CEA/}. Based on the net electricity supplied and the emission factor the baseline emissions are 248,351 tCO_{2e}.

Related Findings:

- ☐ No CARs, CLs or FARs have been identified in this context
- ☒ The following finding(s) have been addressed:

Finding:	CAR 3.4-1		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	During the verification of generation statements most of the WTGs, the month of March 2006 also has been accounted and considering the crediting period start date of the project activity, the generation excel sheets and relevant sections of monitoring report need to be revised.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The generation for calculating the emission reductions is taken from 1 st April 2006 in the revised MR. The Emission reductions are also provided vintage wise in the revised MR.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	As per VCS 2007.1 the VCS crediting start date is 01/04/2006. But most of the monthly energy statement provides the generation details for the whole month of March 2006 and the same has been accounted for the emission reduction calculations. Now the project proponent has removed the generation of the march month and revised the emission reduction calculations. The same has been verified in the emission reduction calculation sheets ^{/XLS/} and found to be correct. Hence CAR 3.4.1 is closed.		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements		

Finding:	CAR 3.4-2		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	The emission factor value mentioned in the MR is not inline with Validated PD. Correction requested in this context. Moreover submit the emission reduction calculations sheet to the verifier for Verification.		

Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The emission factor in MR is corrected to be in consistent with the validated PD. The resulting ER number is also corrected in accordance with the revised emission factor. The emission reduction calculation is submitted along with the revised MR.
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The emission factor value mentioned in the revised monitoring report is now consistent with the validated PD also the same has been applied for the emission reduction calculations. The emission reduction calculation sheets has been cross checked and found to be correct. Hence CAR 3.4-2 is closed.
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

Finding:	CL 3.4-1		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Comparison between “estimated emission reductions” and “achieved emission reductions” over the crediting period is missing and has to be provided in the monitoring Report.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The comparison between estimated and actual ER is provided in the monitoring report.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The comparison between estimated vs. actual emission reductions and reasons for higher emission has been provided in the revised monitoring report. CL 3.4-1 is closed.		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements		

Final Assessment

The emission reductions were calculated correctly on the basis of the approved CDM baseline and monitoring methodology ACM 0002 Version 10, formulae given in the monitoring report and validated PD^{VCS-PD/}. The verification team crosschecked the emission reduction calculations by comparing TNEB statements with corresponding monthly invoices, which were found to be correct and accurate. There are no possible transposition errors between data sets since the monitoring of the net electricity generated is through calibrated electronic meters with high accuracy. Also

all the recorded data are verified by the team of project proponent as described monitoring plan of registered PD. The closure of all the CARs and CRs issued above resulted in change of 248,351 tCO₂e. Also the project proponent given justification for the difference in estimated emission reduction and actual emission reduction. The actual emission reduction is higher than the estimated emission reduction over the monitoring period is acceptable. This due the fact the monitoring period is from April 2006 to December 2008 and which falls under the high wind regimes. Because of the high wind regime during the considered monitoring period the PLF is slightly higher which resulted in higher emission reduction than the estimated.

3.5 Quality of evidence to determine emission reductions

Description

The net electricity exported to the grid is taken from joint meter reading which forms the basis for emission reduction calculations. The amount of electricity generated from the project activity and dispatched to the grid is continuously metered by TNEB energy meter. The meters are Tri-vector energy meters with an accuracy class of 0.5 which can measure both imported and exported electricity. The energy meter readings are noted in presence of officials from both WTG owners and TNEB. The data provided by TNEB are authentic based on which project proponent raises the invoices. The meters are calibrated by state electricity board ensuring error free measurements. Also the the log books are maintained for panel meter by the operating personnel has been verified by the site incharge of the respective WTGs and the same is forwarded to the individual project promoters ,If any major deviation between those values the same would be informed to TNEB for further action.

Related Findings

- ☒ No CARs, CLs or FARs have been identified in this context
- ☒ The following finding(s) have been addressed:

Finding:	CAR 3.5-1		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	During verification of the calibration records it was found that the calibration has not been done for some of the energy meters as specified calibration interval mentioned in the validated PD. Clarification requested in this context.		

Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	As per the EB 52 annex 60 “Guidelines for assessing compliance with the calibration frequency requirements” the data of delayed calibration WTGs are revised with the accuracy class of the corresponding energy meter. Since the calibration report states no error, as per the guidelines para 4 (a) the maximum permissible error (accuracy class) of the energy meter is applied to the delayed periods. Power: Import = Import + (Accuracy class of energy meter * Import) Export = Export - (Accuracy class of energy meter * Export) Note: Accuracy class of energy meter is 0.5 (maximum permissible error is 0.5%) Please refer “Revised VER calculation spreadsheet and Monitoring report”
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	The Export and import value has been corrected in the revised emission reduction calculation sheets as per EB 52 annex 60. “Guidelines for assessing compliance with the calibration frequency requirements” for the delayed calibration period(Refer Appendix 1). The calculated values has been verified and found to be conservative. Hence CAR 3-5.1 is closed.
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

Final Assessment

The project activity has got dedicated metering system and thus the value reflected in the ER sheet is purely for the project activity. Calibration procedures and test reports of the all online energy meters covering the reported monitoring period were verified for their frequency and traceability to industry standards. The verification team found that calibration has been delayed for some of the WTGs in this context CAR has been raised. For the delayed calibration the net energy generation has been corrected based on the EB 52 Annex 60 for the respective WTGs and the delay period. The calibration certificates^{/CAL/} for entire vintage were verified along with the monthly meter readings. Proper data management including of data acquisition, aggregation and data management system is being followed in project activity. All records needed for monitoring are archived in line with the requirements of the validated monitoring plan^{/VCS-PDI/}. No significant, lack of evidence and missing data were detected during on-site verification. It is evident from the monitoring data that the monitoring system ensures for continuous operation, no major break down has

been found during the monitoring period. The data pertaining to the monitoring are maintained in identified records for the entire monitoring period. All the data is in compliance with the figures stated in the monitoring report. Hence the quality of evidence provided is found to be credible and inline with monitoring plan of the validated PD^{VCS-PD/}

3.6 Management and operational system

Description

Tamil Nadu Spinning Mills Association is responsible for conducting the monitoring task strictly as per monitoring plan in the Validated PD^{VCS-PD/} and also calculates the emission reductions regularly and writes the monitoring report. The organisational structure includes site incharges who is responsible for O & M monitoring and coordinate with O & M contractor for smooth functioning of WTGs. He is also responsible for recording the required monitored parameters along with the TNEB officials and to report the monitoring results to TASMA. Chief Advisor of TASMA is responsible for overall project management. Day to day operation is supervised by Site Engineer of respective service providers of the WTG. They have the responsibility to supervise the O&M personnel for around the clock operation and maintenance of the WTGs. The training needs of the monitoring personnel are identified and necessary training programs are conducted by qualified personnel like induction training i.e. persons joined newly for monitoring, maintenance and reporting of the same. Also trainings related to safety and emergency preparedness were conducted at regular intervals based on the training needs identified. All monitored data are archived in Physical and Electronic form. The data will be kept for the whole crediting period and additional 2 years as given in the PD^{VCS-PD/}. Plant log book providing details of down time of the generating equipment. The O&M providers have followed systematic maintenance procedures.

Related Findings

- ☒ No CARs, CLs or FARs have been identified in this context
- ☐ The following finding(s) have been addressed:

Final Assessment

The allocation of responsibilities is documented in a written form and is followed as described in the Validated PD^{VCS-PD/}. Routines for the archiving of data are defined and documented. The monitoring personnel are well trained and follow reproducible routines. Thus, they have the necessary competence to carry out the relevant tasks

with sufficient accuracy. The training procedures^{/TRG/} for the monitoring personnel's at the time of joining and further training records^{/TRG/} were checked by the verification team during the on-site verification and found acceptable. During onsite visit the verification team confirmed the above mentioned monitoring and reporting procedures and also inline with established procedures as mentioned in the monitoring plan of the validated PD.

...

