Voluntary Carbon Standard
Project Description

Date of completion of VCS PD

27 October 2009, Version 02

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1. Description of Project:

1.1 Project title

Wind Power Project at Anthiyur, Tamil Nadu

1.2 Type/Category of the project

The project activity is a 14.85 MW wind farm consisting of 9 Vestas (India) Pvt. Ltd. WTGs of NM82/1650 KW capacity each.

Project category is a part of the VCS Board approved CDM[1] GHG program. The project is a 'Grid connected Renewable Electricity Generation' plant that falls under the Scope number-1 of sectoral scope: Energy Industries (renewable-non-renewable sources)[2]. The version 14 of AMS-1.D is used for the project activity.

The project is not a grouped project.

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

The crediting period for the project activity shall be for the period from 01-April-2006 to 31-March-2016 which can be renewed twice. The total emission reductions from the project over the crediting period are 2,93,210 tonnes of CO_2 equivalent GHG emissions. The expected vintage-wise emission reductions from the project activity are presented in the table given below:

Period	VCUs (tonnes of CO_2 e)
01-April-2006 to 31-March -2007	29,321
01-April-2007 to 31- March -2008	29,321
01-April-2008 to 31- March -2009	29,321
01-April-2009 to 31- March -2010	29,321
01-April-2010 to 31- March -2011	29,321
01-April-2011 to 31- March -2012	29,321
01-April-2012 to 31- March -	29,321

[1] http://cdm.unfccc.int/index.html
[2] http://cdm.unfccc.int/DOE/scopes.html

2013	
01-April-2013 to 31- March - 2014	29,321
01-April-2014 to 31- March - 2015	29,321
01-April-2015 to 31- March - 2016	29,321
Total	**2,93,210**

The project activity is a project as per the VCS guidelines.

1.4 A brief description of the project:

The 14.85 MW (9 x 1.65 MW) wind farm is located near Anthiyur Village of Udumalpet and Pollachi Talukas of Coimbatore District in Tamil Nadu. The 1.65 MW capacity turbine is of M/s. Vestas Wind Technology (formerly, NEG Micon India Pvt. Ltd) make.

Purpose of the project activity

The project activity involves implementation of WTGs as a voluntary measure to strengthen the regional grid of India through wind power generation potential available to India. The project activity is implemented in the Anthiyur village in the state of Tamil Nadu. The generated electricity shall be fed into the Tamil Nadu Electricity Board (TNEB).

There are no GHG emissions from the project activity since wind energy (a zero emission source) is harnessed for electricity generation. However, in the baseline scenario, in the absence of the project activity the electricity would have been generated from the power stations operating in the grid.

Pre-project scenario: No project activity

The regional grid is dominated by conventional fossil fuel based sources of energy. In the absence of the project activity 14.85 MW of electricity would have been generated from grid-connected conventional power plants.

Project Scenario: Implementation of Project

The project activity has been undertaken to generate 14.85MW power through the installation of WTG. The EPC (Engineering, Procurement & Construction**)** contractor for the project is Vestas (India) Pvt. Ltd. The VCS project activity has implemented 9 nos. of 1.65 MW WTG. The project activity has been connected to Southern Grid through locally available sub-stations owned and maintained by the state electricity utility.

