



Voluntary Carbon Standard 2007.1

Project Description

Date of VCS PD: 21 October 2009

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1 Description of Project:

1.1 Project title

Title: 53.75 MW Bundled wind Power project in Tamil Nadu and Karnataka by KBD Group, India

1.2 Type/Category of the project

The project activity is a grid connected electricity generation using renewable energy sources (wind) and power generation capacity is more than 15 MW, hence can be categorise as:

Scope number-1

Sectoral scope- Energy industries (renewable - / non-renewable sources)

Project Category: ACM0002 - Consolidated baseline methodology for grid-connected electricity generation from renewable sources. Version-09

The project is a grouped project consisting of commissioning and operation of 53 wind turbine generators by five individual Project participants. The entire electricity generated from the project is being sold to the southern grid.

1.3 Estimated amount of emission reductions over the crediting period including project size:

The project is 53.75 MW wind based electricity generation. Table 1 shows the estimated emission reductions from the project over the crediting period. The crediting period for the project is from 1/10/2006¹– 30/09/2016² which can be renewed once (considering project life of 20 years).

Table 1: Emission reductions over the crediting period

Years	Annual estimation of emission reductions in tonnes of CO ₂ e
2006 -2007	119,382
2007-2008	119,382
2008-2009	119,382
2009-2010	119,382
2010-2011	119,382
2011-2012	119,382
2012-2013	119,382
2013-2014	119,382
2014-2015	119,382
2015-2016	119,382
Total estimated reduction (tonnes of CO₂ e)	1,193,820
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO₂e)	119,382

¹ Commissioning date of first WTG in the group is 29 September 2006

² December 2009 is the expected date of registration for CDM project activity

As per VCS 2007 Guidelines, the project falls under the category of “project” with emission reduction more than 5,000 and less than 1,000,000 tonnes of CO₂ equivalent emission reductions.

1.4 A brief description of the project:

Project Participant: 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.

Description of the project: The project has been undertaken to harness the available wind power potential in the State of Tamil Nadu and Karnataka. 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 project will generate approximately 117 million units of electricity per annum, which 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 utilising wind to produce power.

The implementation of project will achieve approximately 119,382 tCO₂e emission reduction per annum by replacing grid based electricity which is predominately generated by fossil fuel based thermal power plant in Sothern Grid.

There are five individual Project participants from various industries who have set up wind turbines and are bundled in this Project. The Names of the project promoters, Capacity of the WTGs are as listed below.

Table 2: 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

Purpose of the project: The objective of the project is commissioning and operation of 53 WTGs covered in the project activity in Tamil Nadu and Karnataka to provide renewable power to the southern grid. The project has led to reduced greenhouse gas emissions as it displaces electricity from fossil fuel intensive grid.

Pre-project scenario:

In the pre project scenario, the equivalent amount of electricity was being generated by grid connected fossil fuel based power plants with significant deficit. The project locations were non-agrarian hilly areas.

All the Project proponents have ventured into the renewable energy sector with this activity for the first time.

Baseline scenario:

This project is wind based renewable energy source, zero emission power project connected to the Southern grid. The project will generate approximately 117 million units (MU) of electricity which will be supplied to Southern Grid. Hence, as per the baseline methodology ACM0002, the baseline scenario is Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.

Contribution to Greenhouse gas emissions reduction

The project reduces the greenhouse gas emissions by generation of electricity from renewable and clean energy source, wind. The electricity thus generated is connected to the southern grid and supplied to the respective state electricity board. The main greenhouse gas that is prevented from being emitted into atmosphere is CO₂ which would have otherwise been emitted from the fossil fuel fired power plants that are connected to the grid.

The project activity is in conformation of the sustainable development goals³ of the host country in the following ways:

Social well being:

The project activity has created employment opportunities to the community during construction, operation as well as for the long term maintenance. The local workforce technical skills and knowledge will improve thus leading to capacity and knowledge building. Also, the project activity has led sustainable development of non-conventional renewable energy technology for production of power. The infrastructure in and around the project area has been improved due to project

³ http://www.cdmindia.in/approval_process.php

activities. This includes development of road network and improvement of electricity availability in the region as the electricity is supplied to Southern grid.

Economic well being:

The project activity has led to an investment of about Rs 300 crores to a developing region which otherwise would not have happened. The generated electricity will be sold to Southern grid, thereby improving the grid frequency and availability of electricity to the local consumers which will provide new opportunities for industries and economic activities to be setup in the area thereby resulting in greater local employment, ultimately leading to overall development. The project activity also leads to diversification of the national energy supply, which is dominated by conventional fuel based generating units.

Environmental well being:

The electricity generated by project activity will be supplied to southern grid, which otherwise would have been generated by fossil fuels. Hence the project activity will help in reduction of the green house gases emission (CO₂) and other air pollutants (especially NO_x, SO₂ and particulates). The project helps in conservation of depleting fossil fuels such as coal, oil, natural gas which at present are predominantly used for power generation.

Technological well being:

The project has installed higher capacity wind turbo generator (S82 of Suzlon Energy), the success of above project will increase the reliability on efficient technology and large capacity wind mills. Also the success of above project will lead to investment in research and development of higher capacity machine with better efficiency.

1.5 Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project:

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

Table 3: 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

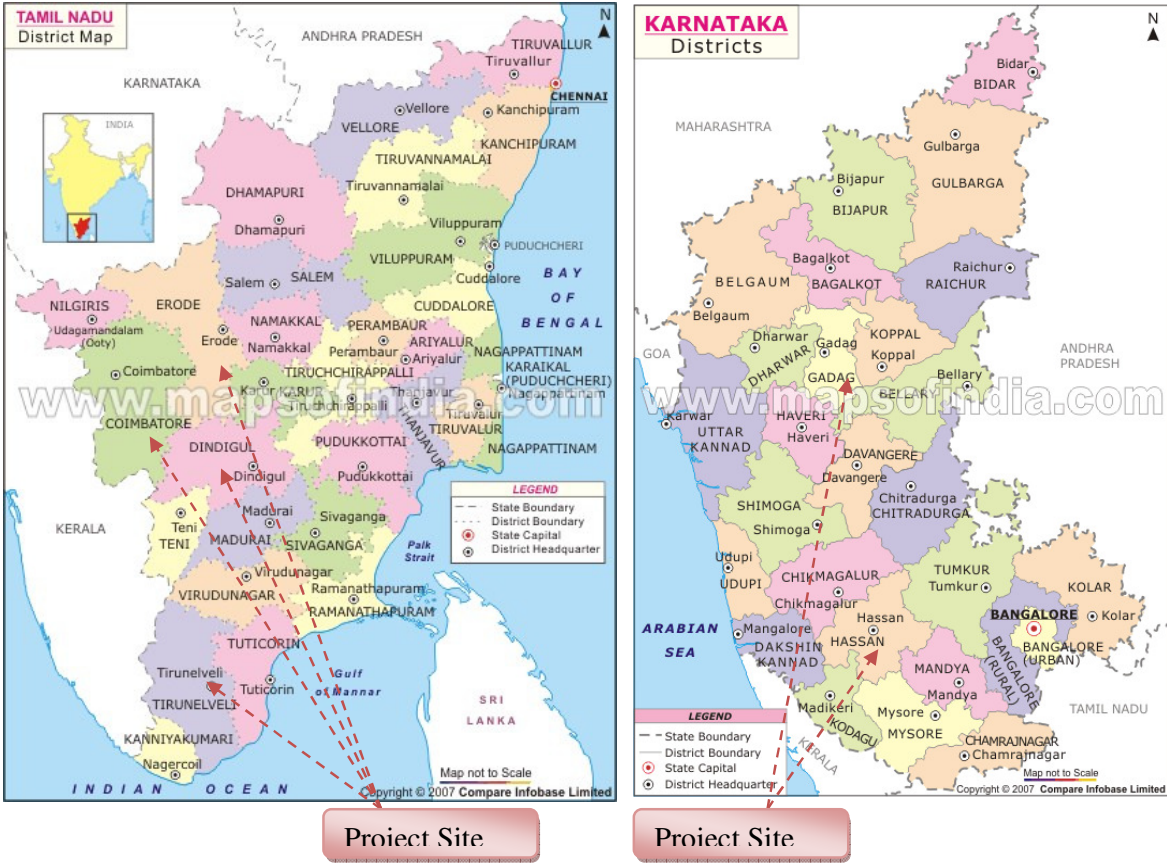


Figure 1: Location of the project activity

Table 4: 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)Chinnapudhur	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)/69/2B9Part) 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