4 VERIFICATION STATEMENT

M/s Tamilnadu Spinning Mills Association has commissioned the TÜV NORD JI / CDM Certification Program to carry out the verification of the Project “Bundled Wind power project in Tamil Nadu, India, co-ordinated by Tamil Nadu Spinning Mills Association (TASMA-VI)” in Tamil nadu, India with regard to the requirements of VCS 2007.1 Standard.

The project activity is generation of electricity by Wind Turbine Generators generating electricity which displaces electricity generated in the Southern grid of India, thus achieves GHG emission reduction.

Reporting period: From 2006-04-01 to 2008-12-31

In the course of the verification 5 Corrective Action Requests (CARs), 3 Clarification Requests (CLs) were raised and successfully closed out.

The verification is based on the monitoring report, revised monitoring report, the monitoring plan as set out in the validated PD, the validation report, emission reduction calculation spreadsheet and supporting documents made available to the TÜV NORD JI/CDM CP by the project participant.

In detail the conclusions can be summarised as follows:

- all operations of the project are implemented and installed as planned and described in the validated project description.
- the monitoring plan is in accordance with the applied approved methodology, i.e., ACM 0002 Version 10.
- the installed equipment essential for measuring parameters required for calculating emission reductions is calibrated appropriately.
- the monitoring system is in place and functional. The project has generated GHG emission reductions.

As the result of the 1st periodic verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner. TÜV NORD JI/CDM CP herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows:

Year	Emission Reductions (tCO ₂)
2006	69846
2007	88981
2008	89524
Total	248,351

Verification Report: Bundled Wind power project in Tamil Nadu, India, coordinated by Tamil Nadu Spinning Mills Association (TASMA-V1)

TÜV NORD JI/CDM Certification Program

P-No.: 53802908 - 08/660



Bangalore 2011-03-10

Essen, 2011-03-16

A handwritten signature in blue ink, appearing to be 'M. K. S.', written over a horizontal line.

TÜV NORD JI/CDM Certification
Program Verification

Team Leader

A handwritten signature in black ink, appearing to be 'G. S.', written over a horizontal line.

TÜV NORD JI/CDM Certification
Program

Final Approval

5 REFERENCES

Table 5-1: Documents provided by the project participant

Reference	Documents
/CAL/	Calibration certificates for the main meters during the monitoring period.(provided in Appendix 2 of the Report)
/GR/	Statements for electricity generation certified by TNEB covering the monitoring period.
/MR/	Monitoring Report version 01Monitoring Report Version 02
/O&M/	Operation and maintenance agreements.
/PPA/	Extract of Power Purchase/Wheeling Agreement between TNEB and respective project promoters.
/SC/	Statutory Clearances: 1. Commissioning certificates (provided in Appendix 2 of the Report)
/TRG/	Training Procedures and Records of Monitoring Personnel.
/TS/	Technical specification of the WTGs.
/ VCS-PD/	Validated Project Document as per VCS 2007.1 standards
/XLS/	Emission reduction calculation sheet corresponding to ^{/MR/}

Table 5-2: Background investigation and assessment documents

Reference	Document
/ACM 0002/	“Consolidated methodology for grid-connected electricity generation from renewable sources” Version 10
/CPM/	TÜV NORD JI / CDM CP Manual (incl. CP procedures and forms)
/IPPC/	1. 1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book 2. 2006 IPCC Guidelines for National Greenhouse Gas Inventories:

Reference	Document
	work book
/ISO 14064/	Greenhouse gases -- Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals Greenhouse gases -- Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements Greenhouse gases -- Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions
/ISO14065/	Greenhouse gases -- Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition
VCS	Voluntary Carbon Standard 2007.1
/VDS-PD-T/	VCS PD Template
/VVM/	Validation and Verification Manual (Version as per EB51)

Table 5-3: Websites used

Reference	Link	Organisation
/cd4cdm/	www.cd4cdm.org	UNEP Riso Centre
/ipcc/	www.ipcc-nggip.iges.or.jp	IPCC publications
/vcs/	www.v-c-s.org	VCSA
/unfccc/	http://cdm.unfccc.int	UNFCCC