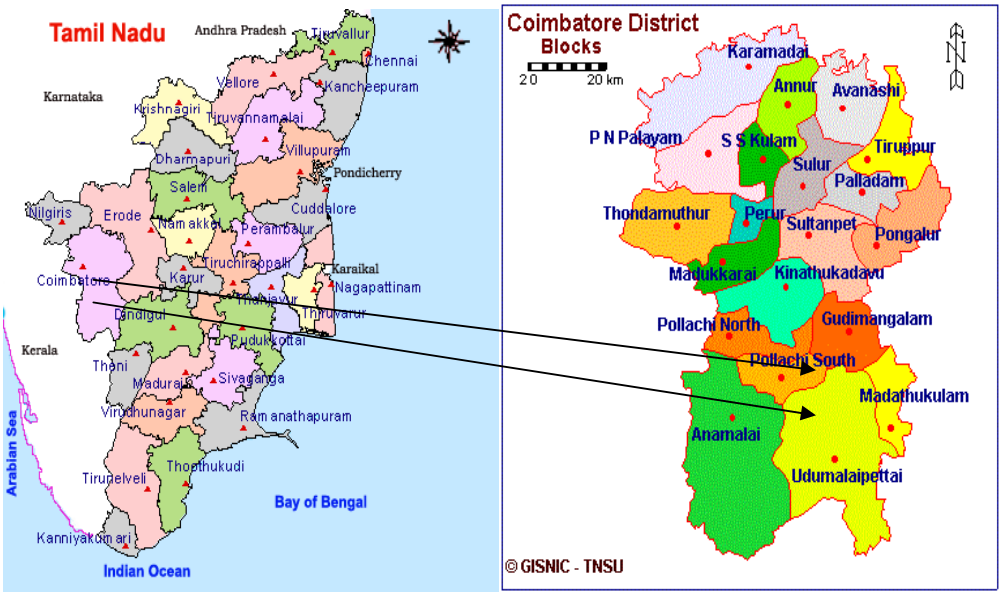
Baseline scenario:

As per AMS-1.D, version 14, 'The baseline emissions are the product of electrical energy baseline expressed in kWh of electricity produced by the renewable generating unit multiplied by an emission factor'.

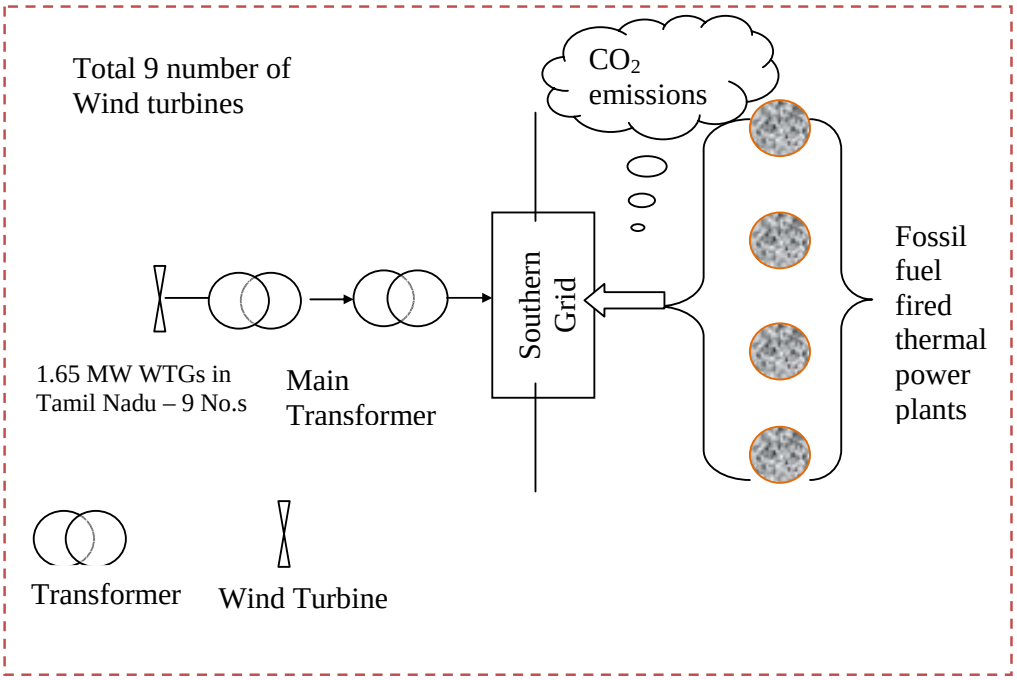
Thus the baseline scenario for the project activity is the emissions generated when the same amount of electricity (generated from the project activity) would have been generated through the participating facilities of the grid energy mix.

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

The 14.85 MW wind farm is located near Anthiyur Village of Udumalpet and Pollachi Talukas of Coimbatore District in Tamil Nadu. This wind farm is located 60 Km south – east of Coimbatore, Tamil Nadu. The altitude of wind farm is 380 m.