Sr. No.	Location No.	RR No.	Capacity (kW)	SF No.	Latitude	Longitude	Taluka
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20	H23	HSN/TL&SS/WF/H23/04	1500	1 Rangapurakavalu	N 76 11 50.6	E 13 10 81.6	Arasikere
21	H24	HSN/TL&SS/WF/H23/04	1500		N 76 11 44.3	E 13 10 95.8	Arasikere
22	K310	GDG/TL&SS/WF/SDPLK/K-311/89	1500	72, 77 Keluru	N15 08 38.6	E 75 46 49.8	Mundargi
23	K311	GDG/TL&SS/WF/SDPLK/K-311/89	1500		N15 08 18.3	E 75 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 Kozhumankondam	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 Kozhumankondam	N10 ⁰ 34' 26.9"	E77 ⁰ 27' 07.8"	Palladam
35	G 546	D 17	600	143 Kozhumankondam	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) Kozhumankondam	N10 ⁰ 33' 38.3"	E77 ⁰ 26' 13.1"	Palladam
37	G 476	D 25	600	500/1C(P), 2C(P) Kozhumankondam	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) Kozhumankondam	N10 ⁰ 33' 11.9"	E77 ⁰ 26' 22.6"	Palladam
39	G 420	D 23	600	478/2A(P) Kozhumankondam	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.	Unique ID	On Board at site	HT SC No.	Capacity (kW)	SF No.	Latitude	Longitude	Taluka
43	55255	G 897/10	2319/TIN	750	178/7, Sampavarvadakarai	N9 ⁰ 01' 29.2"	E77 ⁰ 24' 00.6"	Surandai

44	55257	G 897/18	2320/TIN	750	125/7 (p),/8 (p)/9(p)10(p), Sampavarvadakarai	N9 ⁰ 00' 58.1"	E77 ⁰ 24' 44.4"	Surandai
45	55258	G 897/19	2321/TIN	750	44/2,3,4(P), Sampavarvadakarai	N9 ⁰ 01' 06.3"	E77 ⁰ 22' 45.5"	Surandai
46	55253	G 897/8	2233/TIN	750	287/(p), Alagiapandiapuram	N9 ⁰ 01' 23.9"	E77 ⁰ 31' 34.8"	Surandai
47	55254	G 897/9	2232/TIN	750	210/1a(p), Alagiapandiapuram	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 ⁰ 01' 25.9"	E77 ⁰ 32' 01.5"	Surandai
50	55245	2289 TIN	750	415/1A, 1B, 2 Keelakalangal	N8 ⁰ 56' 26.8"	E77 ⁰ 38' 41.9"	Surandai
51	55252	2307	750	378/ 2(P), 3(P) Keelakalangal	N9 ⁰ 01' 13.7"	E77 ⁰ 30' 28.8"	Surandai
52	G 399	D 9	600	72/2B (P)	N10 ⁰ 33' 24.3"	E77 ⁰ 24' 02.9"	Palladam
53	R107	2170	1500	133/1(part)Udayathoor	N8 ⁰ 17.297'	E77 ⁰ 45.182'	Sankaneri

1.6 Duration of the project activity/crediting period:

- *Project start date:* 29/09/2006 (The project start date is the earliest commissioning date amongst all the WTGs in this grouped project)
- *Crediting period start date:* 1/10/2006
- *VCS project crediting period:* 01/10/2006 to 30/09/2016
- VCS project crediting period: 10 years and 0 months, renewable once (considering 20 year life of project)
- Estimated life time of the project: 20 years

1.7 Conditions prior to project initiation:

Prior to the project initiation, the electricity was being developed from the existing fuel mix (fossil fuel dominated) in the grid and there was significant deficit in the grid. The project locations were non-agrarian hilly areas.

1.8 A description of how the project will achieve GHG emission reductions and/or removal enhancements:

The Project reduces the anthropogenic emissions of greenhouse gases (GHGs) into the atmosphere by displacing the equivalent amount of electricity generation from the operation of existing/proposed fossil fuel based power plants connected to the Southern Grid. This will also reduce the carbon intensity of the grid and help meet part of the deficit.

The Project activity will thus reduce the anthropogenic emissions of greenhouse gases (GHGs) in to the atmosphere associated with the equivalent amount of electricity generation.

1.9 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 will be composed by WTG of three blades each (with power control) and an active system for rotor orientation. Under wind high speed, a control system will keep 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 axix
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

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 axix
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 axix
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 axix
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 axix
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.

1.10 Compliance with relevant local laws and regulations related to the project:

Renewable energy projects are not mandated in India by any enforced law or other regulatory framework. However, for guidance on voluntary wind energy based electricity generation, there are policies introduced/incentives declared by the state governments. These policies have been considered for the project activity and are available at <http://www.windpowerindia.com/govtinc.html>

The wind power project abides and will abide by all regulatory and statutory requirements as prescribed under the state and central laws and regulations. The laws and regulations applicable to the project activities and the status of the project activity with its compliance are demonstrated in the following Table.

Table 5: Relevant applicable laws & regulations and compliance status of the project activity

Regulations	Compliance status
NOC from TNEB and KREDL	Complied
Power Purchase Agreement with TNEB and KREDL	Complied
Land sale deeds (ownership)	Complied

1.11 Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements:

Wind energy generation by modern wind turbine generators is an established technology. Also, there is dedicated, state of art O&M service in place. Thus, there are no risks identified that may affect the project's GHG emission reduction.

Some natural and operational issues that can alter the performance of WTGs i.e. amount of electricity generation are variation in the wind speeds and grid failure with no evacuation for some time. This is not a major risk though and only performance will be affected to certain extent.

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

The project involves renewable electricity generation by use of natural wind. This does not have any GHG emissions involved in the process. Thus, the project does not involve creating GHG emissions for the purpose of its subsequent removal or destruction.

1.13 Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates).

The project activity does not result in creation of any other kind of environmental credits. A letter from the project proponent has been submitted to the validator with an undertaking that the project has not created another form of environmental credit.

The project activity is under validation for CDM registration. However, during the present VCS verification period, the project activity is not registered for CDM yet and can not generate CERs. An undertaking of such effect is given to the DOE.

1.14 Project rejected under other GHG programs (if applicable):

The project activity has never been rejected under any other GHG programs. However, the project proponent has applied for registration under Clean Development Mechanism (CDM) of Kyoto Protocol and the same is under validation stage.

1.15 Project proponents roles and responsibilities, including contact information of the project proponent, other project participants:

Table 6: Roles and responsibilities of project proponent

Project Proponent	Roles & Responsibilities
Sapthagiri Distillery Private Limited	- To ensure that the project activity is in compliance with all the local laws and regulation applicable to the project activity. - It is under the purview of their duty to ensure that parameters are monitored in accordance with the monitoring protocol and the records are maintained in a proper manner, so that it eases the validation/ verification procedures.

Table 7: Contact details of the project proponent

Organization:	Sapthagiri Distilleries Private Limited
Street/P.O.Box:	17, Sankey Road,
Building:	--
City:	Bangalore
State/Region:	Karnataka
Postfix/ZIP:	560020
Country:	India
Telephone:	+91 80-23447993 / 23364732
FAX:	+91 80 – 23310040
E-Mail:	paniconsultancy@yahoo.com; kdbldt@hotmail.com
URL:	--
Represented by:	P.S.Chakarapani
Title:	Financial Advisor

Salutation:	CA
Last Name:	Chakarapani
Middle Name:	Srinivasalu
First Name:	Pallikonda
Department:	Fianacial Advisor
Mobile:	-
Direct FAX:	+91 44 / 28260203
Direct tel:	+91 44/42014102
Personal E-Mail:	paniconsultancy@yahoo.com

Mr. PS Chakarapani will be responsible for all the communications and actions in relation to the project being validated in accordance with the VCS standard.