Table 5-4: List of interviewed persons

¹⁾ Means of Interview: (Telephone, E-Mail, Visit)

Reference		Name	Organisation / Function
/IM01/	☒ Mr. ☐ Ms.	K.Venkatachalam	Chief Advisor – TASMA

Reference		Name	Organisation / Function
/IM01/	☒ Mr. ☐ Ms.	V.Bharathi Kannan	CDM Co-ordinator ,TASMA
/IM01/	☒ Mr. ☐ Ms.	K.Selvaraju	CDM – Expert TASMA
/IM01/	☒ Mr. ☐ Ms.	R.Ponnambalam	Site Incharge,G.K.Spinner
/IM01/	☒ Mr. ☐ Ms.	P.Prabhu Srinivas	Senior Engineer
/IM01/	☒ Mr. ☐ Ms.	K.Padmanabhan	Site in charge
/IM01/	☒ Mr. ☐ Ms.	T.Ramakrishan	Operator Enercon
/IM01/	☒ Mr. ☐ Ms.	C.Ramesh Kumar	Manager (Site)
/IM01/	☒ Mr. ☐ Ms.	S.Prakash	Operator Enercon
/IM01/	☒ Mr. ☐ Ms.	S.P.Lenin	Suzlon Wind Farm -Engineer (Site)
/IM01/	☒ Mr. ☐ Ms.	N.Sivanandham	DTE,Suzlon Wind Farm Pushpathur
/IM01/	☒ Mr. ☐ Ms.	G.Eswarasamy	Vestas RRB - Site In charge
/IM01/	☒ Mr. ☐ Ms.	P. Easwaran	Site In charge
/IM01/	☒ Mr. ☐ Ms.	R. Venkat	Site In charge
/IM01/	☒ Mr. ☐ Ms.	S.Somasundaraj	Manager Maintenance



Reference		Name	Organisation / Function
/IM01/	☒ Mr. ☐ Ms.	K.Sivaraj	Asst Manager
/IM03/	☒ Mr. ☐ Ms.	P.Soundaraj	Junior Engineer
/IM02/	☒ Mr. ☐ Ms.	Atul Kumar Singh	Consultant -Cantor CO2

6 APPENDIX 1

The period of uncalibrated WTGs are presented below

COMP CODE	NAME OF THE MILLS / COMPANIES	WM. NO	CAPACITY	HTSC. NO	UNCALIBRATED PERIOD
C002	Arun Excello Urban Infrastructure Pvt. Ltd.,	1	225	546	April 06 to August 08
C002	Arun Excello Urban Infrastructure Pvt. Ltd.,	2	225	547	April 06 to October 2007
C004	Classic Spinning Mills Pvt. Ltd.,	1	225	314	November 07 to June 09
C004	Classic Spinning Mills Pvt. Ltd.,	2	225	314	January 08 to June 2009
C004	Classic Spinning Mills Pvt. Ltd.,	3	225	314	August 08 to June 09
C004	Classic Spinning Mills Pvt. Ltd.,	4	225	314	November 08 to June 09
C004	Classic Spinning Mills Pvt. Ltd.,	5	225	314	November 08 to June 09
C004	Classic Spinning Mills Pvt. Ltd.,	6	500	258	March 06 to June 09
C005	Classic Wind Farms	1	225	255	November 05 to June 09
C005	Classic Wind Farms	2	225	255	November 05 to June 09
C005	Classic Wind Farms	3	500	259	March 06 to June 09
C006	Deffree Engineering (P) Ltd.,	1	800	1059	December 08 to July 09
C007	Dhanalakshmi Controls & Equipments	1	225	726	March 08 to August 09
C009	Jayakrishna Flour Mills Pvt. Ltd.,	6	225	1463	September 08 to November 08
C012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	6	250	252	March 05 to August 09
C012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	7	250	252	March 05 to August 09