The schematic diagram of project boundary is as follows:



The information allowing for the unique identification of the WTGs is as follows;

S. No	Location Name	S.F.Nos	Village Name	Taluk Name	Co-ordinates			HT.Service Number	Date of commissioning
					North	East	Altitude in meters		
1	NSL 1	38 & 39/3	Koolanayakan Patti	Pollachi	10°36'49.6"	77°09'15.3"	385	751	31.03.2005
2	NSL 2	150/3A2,150/3B, 158/1	Gomangalam Puthoor	Pollachi	10°37'21.4"	77°09'30.0"	380	752	31.03.2005
3	NSL 3	104/1 & 109/1	Gomangalam Puthoor	Pollachi	10°36'48.2"	77°09'51.0"	386	754	31.03.2005
4	NSL 4	56/1C, 47/8 & 56/1B	Gomangalam Puthoor	Pollachi	10°37'01.2"	77°09'45.6"	383	788	29.04.2005
5	NSL 5	431/3	Gomangalam	Pollachi	10°37'15.5"	77°09'52.9"	379	753	31.03.2005
6	NSL 6	95/2 , 95/3 & 95/4	Gomangalam Puthoor	Pollachi	10°36'39.6"	77°10'07.7"	385	808	17.05.2005
7	NSL 7	17 & 18	Venasa Patti	Udumalpet	10°37'11.7"	77°11'25.2"	383	728	30.03.2005
8	NSL 8	.2/1	Venasa Patti	Udumalpet	10°37'27.5"	77°11'21.0"	379	755	31.03.2005
9	NSL 9	254/A1, 255/2B, 255/2C	Pannai Kinaru	Udumalpet	10°38'33.8"	77°11'02.9"	364	690	26.03.2005

Duration of the project activity/crediting period:

Project category is a part of the VCS Board approved CDM[3] GHG program. The project is a 'Grid connected Renewable Electricity Generation' plant that falls under the Scope number-1 of sectoral scope: Energy Industries (renewable-non-renewable sources)[4]. The version 14 of AMS-1.D is used for the project activity.

Project Start date: 26/03/2005 (Date on which the project began reducing or removing GHG emissions i.e. the commissioning date of the project).

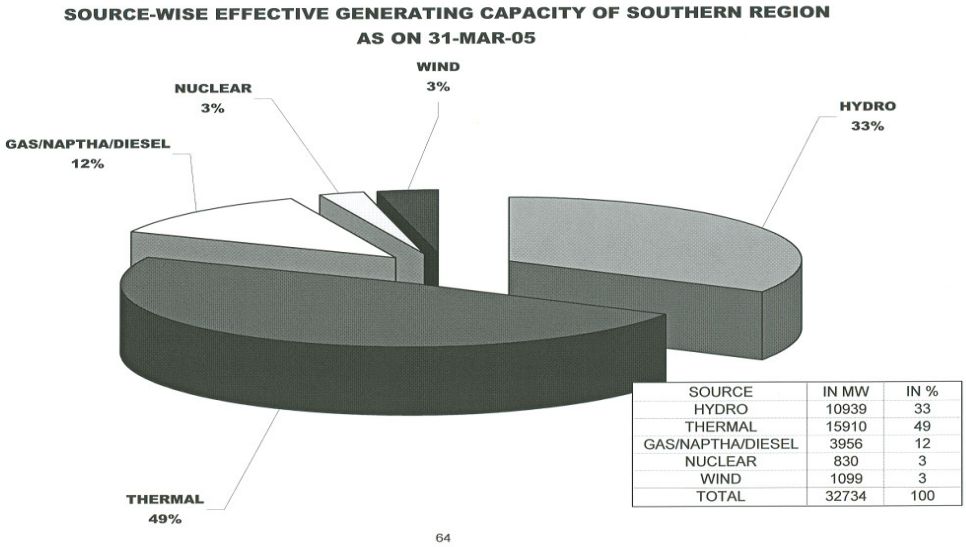
Crediting period start date: 01/04/2006

VCS project crediting period: 01/04/2006 to 31/03/2015

The lifetime of the project activity is 20 years.