1.16 Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and temporal information.):

The project is renewable energy generation project and supplies electricity to the southern grid. By doing so, it displaces the electricity generation in the fossil fuel intensive grid and reduced the CO₂ emissions. There are no regulations that mandates this type of investment and hence is eligible for the claiming the emission reductions.

1.17 List of commercially sensitive information (if applicable):

Not applicable

2 VCS Methodology:

2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices:

Approved baseline and monitoring methodology applied for the project activity is

Table 8: VCS Methodology details

Methodology Applicable	ACM0002
Version	09
Sectoral scope	01
Reference	http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

The methodology refers to the following tools in order to calculate the emission reduction from the project activity:

- Tool to calculate the emission factor for an electricity system (version 1.1);
- Tool for the demonstration and assessment of additionality (version 5.2);
- Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion (version 02).

However, for the project activity, following tools has been used:

- Tool to calculate the emission factor for an electricity system (version 1.1);
- Tool for the demonstration and assessment of additionality (version 5.2);

2.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The project activity avoids the expansion of grid connected fossil fuel based power generation, as it utilises renewable resources (wind energy) to generate power. The adopted baseline methodology ACM0002 has been chosen for the project activity based on fulfilment of the applicability conditions as described below:

Table 9: Justification for applicable methodology i.e. ACM0002

S. No.	Technology/Measures as per ACM0002 version 09	Project activity measures
1	The project activity is the installation or modification/retrofit of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.	The project activity is installation of grid connected wind power plants. The project activity is a green field project, no switch over involved from fossil fuel based power plant.
2	In case of hydro power plants: - The project activity is implemented in an existing reservoir, with no change in the volume of reservoir. - The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m ² . - The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m ² .	The project activity is installation of grid connected wind power plants and does not involve hydro power plant. This condition is not applicable.
3	The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available	The project activity is connected to Southern grid. Geographic and system boundaries for the relevant grid (Southern) can be clearly defined and information on the characteristics of the grid is also available.
4	Applies to grid connected electricity generation from landfill gas to the extent that it is combined with the approved "Consolidated baseline methodology for landfill gas project activities" (ACM0001); and	The project activity is installation of grid connected wind power plants and does not involve landfill gas. This condition is not applicable.
5	5 years of historical data (or 3 years in the case of non hydro project activities) have to be available for those project activities where	The project activity is installation of grid connected wind power

	modification/retrofit measures are implemented in an existing power plant.	plants and does not involve hydro power plant. This condition is not applicable.
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It can be seen from the above table that the approved methodology ACM0002, version 09 is applicable to the project activity.

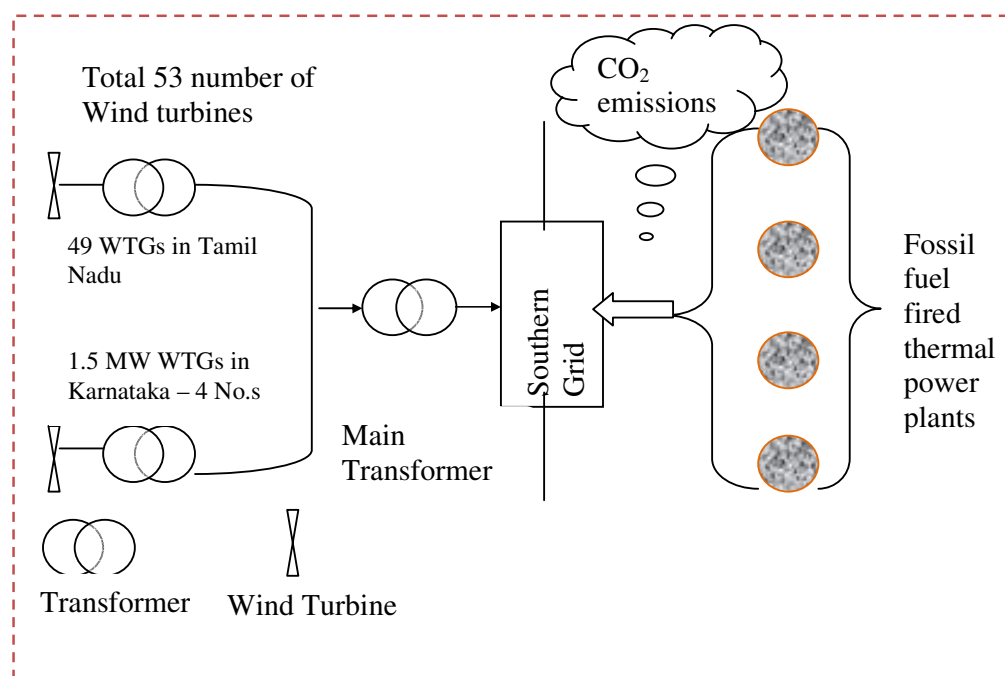
2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

The proposed project is the installation of a new grid-connected renewable power plant, and the baseline scenario is the following:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.

The spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints is defined as the project electricity system. For the proposed project, the spatial extent of the project boundary includes the proposed Wind Power Project and all power plants connected physically to the Southern Grid of India

The schematic diagram of project boundary is as follows:



The **greenhouse gases** included in or excluded from the project boundary are shown in the table below:

Table 10: Overview on emissions sources included in or excluded from the project boundary

Baseline	Grid connected thermal power station	CO ₂	Yes	Major source of emission
		CH ₄	No	Excluded for simplification, this is conservative
		N ₂ O	No	Excluded for simplification, this is conservative
Project	Grid connected electricity generation	CO ₂	No	There will be no project emissions since wind mills convert wind energy to electricity. Further, the electricity displaced at the grid is on net displacement of equivalent electricity generated by the project, i.e. (exports to grid less imports from grid equals net power displaced), hence auxiliary units consumed from grid is subtracted from benefits.
		CH ₄	No	
		N ₂ O	No	
	For all renewable energy plants, CO ₂ emissions from backup power generation.	CO ₂	No	The project activity does not have any backup power generation units
		CH ₄	No	The project activity does not have any backup power generation units
		N ₂ O	No	The project activity does not have any backup power generation units

2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario:

The baseline methodology has followed the one specified in “Baseline Methodology Procedure” of ACM0002, version 09, if the project activity is the installation of a new grid-connected renewable power plant/unit; the baseline scenario is the following:

Table 114: Alternatives identified to the project activity

Scenario	Main Implementation Barrier
Scenario 1 Proposed project activity without VER revenues	1. The 53.75 MW wind based power generation unit at TN and Karnataka would sell the power generated to the southern grid and would reduce an equivalent amount of fossil fuel that would have been used in order to generate the power in the grid. 2. Implementation of this wind based project activity will reduce the thermal pollution levels from the burning of fossil fuels and release GHG into the atmosphere and displace the electricity purchase from southern grid, which in turn reduce the CO₂ emissions from

	fossil fuel based thermal power plants of southern grid. 3. KBDL has to make additional investment, which makes this alternative, less attractive for the project activity without emission reduction benefit. Hence this option can be eliminated for consideration as a baseline scenario.
Scenario 2 No project activity; Continuation of current situation	1. In this alternative, project activity is not implemented resulting in the continued current grid mix of TNEB and KSEB. There is no displacement of electricity of the grid mix of the southern grid. 2. In this alternative when there is no project activity, an equivalent amount of electricity would be generated by the power plants comprising of southern grid which is predominantly thermal. An equivalent amount of carbon dioxide would be generated at the thermal power generation end. This alternative is in compliance with all applicable legal and regulatory requirements and may be a part of the baseline. This scenario was the status of the existing facility before VER project implementation.

“Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”.

This project activity is renewable energy resource based power project connected to the Southern grid. Hence the baseline scenario for the project activity will be *“Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources in Sothern Grid, as reflected in the combined margin (CM) calculations described below”*.

The estimation of baseline emission using calculation of Combined Margin multiplied by electricity delivered to the grid by the Project. It is discussed in Section 4.1.

2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality):

The guidelines as mentioned in VCS 2007.1 have been used to demonstrate the additionality for the project activity. The test 1 “THE PROJECT TEST” of additionality tool is selected, as the project encounters various barriers. The various barriers that hinder the project activity is described elaborately by undertaking barrier analysis, and the necessity for VER revenue to overcome the barriers for establishing the project activity is justified accordingly.