COMP CODE	NAME OF THE MILLS / COMPANIES	WM. NO	CAPACITY	HTSC. NO	UNCALIBRATED PERIOD
C012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	8	250	252	September 05 to August 09
C012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	9	250	260	March 06 to August 09
C012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	10	250	261	March 06 to August 09
C012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	11	250	444	June 08 to August 09
C012	Lakshminarayan Gourishanker Enterprises Pvt. Ltd.,	12	250	445	June 08 to August 09
C014	M.S. Raja Transports (Wind Mill Division)	1	800	1063	December 08 to July 09
C015	Poombukar Process	1	225	592	December 07 to September 09
C016	Poomer Hosieries	1	225	984	September 08 to September 09
C017	Power Link System Pvt. Ltd.,	1	230	281	March 06 to June 09
C018	Prime Tex	1	225	574	September 06 to March 08
C018	Prime Tex	2	225	574	September 06 to March 08
C018	Prime Tex	6	225	320	September 06 to June 09
C018	Prime Tex	7	225	318	September 06 to June 09
C019	Rangasayee Alloy Castings	1	230	407	March 07 to June 09
C021	S.S.K. Textiles	2	250	446	June 08 to September 09
C026	Shriram City Union Finance Ltd.,	1	1250	584	September 06 to November 06
C027	Shriram City Union Finance Ltd.,	2	1250	585	September 06 to November 06
C027	Shriram City Union Finance Ltd.,	3	1250	586	September 06 to November 06

COMP CODE	NAME OF THE MILLS / COMPANIES	WM. NO	CAPACITY	HTSC. NO	UNCALIBRATED PERIOD
C028	Shriram Investments Ltd.,	1	750	640	October 06 to March 07
C028	Shriram Investments Ltd.,	8	750	642	October 06 to March 07
C029	SNQS International Socks Pvt. Ltd.,	1	230	290	September 06 to July 09
C031	SRG Apparels Private Ltd.,	1	225	575	September 06 to March 08
C031	SRG Apparels Private Ltd.,	2	225	575	September 06 to March 08
C031	SRG Apparels Private Ltd.,	3	225	554	July 06 to March 08
C031	SRG Apparels Private Ltd.,	4	225	554	March 06 to March 08
C031	SRG Apparels Private Ltd.,	5	225	554	March 06 to March 08
C031	SRG Apparels Private Ltd.,	6	225	319	September 06 to June 09
C031	SRG Apparels Private Ltd.,	7	225	319	September 06 to June 09
C039	T.E.S. Naina Mohamed	1	225	754	March 07 to June 07
C040	The Prem Dyeing Works	1	500	424	March 08 to June 09
C041	The United Yarn Processors	1	500	1224	June 08 to November 09
C047	Vetal Hi-Tech Industries	1	250	267	September 06 to August 09
C048	Vetal Textiles & Electronics Pvt. Ltd.,	1	250	266	September 06 to August 09
C049	Victus Dyeing	1	750	384	March 07 to June 09

7 APPENDIX 2

The details of calibration and commissioning dates of the WTG involved in the project activity.

CODE NO.	NAME OF THE MILLS / COMPANIES	CAPACITY IN KW	HTS C. NO	DATE OF COMMISSIONING (MM/DD/YYYY)	Date of calibrations (MM/DD/YY YY)	METER CALIBRATION DATE (MM/DD/YY YY)
V001	Anugraha Valve Casting Ltd	1250	493	3/21/2003	7/7/2005	1/7/2008
V002	Arun Excello Urban Infrastructure Pvt. Ltd.,	225	546	3/31/2003	3/31/2003	8/19/2008
V002	Arun Excello Urban Infrastructure Pvt. Ltd.,	225	547	3/31/2003	10/31/2007	8/19/2008
V003	Arunachala Gounder Textile Mills Pvt. Ltd.,	600	597	9/29/2006		11/20/2008
V003	Arunachala Gounder Textile Mills Pvt. Ltd.,	600	2496	9/30/2007	9/30/2007	10/4/2007
V004	Classic Spinning Mills Pvt. Ltd.,	225	314	11/18/2004		6/18/2009
V004	Classic Spinning Mills Pvt. Ltd.,	225	314	1/5/2005		6/18/2009
V004	Classic Spinning Mills Pvt. Ltd.,	225	314	8/8/2005		6/18/2009
V004	Classic Spinning Mills Pvt. Ltd.,	225	314	9/8/2005		6/18/2009
V004	Classic Spinning Mills Pvt. Ltd.,	225	314	9/8/2005		6/18/2009
V004	Classic Spinning Mills Pvt. Ltd.,	500	258	3/27/2003		6/18/2009
V004	Classic Spinning Mills Pvt. Ltd.,	500	625	3/16/2007		6/18/2009
V005	Classic Wind Farms	225	255	9/28/2002		6/18/2009
V005	Classic Wind	225	255	9/28/2002		6/18/2009