1.6 Conditions prior to project initiation:

The source wise effective generation capacity as on 31/03/2005[5] in the Southern Region was as given below;



SOURCE	IN MW	IN %
HYDRO	10939	33
THERMAL	15910	49
GAS/NAPTHA/DIESEL	3956	12
NUCLEAR	830	3
WIND	1099	3
TOTAL	32734	100

From the above figure it is evident that the share of wind power in the total effective generation capacity of Southern Region is only 3.0%, whereas the share of thermal power generation in the total installed generation capacity is 61.0%. From this it can be understood that the Project boundary i.e. the Southern Grid is dominated by fossil fuel fired power plants.

[3] http://cdm.unfccc.int/index.html
[4] http://cdm.unfccc.int/DOE/scopes.html
[5] http://www.srldc.org/var/ftp/reports/yearlyrep/2004-0year.pdf

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

The scenario of power generation before the commencement of this project is dominated by fossil fuel fired power plants which are GHG intensive in nature. Also, according to the National Electricity Policy[6] (dated 12 February 2005) coal will continue to be the major power generation source in India. However, the project proponent is promoting 14.85 MW wind power project as it is not GHG intensive in nature and is also sustainable. As the project is connected to the Southern Grid, it displaces an equal amount of power supplied to the grid by other GHG intensive sources and thus also displaces the GHG emissions generated through these sources.

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

Expected level of activity

There are 9 Nos. Vestas (India) Pvt. Ltd. machines of 1650 kW WTGs. The estimated Plant Load Factor as provided by an independent third party Micro siting study is 25.20%. Each WTG consists of

- Nacelle assembly consisting of gear box, generator and other accessories
- Three bladed active stall rotor of 82m diameter
- WTG microprocessor control unit and control panels
- 75.5 m conical steel painted tower
- Civil Foundation
- Transformers and related electricals including circuit breakers and Metering units

The salient features of the WTG are further detailed as below;

Operational conditions	
Calculated lifetime	20 years
Cut in wind speed	3.5 m/s
Cut out wind speed	20m/s
Maximum rotational speed	14.4 rpm
Main specification	
Rotor Diameter	82m
Number of Blades	3
Rotational speed (synchronous)	14.4 rpm

[6] http://powermin.nic.in/indian electricity scenario/national electricity policy.htm

Rotor	
Rotor Diameter	82m
Tilt angle	5°
Swept area	5281 m^2
Generator	
Nominal Power	1650 kW
Rotational Speed	1012 rpm at rated power
Control system	
Manufacture	VESTAS control systems
Type	Microprocessor based

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

The project activity is compliant to the relevant local laws and regulations and is not prohibited by any of the national/state level sectoral policies. Further, the consent to operate the plant has been received from statutory authorities.

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

The project is dependent on the utility provider for grid availability. If there is a grid failure, the project will be unable to supply the generated electricity to the grid.

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

The renewable wind power project was taken up during the time when the grid was dominated by fossil fuel power plants which are GHG intensive in nature. Also, the wind power project being a renewable source provides for a clean power generation. Therefore, the project is not implemented to create GHG emissions for the purpose of its subsequent removal or destruction.

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

The project has not created another form of environmental credit. The project has not applied to any other GHG abatement program. A letter from the project proponent has been submitted to the validator to demonstrate that the project has not created another form of environmental credit.

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

Not applicable

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

CONTACT INFORMATION of PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Nuziveedu Seeds Limited
Street/P.O.Box:	Road No.12, Banjara Hills
Building:	NSL ICON, 4th Floor
City:	Hyderabad
State/Region:	Andhra Pradesh
Postcode/ZIP:	500 034
Country:	India
Telephone:	+91-40-23327939/49/59
FAX:	+91-40-23327919
E-Mail:	nuziveeduseeds@hotmail.com
URL:	
Represented by:	
Title:	DGM-Projects
Salutation:	Mr
Last name:	Murali
Middle name:	
First name:	S S
Department:	
Mobile:	
Direct FAX:	
Direct tel:	+91 403051 4444
Personal e-mail:	ssmnsl@gmail.com

1.15 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.):

Project's contribution to sustainable development

The project primarily assists the region as a whole in stimulating and accelerating the commercialization of grid connected renewable energy technologies.