Test 1**Step 1: Regulatory Surplus**

There is no law or regulation prevalent in the state of Tamil Nadu and Karnataka that makes mandatory the establishment of the wind power plant for power generation.

Step 2: Implementation Barrier

The project shall face one (or more) distinct barrier(s) compared with barriers faced by alternative projects.

The project activity is connected to southern grid, which is dominated by fossil fuel based power generation plant. In the absence of the project activity, in view of the substantial energy deficit situation in the state of Tamil Nadu and Karnataka respective state electricity grid would have gone for new coal based thermal power plant or capacity addition in existing plants.

The project activity has displaced fossil fuel based electricity that would otherwise be provided by the operation and expansion of the Southern grid, hence reducing the emission of green house gases.

Investment Barrier:

An investment of the project activity was conducted with project IRR as suggested by additionality tool. The internal rate of return (IRR) on investment as financial indicator is one of the known financial indicator used by banks, financial institutions and project developer for making investment decision. The financial indicator chosen is the internal rate of return of the project (IRR). This is compared with the cost of financing which has been taken from the benchmark or cut-off rate to determine the adequacy of the return. Weighted Average Cost of Capital (WACC) has been chosen by the project proponent as WACC alone represents the weighted average of the costs of various sources of financing in the financial structure of the project. In other words, WACC represents the minimum rate of return which the project should earn to merit consideration, as failure to earn the minimum rate of return is indicative of the erosion in the value of investment.

As per the Guidance on Assessment of Investment analysis, version 02, annex 45 of EB 41, it states that “In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Benchmarks supplied by relevant national authorities are also appropriate if the DOE can validate that they are applicable to the project activity and the type of IRR calculation presented.”

As per Sub-step 2b of Additionality tool, version 5.2, “When applying benchmark analysis, the financial/economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer. Only in the particular case where the project activity can be implemented by the project participant, the specific financial/economic situation of the company undertaking the project activity can be considered.”

The WACC for the respective years has been calculated as demonstrated below:

$$WACC = CoE * \{E/(E+D)\} + CoD_{post\ tax} * \{D/(E+D)\}$$

Where:

E- Percentage of equity in the capital structure

D-Percentage of debt in the capital structure

CoE – Cost of equity

CoD – Cost of Debt

CoE – Cost of Equity:

The Capital Asset Pricing Model (CAPM) approach is a generally accepted methodology for determining the Cost of Equity. CAPM is based on the portfolio theory of finance in which risks are classified into:

- Systematic risk - risk applicable to the market as a whole, such as inflation, tax rises, interest rates, etc.
- Specific risk - residual risk unique to an individual firm or a small group of companies that form a subset of the market.

The theory stipulates that specific risks can be eliminated through diversification and hence, only systematic risks determine the return expectation of investors. The basis of CAPM is the relationship between risk and return. Whilst there has been considerable debate on the strength of the risk/return relationship, evidence indicates that there is a strong linear and positive relationship over the long term, which can be expressed by the following formula

$$E(re) = rf + Equity\ Beta\ (\beta) * [E(rm) - rf]$$

Where:

E(re) - the expected rate of return on equity (cost of equity)

rf is the risk-free rate of return (e.g. return on government bonds)

E(rm) - the expected rate of return on a market portfolio

Equity Beta (β) - coefficient reflecting the volatility (risk) of the stock relative to the market, which measures the systematic risk of the stock

The Risk free rate (rf) has been taken from the long term government bond rates at the time of the investment decision of the project activity in January 2006. The weighted average interest rate on Central Government date Securities i.e. bond rate during the investment year decision was 6.11⁴

The Market Risk Premium (E(rm) – rf), as measured and applied in practice, is the premium above the risk-free rate of return that investors expect to earn on a well-diversified portfolio of equities.

The expected rate of return on a market portfolio (E(rm)) has been calculated as the compounded annual growth rate of the market portfolio. In calculating market risk premium, it is usual to use an established stock market index as a proxy for the market portfolio. In India, a choice of possible indices are available namely:

- Bombay Stock Exchange 30 (BSE 30) – Flagship diversified index of 30 blue chip stocks.
- Bombay Stock Exchange 100 (BSE 100) – Index constituted by top 100 companies (by market cap) trading on the Bombay Stock Exchange
- National Stock Exchange Nifty 50 – Flagship diversified index of 50 blue chip stocks.

⁴ <http://rbidocs.rbi.org.in/rdocs/Publications/PDFs/80303.pdf>

Choice of stock market index will also be considerably influenced by the availability of historical data. In this regard, BSE 30 has the advantage of having the longest history and data is available for 20 years. The data on other indices, viz. Nifty, are available only since 1991. Hence BSE Sensex has been considered for calculating the Expected market return at the time of taking decision of project activity. The Expected market return has been estimated for year 2004-05 is 17.19%⁵.

Equity Beta is the measure of the expected volatility of a particular stock relative to a well-diversified market portfolio. It measures the systematic risk of a stock, i.e. the risk that cannot be eliminated in a well-balanced, diversified portfolio. The beta of equity is calculated as the covariance between its return and the return on a well-diversified market portfolio, divided by the variance of the return on a well-diversified market portfolio.

As the project activity entails wind power generation, the equity beta to be considered should ideally be of listed wind power companies. However since no such companies with wind or renewable energy generation portfolio are available, the beta values of following companies in power generation sector have been considered for the three financial years before the investment decision:

Tata Power Company Ltd.; CESC; Reliance Energy/ Reliance Infrastructure Ltd. and BF Utilities. It is understood that since these companies are in the business of power generation their beta values on an average would provide an appropriate figure for calculating the benchmark. The beta value for the relevant investment decision year is 1.71. As a conservative estimate, the appropriate beta for all years has been chosen as 1. The Cost of Debt has been considered as per the mean PLR of the State Bank of India and ICICI Bank for the time periods under question.

The benchmark WACC is calculated as 14.69%⁵.

For the investment analysis a useful life of 20 years has been considered for projections of cash flow. The revenue projections are done as per company wise and assessee wise. SDPL, KBDL, Mr. DK Audikesavulu, Mrs. DA Satyaprabha and Mr. S. Srinivas are the sub-project owners. These sub projects have been considered for investment analysis of the project activity. All the relevant cost i.e. capital cost, O&M cost and revenue (excluding VER revenue and including subsidies/fiscal incentive wherever applicable) for investment analysis. The following table shows the common parameter used for calculation of IRR and project specific parameter are mentioned in the table with references.

Common Parameters

Description	Value	Reference
Free O&M years	1	As per agreement with supplier
O&M escalation	5.0%	
HT Tariff in Tamil Nadu	INR 2.7 per kWh	PPA with TNSEDCL
HT Tariff in Karnataka	INR 3.4 per kWh	PPA with KSEDCL
Insurance cost	As per the actual insurance policy	Insurance Policy papers
Income Tax rate	30%	The Indian Income Tax

⁵ Refer to the worksheet 'Benchmark Analysis'

Surcharge	10%	Act, 1961
Cess	3%	
MAT	10	
Useful life of project	20 years	
Book Depreciation	4.5%	
Income Tax Depreciation rate	80	TNERC Order on purchase of power from NCES based Generating Plants, dt. 15/05/2006 ⁶ (for agreements signed before this order)
Book depreciation (% of asset value)	90	
PLF for Tamil Nadu	27.46%	
PLF for Karnataka	26.5%	KERC Renewable Energy Tariff regulation, 2005 ⁷

Project specific parameters

Description	Value	Reference
Capacity of Machine	1500 KW	Invoice
Number of machine	4	
Cost per MW	58.33 million	
Total project cost	350 million	Agreement with supplier Term loan paper
O&M charges	1.2 million per WTG	
Debt equity ratio	70:30	
Loan period	8 year	
Interest rate	13%	

Description	Value	Reference
Capacity of Machine	1500 KW	Invoice
Number of machine	16	
Cost per MW	58.33 million	
Total project cost	1400 million	Agreement with supplier Term loan paper
O&M charges	1.2 million per WTG	
Debt equity ratio	70:30	
Loan period	8 year	
Interest rate	13%	