CODE NO.	NAME OF THE MILLS / COMPANIES	CAPACITY IN KW	HTS C. NO	DATE OF COMMISSIONING (MM/DD/YYYY)	Date of calibrations (MM/DD/YY YY)	METER CALIBRATION DATE (MM/DD/YY YY)
	Farms					
V005	Classic Wind Farms	500	259	3/27/2003		6/18/2009
V005	Classic Wind Farms	500	627	3/16/2007		6/18/2009
V005	Classic Wind Farms	500	626	3/16/2007		6/18/2009
V006	Deffree Engineering (P) Ltd.,	800	1059	12/30/2005		7/2/2009
V007	Dhanalakshmi Controls & Equipments	225	726	3/29/2005		8/22/2009
V008	Frontier Processing Mills	500	1723	3/29/2006	3/29/2006	6/4/2008
V009	Jayakrishna Flour Mills Pvt. Ltd.,	225	477	2/5/2003	1/10/2005	11/4/2008
V009	Jayakrishna Flour Mills Pvt. Ltd.,	225	518	3/28/2003	3/9/2005	11/4/2008
V009	Jayakrishna Flour Mills Pvt. Ltd.,	225	623	9/29/2003	6/29/2005	7/8/2008
V009	Jayakrishna Flour Mills Pvt. Ltd.,	225	781	3/31/2004	6/29/2005	10/8/2009
V009	Jayakrishna Flour Mills Pvt. Ltd.,	225	782	3/31/2004	6/29/2005	8/11/2008
V009	Jayakrishna Flour Mills Pvt. Ltd.,	225	1463	9/29/2005	9/29/2005	11/4/2008
V009	Jayakrishna Flour Mills Pvt. Ltd.,	225	1769	3/30/2006	3/30/2006	10/25/2008
V010	K.G. Entertainment Company (P) Ltd.,	350	1328	9/30/2006		6/30/2009
V011	Kaleesuwari Refinery Pvt. Ltd.,	500	609	9/25/2003	9/22/2005	2/27/2008
V011	Kaleesuwari Refinery Pvt. Ltd.,	600	603	9/24/2003	19/07/2005 & 14/11/2006	10/22/2008
V012	Lakshminarayan Gourishanker	500	561	4/3/2006		8/22/2009

CODE NO.	NAME OF THE MILLS / COMPANIES	CAPACITY IN KW	HTS C. NO	DATE OF COMMISSIONING (MM/DD/YYYY)	Date of calibrations (MM/DD/YYYY)	METER CALIBRATION DATE (MM/DD/YYYY)
	Enterprised Pvt. Ltd.,					
V012	Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	663	4/10/2007		8/22/2009
V012	Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	664	4/10/2007		8/22/2009
V012	Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	665	4/10/2007		8/22/2009
V012	Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	666	4/10/2007		8/22/2009
V012	Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	252	3/28/2002		8/22/2009
V012	Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	252	3/28/2002		8/22/2009
V012	Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	252	9/23/2002		8/22/2009
V012	Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	260	3/29/2003		8/22/2009
V012	Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	261	3/29/2003		8/22/2009
V012	Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	250	444	6/4/2005		8/22/2009
V012	Lakshminarayan Gourishanker	250	445	6/4/2005		8/22/2009