The project activity contributes to the sustainable development[7] in the following way:

Social well being: Enhancing local employment in the rural area around the project. Capacity building and empowerment of vulnerable sections of the rural community dwelling in the project area.

Economical well being: During the construction and operation phases, the project activity would generate small business opportunities for local stakeholders such as bankers, suppliers, manufacturers and contractors.

Environmental well being: This project activity contributes to sustainable development through generation of eco-friendly power resulting in the increase of the share of renewable energy power generation in the regional and national grid. It would aid in strengthening India's rural electrification coverage. Wind power projects also aid in reducing GHG emissions and other pollutants (SOx, NOx, PM etc).

Technological well being: The project activity helps in increasing the share of renewable energy power generation in the regional and national grid. The project activity also, encourages clean, renewable and efficient technologies.

1.16 List of commercially sensitive information (if applicable):

None

[7] As stipulated by Ministry of Environment and Forest social, economic, environmental and technological well being are the sustainable development indicators for a project activity. MoEF Web site http://envfor.nic.in/cdm/host_approval_criteria.htm#

2 VCS Methodology:

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

Title: "Grid Connected Renewable Electricity Generation[8]".

Reference: This is an UNFCCC approved small scale methodology AMS I.D, Version 14.
As the project is a grid connected renewable wind power plant, the above methodology has been chosen.

Tool referenced in this methodology is Version 1.1 of "Tool to calculate the emission factor for an electricity system[9]"

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

The chosen small scale methodology AMS-I.D (Version 14) is applicable to the project activity (9 X 1.65 MW) as it is a renewable energy project activity with a maximum output capacity less than 15 MW.

Applicability conditions	Project Under Consideration
Renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit	The project is a renewable energy generation unit using wind power potential in the State of Tamil Nadu and supplying electricity from TNEB that would have otherwise been generated using the grid mix dominated by fossil fuels. Hence, the project activity is applicable to the methodology
Combined heat and power (co-generation) systems are not eligible under this category	The project activity is a wind power project and not a cogeneration power project. Hence, the project activity is applicable to the methodology

[8] http://cdm.unfccc.int/EB/048/eb48_repan23.pdf
[9] http://cdm.unfccc.int/Reference/tools/ls/meth_tool07_v01_1.pdf

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

For the baseline determination, project participants account CO_2 emissions from electricity generation in fossil fuel fired power that is displaced due to the project activity. Since the project activity is Wind power project, there are no emissions within in the project boundary.

	Source	Gas	Included?	Justification/Explanation
Baseline	Grid-connected electricity generation	CO_2	Yes	In the baseline scenario the electricity would have been sourced from the NEWNE grid which in turn would be connected to fossil fuel fired power plants which emit CO_2.
		CH_4	No	No methane generation is expected to be emitted.
		N_2O	No	No nitrous oxide generation is expected to be emitted.
Project Activity	Greenfield wind energy conversion system	CO_2	No	The project activity does not emit any emissions.
		CH_4	No	No methane generation is expected to be emitted.
		N_2O	No	No nitrous oxide generation is expected to be emitted.

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

The baseline for the candidate VCS project has been developed in line with the approved methodology AMS-1.D (version 14). The baseline scenario is the emissions generated by the operation of grid connected power plants and by addition of new generation sources.

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):

Project category is a part of the VCS Board approved CDM[10] GHG program. The project is a 'Grid connected Renewable

[10] http://cdm.unfccc.int/index.html

Electricity Generation' plant that falls under the Scope number-1 of sectoral scope: Energy Industries (renewable-non-renewable sources)[11]. The version 14 of AMS-1.D is used for the project activity.

In accordance with the VCS 2007.1, the project proponent demonstrates that the project is additional by using the Test.1-The Project Test.

Test 1 – The Project Test:

Step 1: Regulatory surplus

The project is not mandated by any enforced law, statute or other regulatory framework.

Step 2: Implementation Barriers

Investment Barrier:

The project proponent has chosen benchmark analysis to demonstrate additionality of the project. For this purpose project IRR has been selected as the financial indicator. The Weighted Average Cost of Capital (WACC) has been calculated using the cost of equity and cost of debt. The cost of equity is calculated using Capital Asset Pricing Model (CAPM). The calculation procedure for the cost of equity has been demonstrated below.