Description	Value	Reference
Capacity of Machine	1250 KW	Invoice
Number of machine	4	
Cost per MW	48.48 million	
Total project cost	242.4 million	Agreement with supplier Term loan paper
O&M charges	1.1 million per WTG	
Debt equity ratio	70:30	
Loan period	8 year	

⁶ <http://tnerc.tn.nic.in/orders/ncs%20order%20-approved%20order%20host%20copy.pdf>

⁷ [www.kerc.org/order2005/Order%20on%20NCE%20Tariff%20\(FINAL\).doc](http://www.kerc.org/order2005/Order%20on%20NCE%20Tariff%20(FINAL).doc)

Interest rate	10.5%
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Description	Value	Reference
Capacity of Machine	750 KW	Invoice
Number of machine	9	
Cost per MW	48.88 million	
Total project cost	329.94 million	
O&M charges	0.5 million per WTG	Agreement with supplier Term loan paper
Debt equity ratio	75:25	
Loan period	8 year	
Interest rate	13%	

Description	Value	Reference
Capacity of Machine	600 KW	Invoice
Number of machine	20	
Cost per MW	63.33 million	
Total project cost	760 million	
O&M charges	0.6 million per WTG	Agreement with supplier Term loan paper
Debt equity ratio	70:30	
Loan period	8 year	
Interest rate	13%	

Project IRR

Sub-project title	Without VCS (%)	With VCS (%)
Karnataka Breweries & Distilleries Ltd. 4 No. 1.25 MW WTGs in Tamil Nadu	12.73	13.79
Sapthagiri Distilleries Private Ltd 15 No. 1.5 MW WTGs in Tamil Nadu 4 No. 1.5 MW WTGs in Karnataka	10.27 13.53	11.18 14.43
Mr. D.K. Audikesavulu (0.6 x 19 No.s)		
Mrs. D.A. Satyaprabha (0.75 x 5 No.s)	2.67	3.28
Mr. D.A. Srinivas – (0.6+1.5+0.75 MW x 4 No.s)	3.71	4.32

It can be seen that the internal rate of return on investment (Project IRR) without VER revenue varies between 2.67% - 13.53% is lower than established benchmark 14.69% being used as the conservative financial indicator for wind power plants.

Sensitivity analysis

As per guideline provided by EB 41 Meeting Report, Annex 45 the criteria for choosing the sensitivity analysis parameter is:

16. Guidance: Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets. Where a DOE considers that a variable which constitute less than 20% have a material impact on the analysis they shall raise a corrective action request to include this variable in the sensitivity analysis.

The project activity involves the sale of electricity to the grid; hence it is the sole source of revenue for this project. This revenue is based on two parameters namely,

the tariff and the power generation. The tariff is fixed without any escalation by the PPAs signed for all the WTGs in the bundle, thus it is not varied in the sensitivity analysis. Also, $\pm 10\%$ variation in either of these parameters would be affecting IRR to the similar extent.

Similarly the parameters which can affect 20% of the total cost for this case is only the capital investment o project cost. Since the project costs were considered on the purchase/ work orders, as per actual, there were no possibilities of this cost getting reduced. Hence, the sensitivity analysis would have to be performed only for an increase in capital cost which would result in decreasing project IRR further and make carbon revenue all the more important to make project happen. Hence this analysis has not been presented. Thus the PLF is considered to be the only parameter which required to be checked for sensitivity analysis.

Sensitivity analysis has been conducted considering total electricity available to the project proponent and hence sales realisation, which is directly proportional to the key parameter - plant load factor. The plant load factor includes the variations in wind profiles, variations in off-take (including grid availability) and machine downtimes. The probable variation in key parameter has been considered, as $\pm 10\%$ in plant load factor to see the changes in project IRR.

Outcome of sensitivity analysis:

The results are shown in the below table:

Table 12: Sensitivity analysis

Sub-project title	IRR at PLF – 10%	IRR at base PLF	IRR at PLF + 10%
Karnataka Breweries & Distilleries Ltd.			
4 No. 1.25 MW WTGs in Tamil Nadu	10.97	12.73	14.42
Sapthagiri Distilleries Private Ltd			
15 No. 1.5 MW WTGs in Tamil Nadu	8.65	10.27	11.79
4 No. 1.5 MW WTGs in Karnataka	11.70	13.53	15.30
Mr. D.K. Audikesavulu (0.6 x 19 No.s)	2.14	3.45	4.70
Mrs. D.A. Satyaprabha (0.75 x 5 No.s)	1.28	2.67	3.98
Mr. D.A. Srinivas – (0.6+1.5+0.75 MW x 4 No.s)	2.39	3.71	4.97

A sensitivity analysis is undertaken to identify those parameters that are both uncertain and for which the project decision, taken through the IRR, is sensitive. It can be seen that at the entire plant load factors the internal rate of return for project activity without VCS revenue ranges from 1.28% to 14.42% (except for one case). The sensitivity analysis shows that in all case the project activity is less attractive as it does not yield expected benchmark returns. This is true even in the case where the project IRR is higher than the benchmark used, the PLF is considered at 10% higher than the certified PLF, for sensitivity. The actual monitored data for the last two years shows that the PLF was never above 22%⁸. Thus possibility of achieving PLF so higher as to meet benchmark returns without carbon credit revenue is unlikely. By analyzing the comparative analysis, it can be concluded that the project is additional at all load factors in the sensitivity analysis.

⁸ PLF calculated from the commissioning for two year generation data is submitted to DOE

Considering the VCUs revenue the project IRR increases to reduce the gap between project IRR without VCUs revenue and established benchmark. VCS registration and the resulting revenue from VCUs sales helps the project to overcome the barriers outlined above, most notably project IRR. The impact of VCUs revenue improves the returns associated with undertaking the project and will act as an important buffer against these barriers.

Outcome of Investment Analysis: It can therefore be concluded from above analysis that the project activity is financially not attractive and hence project is additional.

Common practice analysis

The project activity is installation of 53.75 MW wind based energy generation by KBD group. The project activity is distributed as 47.75 MW in Tamil Nadu and 6 MW in Karnataka.

Scenario in Tamil Nadu:

The first WTGs in the project activity was commissioned in September 2006. As per the TNERC Order on purchase of power from NCES based Generating Plants⁹, the total installed capacity as on 31/03/2006 in India was 124,287 MW. The share of the renewable energy sources in this was only 8661 MW i.e. about 6.97%. Further, the same report also discusses the non-conventional energy scenario in India. As per, the potential for the various non-conventional energy sources and that harnesses was as presented below

Sources / Systems	Potential (MW)	Harnessed (MW)
Biomass based Power	19,500	912.53
Wind Power	45,000	5340.60
Small Hydro power (up to 25 MW)	15,000	1826.43
Energy Recovery from Waste	2,700	45.78

Thus, even with in the available 45,000 MW identified wind energy potential, only 11.87% was established by Marc 2006.

Scenario in Karnataka:

The total installed capacity of southern grid as on 31/03/2006 was 36447.52 MW¹⁰. The total installed capacity comprises Hydro – 10967.71 MW (30.1%), Coal – 15992.50 MW (43.9%), Gas - 3434.50 MW (9.4%), Diesel- 939.32 MW (2.6%), Nuclear- 880 MW (2.3%), Renewable energy sources (including wind) - 4233.49 MW (11.6%).

It is clear from above statistics that the southern grid system is mainly dominated by the fossil fuel fired thermal power plant. The share of thermal power sector (Coal + Gas + Diesel) is 20366.32 MW (55.87%) as compared to wind & RES which is 10.7%.

Moreover, the installed capacity for the State of Karnataka as against the total installed capacity in India is given in the following table:

⁹ Order No. 3, dt. 15/05/2006, pg. 3

¹⁰ http://www.cea.nic.in/power_sec_reports/Executive_Summary/2006_03/6.pdf

State-wise Grid-interactive Wind Power Installed Capacity (as on 31/12/2005) ¹¹	
State	Cumulative Installed Capacity (MW)
Andhra Pradesh	126.1
Gujarat	287.8
Karnataka	487.0
Kerala	2.0
Madhya Pradesh	35.1
Maharashtra	654.6
Rajasthan	312.6
Tamil Nadu	2526.7
West Bengal	1.1
Others	1.6
Total	4434.5

At the time of investment decision in January 2006, the installed capacity of Karnataka (487.0 MW) was only 10.9% of all India installed capacity.