CODE NO.	NAME OF THE MILLS / COMPANIES	CAPACITY IN KW	HTS C. NO	DATE OF COMMISSIONING (MM/DD/YYYY)	Date of calibrations (MM/DD/YYYY)	METER CALIBRATION DATE (MM/DD/YYYY)
	Enterprised Pvt. Ltd.,					
V012	Lakshminarayan Gourishanker Enterprised Pvt. Ltd.,	500	516	3/22/2006		8/22/2009
V013	Lotus Agency	750	1956	7/24/2006	7/24/2006	10/15/2008
V014	M.S. Raja Transports (Wind Mill Division)	800	1063	12/31/2005		7/2/2009
V015	Poombukar Process	225	592	12/15/2004		9/3/2009
V016	Poomer Hosieries	225	984	9/29/2005		9/3/2009
Credentia V017	Power Link System Pvt. Ltd.,	230	281	3/31/2003		6/20/2009
V018	Prime Tex	225	574	9/12/2003	9/12/2003	3/15/2008
V018	Prime Tex	225	574	9/12/2003	9/12/2003	3/15/2008
V018	Prime Tex	225	552	8/11/2003	3/8/2006	3/15/2008
V018	Prime Tex	225	552	3/31/2003	3/8/2006	3/15/2008
V018	Prime Tex	225	552	3/31/2003	3/8/2006	3/15/2008
V018	Prime Tex	225	320	9/30/2003		6/9/2009
V018	Prime Tex	225	318	9/30/2003		6/9/2009
V019	Rangasayee Alloy Castings	230	407	3/30/2004		6/11/2009
V019	Rangasayee Alloy Castings	350	1203	3/31/2006		6/16/2009
V020	S.N.Q.S International	330	1180	3/29/2006		8/6/2009
V021	S.S.K. Textiles	600	58	3/26/2007		9/18/2009
V021	S.S.K. Textiles	250	446	6/17/2005		9/16/2009
V022	Santhi Casting Works	500	608	9/25/2003	7/4/2005	7/11/2008

CODE NO.	NAME OF THE MILLS / COMPANIES	CAPACITY IN KW	HTS C. NO	DATE OF COMMISSIONING (MM/DD/YYYY)	Date of calibrations (MM/DD/YYYY)	METER CALIBRATION DATE (MM/DD/YYYY)
V023	Seyad Home Industries Pvt. Ltd.,	500	607	9/25/2003	9/15/2005	4/10/2007
V024	Seyad Shariat Finance Ltd.,	225	645	10/18/2003	17/10/2005 & 25/07/2007	1/29/2009
V025	Seyadu Beedi Company	500	417	3/5/2002	2/12/2004	9/24/2008
V026	Shanmugapriya Textiles Pvt. Ltd.,	750	536	3/31/2003	7/5/2005	1/11/2008
V027	Shriram City Union Finance Ltd.,	1250	584	9/21/2003	21/9/2003 & 10/11/2006	11/3/2008
V027	Shriram City Union Finance Ltd.,	1250	585	9/21/2003	21/9/2003 & 10/11/2006	11/3/2008
V027	Shriram City Union Finance Ltd.,	1250	586	9/21/2003	21/9/2003 & 10/11/2006	11/3/2008
V028	Shriram Investments Ltd.,	750	640	9/30/2003	02/10/2003 & 06/03/2007	1/22/2009
V028	Shriram Investments Ltd.,	750	641	9/30/2003	10/2/2003	12/3/2007
V028	Shriram Investments Ltd.,	750	641	9/30/2003	10/2/2003	12/3/2007
V028	Shriram Investments Ltd.,	750	641	9/30/2003	10/2/2003	12/3/2007
V028	Shriram Investments Ltd.,	750	641	9/30/2003	10/2/2003	12/3/2007
V028	Shriram Investments Ltd.,	750	641	9/30/2003	10/2/2003	12/3/2007
V028	Shriram Investments Ltd.,	750	641	9/30/2003	10/2/2003	12/3/2007
V028	Shriram Investments Ltd.,	750	642	9/30/2003	02/10/2003 & 11/08/2008	9/20/2008
V029	SNQS International Socks Pvt. Ltd.,	230	290	9/26/2003		7/13/2009
V030	Soundararaja	1250	862	8/12/2004	10/11/2006	11/30/2009