Capital Asset Pricing Model

The required return on equity investment is the return of a risk-free security plus suitable market risk premium. While considering a new project, CAPM can provide the required risk premium that the project needs to yield, taking into account the market premium and the volatility (risk) of the stock relative to the market (Beta). This required return on equity represents the cost of equity for the project.

Using the CAPM model and the following assumptions, the project proponent has computed the expected return on equity.

The formula used here is

Expected Return = Risk free rate of Return + Beta x (Market returns –Risk free rate of return) (or)

$$r = Rf + Beta \times (RM - Rf)$$

[11] http://cdm.unfccc.int/DOE/scopes.html

Where:
- r is the expected return rate on a security
- Rf is the risk-free rate of return
- Beta is the Asset class volatility
- RM is the return rate of the appropriate asset class.

Risk free rate of return:
The yield to maturity rate provided by the RBI has been considered to represent the risk free rate of return as it is devoid of default risk. The yield to maturity rate available as on August 2004 was considered for the calculation and it was 6.8951%[12].

Beta:
The β in the CAPM equation helps to account for the systematic risk by quantifying the risk associated with an asset class. Beta represents the volatility of the asset class relative to the volatility of the market. The Beta value taken for this analysis is based on the beta values of the listed companies engaged in business similar to the project activity (i.e. the power sector) before the start of the project activity. The beta values have been calculated using 5 years of data if available or from the date of listing of the listed company. The beta values of the listed companies have been unleveraged and the leveraged beta of the project activity is calculated.

The beta value of companies which invest exclusively in wind power projects would best represent the risk of such an asset class. However, there is only one such entity

[12] http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/82069.pdf

(BF Utilities) listed on the BSE 500. Investments in thermal power sector are relatively less risky as compared to those in non-conventional sector and also represent the baseline scenario. Hence the beta values of the various companies with significant investments in thermal power sector were also considered for the calculation of the average beta. The companies thus identified were Tata power company Limited, Reliance Power, BF Utilities, NTPC, Neyveli Lignite Corporation, Gujarat Industries Power Company Limited and CESC Limited.

The beta values for these companies have been provided in the table given below.

Company	**Income (total) (INR crores) year ending march 31, 2004**	**Debt-Equity Ratio of respective company**	**1+(1-tax rate)DE ratio**	**Beta (Leveraged) (2004)**	**Unleveraged beta (UB)**	**UB*income**
Tata Power Company Limited	4372.94	0.51	1.32911	1.012	0.76	3329.61
Reliance Power	3559.83	0.38	1.24366	0.624	0.50	1786.13
BF Utilities	31.82	0.00	1.00000	1.480	1.48	47.09
NTPC	24978	0.43	1.27572	1.305	1.02	25551.37
Neyveli Lignite Corporation	3434.76	0.73	1.46887	0.998	0.68	2333.70
Gujarat Industries Power Company Limited	777.75	0.00	1.00000	0.999	1.00	776.97
CESC	2309.14	1.64	2.05406	0.901	0.44	1012.89
Sum	**39464.24**					**34837.77**
Tax Rate	35.88%					**0.88**

A detailed calculation of WACC has been provided in the WACC calculation sheet. The source of the values and screenshots has been provided to the DOE for reference.

Market Rate of Return (RM)

The returns generated by BSE-500[13] since 1999 has been used for the calculation of the market returns as the BSE-500 represents a well diversified portfolio of actively traded stocks. The data used for the calculation of market returns has been used since 1999.

Rm = [{(BSE index at the time of start of project) / (BSE index at its start in 1999)} ^ (1/no. of years from 1999 till start of project)]-1

= [(2548.36/1015.70) ^ (1/5.75)]-1

= 17.35%

Risk Free Rate of Return (Rf) = 6.8951%

Market Risk Premium = 17.35% - 6.8951% = 10.45%

Rate of return on equity or cost of equity is Ri= Rf + β (Rm-Rf)

= 6.8951% + 2.20 x 10.45%

= 29.93%

Calculation of Weighted Average Cost of Capital (WACC)

The weighted average cost of capital has been calculated using the following formula

$Cc = (D*C_D*(1-T_R) + (E*C_E))/T$

The following table gives a description of the parameters and the assumptions made for calculating WACC.