Hence, it can be concluded that wind power project development is substantially dependent on carbon revenues and thus is not a common practice.

3 Monitoring:

3.1 Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices:

The project activity falls under the purview of the approved VCS monitoring methodology ACM0002. “Grid connected renewable electricity generation”.

Table 5: Monitoring Methodology Details

Methodology Applicable	ACM0002
Version	09
Sectoral scope	01
Reference	http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

3.2 Monitoring, including estimation, modelling, measurement or calculation approaches:

- **Purpose of monitoring:** The purpose of an efficient monitoring procedure is to record the real and measurable emission reduction as a result of the project activity and to avail the revenues they accrue. The project team is also responsible for calculation of actual creditable emission reduction in the most transparent and relevant manner.
- **Roles and responsibilities:** The roles and responsibilities of various officials at the plant site are explained in detail under section 3.4.
- **Parameter to be monitored:** With respect to the project activity the only parameters that requires a continuous monitoring is the amount of electricity

¹¹ http://mnes.nic.in/annualreport/2005_2006_English/CH8/2.html

(EGy in GWh) that is supplied by the project activity to the grid. Metering system for the project activity consists of one main (tri-vector) meter of accuracy class 0.5 and one check meter on local control system of WTG. Net electricity supplied to grid will be measured through meter readings of the two-way export/ import meter installed by TNEB and KSEB. The procedures for metering and meter reading will be as per the provisions of the power purchase agreement (weekly meter readings will be taken by the WTG operator and monthly Net electricity dispatch reports will be collected at the CDM Head office). The check meter reading will be either at the LCS meter or at the Central Monitoring Stations of the O&M agency.

Types of data and information to be reported, including units of measurement

The project activity involves following information which requires accurate reporting:

1. Total electricity generated by the project activity i.e. Export
2. Electricity imported by the project activity
5. Net electricity supplied to the regional electricity grid

The data type is Energy, recorded in kWh. The details can be referred under section 3.3 of the PD. Project activity also requires the CO₂ emission data for grid to calculate the grid emission factor.

3.3 Data and parameters monitored / Selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals:

In Tamil Nadu, all the WTGs have individual main meter from EB and another check meter from PP. The electricity is directly sold to grid and the net electricity supplied is arrived directly from the import/ export meter by EB and this can be directly read from the invoice of electricity board. Thus, there is only a single monitoring parameter used in the monitoring.

Data / Parameter:	EGy
Data unit:	MWh/ year
Description:	Net electricity supplied to Southern grid by the project activity
Source of data to be used:	Total of the readings installed by State Electricity Boards to individual WTGs (for Tamil Nadu) under the project activity
Value of data applied for the purpose of calculating expected emission reductions	114,862
Description of measurement methods and procedures to be applied:	Metering system for the project activity consists of one main (tri-vector) meter of accuracy class 0.5 and one check meter on local control system of WTG. Net electricity supplied to grid will be measured through meter readings of the 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. The check meter reading will be either at the LCS meter (for Vestas WTGs where CMS is not available) or at the Central Monitoring Stations (for Suzlon WTGs connected to respective CMS) of the O&M agency.

QA/QC procedures to be applied:	Regular calibration of all the meters will be undertaken as per the PPA terms and faulty meters will be duly replaced immediately with information to concerned Authority. For the faulty meters- in case of the EB meter, electricity board assigns reading based on performance of nearby similar capacity machines. The same is conservative and will be used for the VER monitoring as well. This can be verified with the net export monthly billing.
Any comment:	The monitoring records will be archived for whole crediting period + 2 years.

Parameters for monitoring in Karnataka

PPA for WTGs in Gadag is with Chamundeshwari Electricity Supply Corporation Limited (CESC), Mysore and for WTGs at Hasan is with Hubli Electricity Supply Company Limited (HESC), Hubli.

Data / Parameter:	Total Energy (TEG _v)
Data unit:	MWh
Description:	Total electricity generated by the project activity (i.e. Export)
Source of data to be used:	Joint Meter Readings taken at the metering points - and reading apportioned to WTGs in Karnataka from a meter for a group pf WTGs. Please note that the value of Net electricity supplied to Grid (EG _v) is used for the purpose of estimating emission reductions.
Value of data applied for the purpose of calculating expected emission reductions	13,928
Description of measurement methods and procedures to be applied:	Each WEG is having a dedicated main meter and a check meter. There are thus 7 such metering points located at the project site. The meters are sealed and are in the custody of CESC/ HESC. ¹² 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

¹² 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.

	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.
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/ HESC officials.
Any comment:	Data are archived both electronically & on paper. Log records will be maintained for two years from the end of the crediting period.

Data / Parameter:	Energy (EG _I)
Data unit:	MWh
Description:	Electricity imported by the project activity
Source of data to be used:	Joint Meter Readings taken at the metering points
Value of data applied for the purpose of calculating expected emission reductions	--
Description of measurement methods and procedures to be applied:	Joint meter reading at each metering point will be taken as explained above. The difference between initial and final reading will give the 'Import' for the last month. Electricity imported by the project activity is arrived at by adding the 'Import' readings of all metering points of the project activity.
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/ HESC officials.
Any comment:	Data are archived both electronically & on paper. Log records will be maintained for two years from the end of the crediting period.

Data / Parameter:	Energy (EG _y)
Data unit:	MWh
Description:	Net electricity supplied to the regional electricity grid
Source of data to be used:	Invoice of electricity sale to CESC/ HESC. For the purpose of emission reduction estimation in the PD, EG_y has been computed based on certain assumptions.

Value of data applied for the purpose of calculating expected emission reductions	13,928
Description of measurement methods and procedures to be applied:	Net electricity supplied to the regional electricity grid will be calculated using the formula: $EG_y = TEG_y - EG_I - EG_{T-E} - EG_{T-I}$ 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.
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/ HESC officials.
Any comment:	Data are archived both electronically & on paper. Log records will be maintained for two years from the end of the crediting period.

3.4 Description of the monitoring plan

Monitoring plan for the state of Tamil Nadu

The Project has a two metering system, first is LCS (Local Control System) meter installed by the WTG supplier which is pre-calibrated and sealed by the supplier that meets the Indian and regional electricity authority's standards. Another meter (common for few WTGs with multiple WTGs at a location) is installed and owned by State Electricity Boards (SEB).

The electricity supplied to grid is monitored at each wind mill using LCS on weekly basis by the site operator or supervisor. The daily meter reading will be taken and maintained at the wind farms in respective wind farm's electricity meter log books. There is also a main electricity meter installed by the state electricity board (that is common for a group of WTGs – all under this project activity). The reading of the individual/ joint EB meter reading is recorded on monthly basis by the official from state electricity board in presence of site operator/ supervisor.

The receipt of the sales to grid is then cross-checked with the data recorded by each individual meter to avoid any differences. The individual LCS meter is pre-calibrated and sealed by the supplying company and is not interfered by project proponent without the presence of manufacturing company or its accredited representatives. Whereas, the main EB meter is owned by the state electricity board and will be calibrated once in two years. The invoices are raised based on the joint meter readings, so this can also be considered as the third party certified electricity generation. The same data will be used for the emission reduction calculation.

The project proponents have undertaken an operation and maintenance agreement with the supplier of the wind turbines i.e. Suzlon and Vestas. The performance of the mills, safety in operation and scheduled /breakdown maintenances are organized and monitored by the contractor. So the authority and responsibility of O&M lies with the contractor.

Secondary Monitoring and Contingency Plan

The secondary monitoring, which will provide a backup (fail-safe measure), in case of failure of the primary monitoring due to unforeseen reasons, data recording would be done at the individual WTGs with the help of the Local Control System (LCS) meter attached with each WTGs. The total electricity generation will also be cross checked with the invoices raised for the particular month. In some cases where the WTG is monitored continuously at the CMS. Thus, the check meter reading will be either at the LCS meter or at the Central Monitoring Stations of the O&M agency.