CODE NO.	NAME OF THE MILLS / COMPANIES	CAPACITY IN KW	HTS C. NO	DATE OF COMMISSIONING (MM/DD/YYYY)	Date of calibrations (MM/DD/YY YY)	METER CALIBRATION DATE (MM/DD/YY YY)
	Mills Ltd.,					
V030	Soundararaja Mills Ltd.,	1250	888	9/2/2004	02/09/2004 & 10/11/2006	11/30/2009
V030	Soundararaja Mills Ltd.,	1250	889	9/2/2004	02/09/2004 & 10/11/2006	11/30/2009
V030	Soundararaja Mills Ltd.,	1250	890	9/2/2004	02/09/2004 & 10/11/2006	11/30/2009
V031	SRG Apparels Private Ltd.,	225	575	9/12/2003	9/12/2003	3/15/2008
V031	SRG Apparels Private Ltd.,	225	575	9/12/2003	9/12/2003	3/15/2008
V031	SRG Apparels Private Ltd.,	225	554	7/23/2003	3/31/2003	3/15/2008
V031	SRG Apparels Private Ltd.,	225	554	3/31/2003	3/31/2003	3/15/2008
V031	SRG Apparels Private Ltd.,	225	554	3/31/2003	3/31/2003	3/15/2008
V031	SRG Apparels Private Ltd.,	225	319	9/30/2003		6/9/2009
V031	SRG Apparels Private Ltd.,	225	319	9/30/2003		6/9/2009
V032	Sri Alamelu Ammal Mills India Pvt. Ltd.,	600	63	3/28/2007		10/5/2009
V033	Sri Senthilandavar Cotton Mills Pvt. Ltd.,	750	519	3/29/2003	29/03/2003 & 05/07/2005	1/11/2008
V034	Sri Venkatram Spinners Pvt. Ltd.,	1650	1683	3/25/2006	25/03/2006 & 12/04/2008	8/17/2009
V035	Sugavaneswara Spinning Mills Pvt. Ltd.,	1250	2273	3/29/2007	29/03/2007 & 19/12/2007	6/8/2009
V036	Super Spinning Mills Ltd.,	1250	611	9/26/2003	26/09/2003 & 07/07/2005	10/13/2008

CODE NO.	NAME OF THE MILLS / COMPANIES	CAPACITY IN KW	HTS C. NO	DATE OF COMMISSIONING (MM/DD/YYYY)	Date of calibrations (MM/DD/YY YY)	METER CALIBRATION DATE (MM/DD/YY YY)
V037	Suresh Textiles	250	613	2/6/2007		9/22/2009
V038	T.E.S. Fathu Rabbani	225	447	9/27/2002	8/25/2004 & 06/11/2007	1/8/2008
V039	T.E.S. Naina Mohamed	225	754	3/29/2004	03/29/2004 & 06/11/2007	1/13/2009
V040	The Prem Dyeing Works	500	424	3/31/2005		6/18/2009
V041	The United Yarn Processors	500	1224	3/29/2005	3/29/2005	11/12/2009
V042	Thriveni Earth Movers Pvt. Ltd.,	225	1470	9/6/2007		9/6/2007
V043	Unifront Driers	500	1715	3/29/2006	3/29/2006	6/4/2008
V044	Unifront Textiles Processors (P) Ltd.,	500	1763	3/30/2006	3/30/2006	6/4/2008
V045	V.R. Foundries	850	602	12/23/2006		6/8/2009
V046	Veena Fabrics	250	1257	4/28/2006		9/16/2008
V046	Veena Fabrics	250	1244	3/31/2006		9/16/2008
V047	Vetal Hi-Tech Industries	250	267	9/12/2003		8/4/2009
V048	Vetal Textiles & Electronics Pvt. Ltd.,	250	266	9/12/2003		8/4/2009
V049	Victus Dyeings	750	384	3/27/2004		6/30/2009
V050	Vigneshkumar Spinning Mills Pvt. Ltd.,	350	2201	3/20/2007	3/20/2007	1/6/2009
V050	Vigneshkumar Spinning Mills Pvt. Ltd.,	350	1315	9/29/2006		6/12/2009