Parameter	Description	Value
C_E	Cost of equity	29.93%
C_D	Cost of Debt	10.25%
T_R	Tax Rate	35.88%
D	Debt	INR 580.00 Million
E	Equity	INR 248.00 Million
T	Total Investment	INR 828.00 Million
Cc	Weighted Average Cost of Capital	13.57%

The WACC for the project activity works out to be 13.57**%**, which is considered to be the benchmark for the project IRR.

The main assumptions for the investment analysis are shown in Table below

S. No	Assumption	Value
	Project Cost	

[13] http://www.bseindia.com/histdata/hindices.asp

1.	Total project investment	INR 828 million
	Means of Finance	
2.	Equity	INR 248.0 million
3.	Term loan in investment	INR 580.0 million
4.	Interest rate on term loan as per RBI PLR	10.25% http://www.rbi.org.in/scripts/WSSView.aspx?Id=8263
	Operational Parameters/ Costs	
5.	Tariff offered for power	INR 2.70 / kWh per year up to 20th year
7.	Operational Life of project	20 years
	Depreciation	
8.	Companies Act (SLM)	10.34% - Plant & Machinery
9.	IT Act	80% for the 1st year
	Taxes	
9.	Income tax	35.88%
10.	Alternate Minimum Tax	11.33%

The project IRR and PLR (benchmark) are shown in the table below;

Item	Without VCU revenue	WACC
Project IRR	8.80%	13.57%

Sensitivity analysis:

The IRR of the project activity is below the benchmark IRR of the project activity. The PLF of the project activity is considered for the sensitivity analysis as it would impact the viability by more than 20% as envisaged in the guidelines. The sensitivity of the IRR w.r.t PLF is provided in the table given below.

Parameter	% variation	Project IRR	WACC
PLF	+10%	10.75%	13.57%
	-10%	7.73%	
	0%	8.80%	

The project IRR is below the benchmark calculated for the project activity. Even with a 10% increase in the PLF, the project IRR increases to 10.75%. However, the WACC benchmark calculated is at 13.57%.

Thus, it may be concluded that the viability of the project activity may get adversely affected without the VCS/VER revenues. The above demonstration substantially proves that the project activity is not the least cost option. Therefore the VCS/VER revenues are significant for viability of the project activity.

Step 3: Common Practice

The power generation scenario in Southern Region as on 2003-04 can be noted from the table provided below[14].

5.3 GROWTH OF INSTALLED CAPACITY OF SOUTHERN REGION DURING PAST ELEVEN YEARS

YEAR	HYDRO	THERMAL	GAS / NAPTHA / DIESEL	NUCLEAR	WIND/OTHERS	TOTAL
1997-98	8907.75	10941.45	1033.92	340.00	78.11	21301.23
1998-99	9141.00	11186.25	1485.92	340.00	84.11	22237.28
1999-00	9665.70	11450.56	1897.40	560.00	110.36	23684.02
2000-01	9424.30	12064.76	2545.58	780.00	114.10	24928.74
2001-02	9932.41	13290.25	2480.41	780.00	127.21	26610.27
2002-03	10469.86	14825.39	2963.42	780.00	149.36	29188.03
2003-04	10721.58	15515.84	3463.69	830.00	263.12	30794.23
2004-05	10938.99	15909.51	3955.82	830.00	1099.42	32733.74
2005-06	11222.19	15879.51	4446.82	880.00	4009.12	36769.32
2006-07	11259.39	16089.51	4598.62	880.00	4544.40	37371.92
2007-08	**11373.39**	**16300.31**	**4598.62**	**1100.00**	**5233.02**	**38605.34**

The share of wind power generation in 2003-04 is 263.12 MW. The total power generation in 2003-04 as can be noted from the above table is 30794.23MW. Therefore, the share of wind power in total power generation is 0.85%. This proves that the project activity is not a common practice in the southern region.