In case of any error observed in the meter readings of the individual WTGs and joint meter, site engineers will set correct value in presence of the supervisor and a written report will be sent to the project proponent. In cases, where the joint meter reading is taken on monthly basis and the data of the few days within a particular month is required, the individual meter readings of the WTG will be used. Also, when there is difference of values for the same reading in two meters, the lower meter reading will be used as a conservative approach.

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 system set up takes care of particular hills. The Sapthagiri WTGs are situated on Hill number 9 and 10 and the CDM building for that region is on Hill Number 10.

For the two WTGs (H23 & H24) at Hassan, there is joint meter installed at one site and same is followed for Kappathguda (K310 & K311). The metering equipment is electronic trivector system.

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/ HESC 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 WEGs 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.

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. 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.

Operation & Maintenance

The project proponents have signed an "Operation and Maintenance" agreement with the supplier of the wind turbines – M/s Suzlon Energy Limited. Operation and Maintenance contract with the manufacturer of the turbines - M/s Suzlon Energy Limited is presently for a period of 6 years after 1st year of free servicing (from date of commissioning.)

Table 14: Roles and Responsibilities

Designation	Responsibilities
Project Head (Incharge 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

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

According to the approved methodology ACM0002 Emission Reductions are calculated as:

$$ER_y = BE_y - PE_y - L_y$$

Where:

BE_y : Baseline Emissions in year y (t CO₂e/yr)
 PE_y: Project Emissions in year y (t CO₂e/yr)
 L_y: Leakage Emissions in year y (t CO₂e/yr)

Estimation of Baseline Emissions

Baseline emissions (BE_y in tCO₂) due to displacement of grid-electricity is calculated as the product of the Baseline Emissions Factor (EF_y in tCO₂/MWh) calculated as described below, times the electricity supplied by the project activity to the grid (EG_y - EG_{baseline} in MWh), over the crediting period.

$$BE_y = (EG_y - EG_{baseline}) \times EF_y$$

Where:

BE_y : Baseline emissions in year y (tCO₂/yr)
 EG_y : Electricity supplied by the project activity to the southern grid (MWh)
 EG_{baseline} : Baseline electricity supplied to the southern grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero. As this is a new power plant this is zero for the project
 EF_y: Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”

Details of Baseline data:

Data of Operating and Build Margin for the three financial years from 2005-06 to 2007-08 has been obtained from –

The CO₂ Baseline Database for the Indian Power Sector

Ministry of Power: Central Electricity Authority (CEA) Version 4

Dated: October 2008

Key baseline information is reproduced in Annex 1.

The detailed excel sheet is available at link below:

<http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm>

The estimation of baseline emission using calculation of Combined Margin multiplied by electricity delivered to the grid by the Project. As per “Tool to calculate the emission factor for an electricity system”, version-1.1 the steps followed to calculate Combined margin of Southern grid are as follows:

Step 1: Identify the relevant electric power system:

Historically, the Indian power system was divided into five independent regional grids, namely Northern, Eastern, Western, Southern, and North-Eastern. Each grid covered several states. Since August 2006, however, all regional grids except the Southern Grid have been integrated and are operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids will be treated as a single grid and is being named as NEWNE grid from FY 2007-08 onwards for the purpose of CO₂ Baseline Database.

Table 15: Geographical scope of the two electricity grid

NEWNE Grid				Southern Grid
Northern	Eastern	Western	North eastern	Southern

Delhi	Bihar	Chhattisgarh	Arunachal	Andhra Pradesh
Chandigarh	Jharkhand	Gujarat	Pradesh	Karnataka
Haryana	Orissa	Daman & Diu	Assam	Kerala
Himachal	West Bengal	Daad & Nagar	Manipur	Tamil Nadu
Pradesh	Sikkim	Haveli	Meghalaya	Pondicherry
Jammu &	Andaman &	Madhya	Mizoram	Lakshadweep
Kashmir	Nicobar	Pradesh	Nagaland	
Punjab		Maharashtra	Tripura	
Rajasthan		Goa		
Uttar Pradesh				
Uttarakhand				

For the purpose of calculating the emission reductions achieved by any CDM project, the CDM Executive Board requires that the “project electricity system is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints”. This implies that the grid emission factors are most appropriately calculated at the level of the two regional grids.

The Southern grid managed by Regional Load Dispatch System (RLDS) constitutes four states (viz Andhra Pradesh, Karnataka, Kerala and Tamil Nadu) and two Union territories (Pondicherry and Lakshadweep). These states under the regional grid have their own power generating stations as well as centrally shared power-generating stations.

The proposed project is located in the state of Tamil Nadu and Karnataka and will be feeding the electricity in the southern grid serving the four southern states and two union territories. Therefore the proposed project would have impact on all the generation facilities in the southern grid. Thus all the power generation facilities connected to this grid form the boundary for the purpose of baseline estimation. The southern grid is also connected with other regional grids, however, the net exchange of energy within the regional grids is very small and negligible and hence other regional grids are not included in the boundary for estimation of baseline emissions.

STEP 2. Select an operating margin (OM) method:

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

- (a) Simple OM, or
- (b) Simple adjusted OM, or
- (c) Dispatch data analysis OM, or
- (d) Average OM.

As per Tool to calculate emission factor of an electricity system, version-1.1, the simple operating margin (Simple OM) can be used only if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

From the available information published by CEA CO₂ Baseline database for the Indian power sector, Version 4.0, it can be seen from the table below that low cost/must run sources for Southern Grid accounts for less than 50% of the total generation in the grid in the last five years. Hence the Simple OM method has been used to calculate the Operating Margin Emission factor applicable.

Share of Must-Run (% of Net Generation)

	2005-06	2006-07	2007-08
NEWNE	18.0%	18.5%	19.0%
South	27.0%	20.9%	21.0%
India	20.1%	20.9%	21.0%

Reference: CO₂ Baseline Database for the Indian Power Sector – Central Electricity Authority (Version 4.0)

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)					
	2000-01	2001-02	2002-03	2003-04	2004-05
North	25.9%	25.7%	26.1%	28.1%	26.8%
East	10.8%	13.4%	7.5%	10.3%	10.5%
South	28.1%	25.5%	18.3%	16.2%	21.6%
West	8.2%	8.5%	8.2%	9.1%	8.8%
North-East	42.2%	41.7%	45.8%	41.9%	55.5%
India	19.2%	18.9%	16.3%	17.1%	18.0%

Reference: CO₂ Baseline Database for the Indian Power Sector – Central Electricity Authority (Version 3.0)

STEP 3. Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units, using the following equation:

$$EF_{OM,y} = [\sum_{i,j} Fi,j,y * COEFi,j] / [\sum_j GENj,y] \dots\dots\dots(3)$$

where Fi,j,y and $COEFi,j$ are the fuel consumption and associated carbon coefficient of the fossil fuel i consumed by power plant j in the grid in year(s) y . $GENj,y$ is the electricity generation by power plant j connected to the grid excluding zero- or low-operating cost sources in year(s) y .

As per ACM0002, the OM emission factor can be calculated using *ex ante* generation-weighted average of the most recent 3 years for which data is available or using *ex post* generation data in the year in which the project generation occurs. The OM emission factor is calculated using *ex ante* generation-weighted average of the most recent 3 years (2005-06, 2006-07, 2007-08) and hence does not require yearly monitoring of the OM emission factor.

The Central Electricity Authority, Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database provides information about the Combined Margin Emission Factors of all the regional electricity grids in India.

The operating margin is calculated as below,

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

STEP 4. Identify the cohort of power units to be included in the build margin (BM)

The database of Carbon Dioxide Emission from the power sector in India published by CEA has calculated the build margin in accordance with the Grid Tool, as the average emissions intensity of the 20% most recent capacity additions in the grid based on net generation. Depending on the region, the build margin covers units commissioned in the last five to ten years.

STEP 5. Calculate the build margin emission factor

The Build Margin emission factor $EF_{BM,y}$ is calculated ex-ante based on the most recent information available on plants already built. The Build Margin emission factor $EF_{BM,y}$ is given as the generation weighted average emission factor of the selected representative set of recent power plants represented by the 5 most recent plants or the most recent 20% of the generating units built (summation is over such plants specified by k). The most 20% of the generating units built recently is used for build margin emission factor calculation.

The Build Margin emission factor will be EF_{BM} is 0.7133 tCO₂/MWh of the year 2007-08 and this value has been fixed *ex-ante* for the entire crediting period for the project activity.

STEP 6. Calculate the combined margin (CM) emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_y = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}$$

Where:

$EF_{grid,BM,y}$	Build margin CO ₂ emission factor in year y (tCO ₂ /MWh)
$EF_{grid,OM,y}$	Operating margin CO ₂ emission factor in year y (tCO ₂ /MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
w_{BM}	Weighting of build margin emissions factor (%)

For wind and solar projects, ACM0002 allows the usage of the default weights are as follows: $w_{OM} = 0.75$ and $w_{BM} = 0.25$. Using the above values the combined margin emission factor is valued as –

	Weights ¹³	tCO ₂ /MWh
Operating Margin	0.75	0.7486
Build Margin	0.25	0.1783
Combined Margin		0.9269

4.2 Quantifying GHG emissions and/or removals for the baseline scenario:

Relevant equations (refer section B.6.1) used to calculate the net emission reduction for the project activity is

$$ER_y = BE_y - PE_y - L_y$$

¹³ For wind and solar energy projects, ACM0002 allows the usage of the default weights are as follows: $w_{OM} = 0.75$ and $w_{BM} = 0.25$

Where:

BE_y: Baseline Emissions in year y (t CO₂e/yr)

PE_y: Project Emissions in year y (t CO₂e/yr)

Ly : Leakage Emissions in year y (t CO₂e/yr)

According to the baseline methodology ACM0002, V 09, Back up power project emissions for all renewable energy plants should be considered. However, in the project activity, there is no backup power unit/s and hence project emissions need not be considered.

$$PE_y = 0$$

According to the baseline methodology ACM0002, the leakage of the proposed project is not considered, i.e.

$$L_y = 0$$

Therefore the above equation is simplified to

$$ER_y = BE_y$$

Parameter	Description	Value	Unit
EG _y	Electricity supplied by the project activity to the southern regional grid	128,790	MWh
EG _{baseline}	Baseline electricity supplied to the southern regional grid in the case of modified or retrofit facilities	Zero ¹⁴	MWh
EF _y	Combined margin CO ₂ emission factor for grid connected power generation	0.9269	tCO ₂ e/MWh

a) for WTGs in Tamil Nadu

$$EG_y = 47.75 \times 24 \times 365 \times 27.46\% \\ = 114,862 \text{ MWh}$$

b) for WTGs in Karnataka

$$EG_y = 6.0 \times 24 \times 365 \times 26.50\% \\ = 13,928 \text{ MWh}$$

Combining electricity generation estimate in these two states,

$$EG_y = 128,790.8 \text{ MWh}$$

Thus,

$$BE_y = (128,790.8 - 0) \times 0.9269$$

$$= 119,382 \text{ tCO}_2\text{e}$$

4.3 Quantifying GHG emissions and/or removals for the project:

Estimation of Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002, there will be no project emissions in the project activity (PE_y = 0).

Estimation of Leakage Emissions

¹⁴ For new, green field power plants this value is taken as zero

As per ACM0002, no leakage has been considered for the calculation of emission factor ($LE_y = 0$).

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project:

The emission reductions are estimated by:

$$ER_y = BE_y - PE_y - L_y$$

Where:

BE_y = Baseline emission due to the project activity in the year y, tCO₂e/annum

PE_y = Project emission due to the project activity in the year y, tCO₂e/annum

L_y = Leakage due to the project activity during the year y, tCO₂e/annum

Table 16: Summary of emission reductions

Year	Estimation of project activity emissions (tonnes of CO ₂ e)	Estimation of baseline emissions (tonnes of CO ₂ e)	Estimation of leakage (tonnes of CO ₂ e)	Estimation of overall emission reductions (tonnes of CO ₂ e)
2006-2007	0	119,382	0	119,382
2007-2008	0	119,382	0	119,382
2008-2009	0	119,382	0	119,382
2009-2010	0	119,382	0	119,382
2010-2011	0	119,382	0	119,382
2011-2012	0	119,382	0	119,382
2012-2013	0	119,382	0	119,382
2013-2014	0	119,382	0	119,382
2014-2015	0	119,382	0	119,382
2015-2016	0	119,382	0	119,382
Total (tonnes of CO₂e)	0	1,193,820	0	1,193,820

See ISO 14064-2: 5.2.k for quantifying GHG emission reductions or removal enhancements.

5 Environmental Impact:

As per the Ministry of Environment and Forests (MoEF), Government of India notification¹⁵ dated September 14, 2006 regarding Environment Impact Assessment studies as per the Environment Protection Rule, 1986 (Published in the Gazette of

¹⁵ <http://envfor.nic.in/legis/eia/eia-2006.htm>

India, Extraordinary, Part-II, and Section 3, Sub-section (ii) MINISTRY OF ENVIRONMENT AND FORESTS), the project activity is not categorized to conduct EIA. The required clearance was obtained from the authorities as recommended by the procedures followed by the host government.

There were no significant Environmental impacts of project activity on environment.

6 Stakeholders' comments:

SDPL has conducted the stakeholder meeting with identified stakeholders with the objective to inform about environmental and social impact of project activity in the region and discuss their concern on the same. Invitation¹⁶ for stakeholder consultation meeting was sent out requesting the nearby village representatives and local governing bodies to participate and communicate any suggestions/objections regarding the project activity. Fifteen days prior to the stakeholders meeting SDPL has published a bulletin on bulletin board of Village panchayat office in nearby villages at respective site to ensure the participation of interested parties. The stakeholder meeting was conducted with the representative of village panchayat, employee of Suzlon and SDPL on 25th - 26th June, 2008 at project sites in Tamilanadu and on 16th-29th September, 2008 at project sites in Karnataka.

At respective sites CA P.S. Chakrapani has explained about the project activity and consultant to the project made a brief explanation of Clean Development Mechanism (CDM). After introductory statement, a chairman has been elected from the stakeholder present in the meeting. The Chairman has invited participants present in the meeting to express their comments and concerns about the project activity.

The interested local stakeholders who failed to attend the meeting were given option to send their comments by e-mail, fax or phone within 15 days of date of meeting.

No comments by e-mail, fax or phone have been received.

No negative comment were received, overall finding was that the participants expected the local villagers would benefit from the project activity. The general queries raised during the stakeholder consultation meetings were:

Table 17: Stakeholder's concerns and clarification

Query	Clarification
Mr Krishnappa, Basavaghatta village, asked does the project activity will affect the precipitation pattern in the region. How deforestation causes to increase global warming?	Mr. Vittal explained that the project activity will have no impact on precipitation pattern. Further he explained that due to increased in deforestation activity the carbon storage capacity is decreasing and hence more carbon dioxide will be released to atmosphere leading to Global

¹⁶ Reference for Invitation letter: Radhapuram site (the stakeholder has been intimated through Panchayat board office and personal invitation), Pushpathur site (the stakeholder has been intimated through Panchayat board office and personal invitation), Kappathguda site (the stakeholder has been intimated through Panchayat board office and personal invitation), Hassan Site (the stakeholder has been intimated through Panchayat board office and personal invitation)

Mr. Chandragowda, Basavaghatta village, asked how the villagers will get benefit by the project activity and requested for financial help for renovation of temple.	Warming. Mr .Vittal informed that local villagers have been employed during construction and O&M activities. He also informed that the financial help has been provided by company to the local committee.
The stakeholders at Pushapathur village, asked whether it is possible to do tree plantation around WTGs?	Mr P.S. Chakarapani informed that wherever possible the local villagers being promoted to do tree plantation.

7 Schedule:

The project schedule as per VCS guidelines is tabulated in table below:

Table 18: Project Schedule

<i>Parameter</i>	<i>Date/period</i>
Initiation of project activity	August 2006
Commissioning date	September 2006
Project lifetime	20 years
VCS PDD completion	April 2009
Begin VCS Validation	May 2009
Monitoring frequency	Once every month
Project termination	September 2026

8 Ownership:

8.1 Proof of Title:

For the ownership details of the project any of the following may be referred to:

1. Power Purchase Agreement (PPA) between State Electricity Board (TNEB) and PP
2. Commissioning certificates

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program (if applicable):

Not Applicable