Thus at the time of taking investment decision, the project activity was not a common practice and therefore is additional.

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:

Title: "Grid Connected Renewable Electricity Generation[15]".

Reference: This is an UNFCCC approved small scale methodology AMS I.D, Version 14.

[14] http://www.srldc.org/var/ftp/reports/yearlyrep/2007-08-year.pdf

[15] http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_PHPV5WESACMBTJ2YY54GAJYSIEI3HD

As the project is a grid connected renewable wind power plant, the above methodology has been chosen.

Tool referenced in this methodology is Version 1.1 of "Tool to calculate the emission factor for an electricity system[16]"

Justification of choice of Methodology

The chosen small scale methodology AMS-I.D (Version 14) is applicable to the project activity (9 X 1.65 MW) as it is a renewable energy project activity with a maximum output capacity less than 15 MW.

The AMS-I.D (Version 14) methodology is applicable to the project as the project is a grid connected wind power project that exports electricity to Tamil Nadu Electricity Board.

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

Purpose of monitoring

The purpose of monitoring is to measure the gross electricity exported, net electricity supplied to the grid and the electricity imported from the project activity to verify the emission reductions.

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

The approved monitoring methodology (AMS-1.D version 14) requires monitoring of the gross electricity exported, net electricity supplied to the grid and the electricity imported from the project activity. The information to be reported and the units of measurement are provided in section 3.3.

Origin of the data

The source of the data on monitoring parameters is provided in section 3.3.

Metering Equipment

Metering system

-Energy Meter for each WTG for metering the exported electricity to the grid and imported electricity from grid system

Data Monitoring:

[16] http://cdm.unfccc.int/Reference/tools/ls/meth_tool07_v01_1.pdf

The data is monitored at the main meter of each WTG.

1. Equipment:
The main meter is an Energy Meter of accuracy class (0.5%). The meters will have capability of recording half-hourly and monthly readings.

2. Meter readings:
The monthly meter readings at the project site and receiving station are taken simultaneously by the site personnel and electricity board personnel every month. A document indicating number of kilo-watt-hours indicated by meter will be prepared and signed by officials of the electricity board and operating Office.

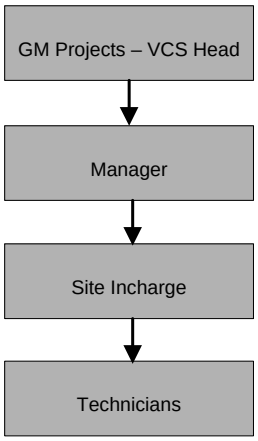
a) **Accuracy**:
All meters installed at the project site are of 0.5% accuracy class. Each meter is jointly inspected and sealed in the presence of both the parties.

The accuracy of monitoring parameter is ensured by adhering to the calibration and testing procedure as described in the QA/QC procedures described for each parameter in Section 3.3 below. The project will adhere to all the mandatory regulatory and statutory requirements at the state as well as national level. The data will be archived for a period of 2 years after the end of the crediting period in the hard copy format.

b) **Testing**:
All meters are tested for accuracy every year in accordance with the electricity standards. The consumption by equipments / electricity exported to the grid registered by main meters hold good for purpose of billing as long as errors in main meters are within the permissible limits.

3. **Billing**:
A daily generation report is prepared by site personnel. As discussed the meters are capable of storing readings, which is submitted to the state electricity board along with the cumulative meter reading for the wind farm. This is maintained by the state authorities. These readings are used to determine line losses as well as power exported to the grid.

Monitoring roles and responsibilities
The operational and management structure implemented by NSL is as follows:



The General Manager (GM) manager is the head of the VCS team and would be responsible for coordinating with the manager and ensures that the monitoring is carried out in a transparent and accurate manner. The manager coordinates with the site in charge and the technicians and takes care of all the day to day activities of the plant and is responsible for testing the equipment, billing and archiving the data. The site in charge and the technicians are responsible for recording the operation and downtime hours of the project activity.

The monitoring team is also responsible for the following:

- Overall maintenance of the WTGs
- Calculation of actual creditable emission reduction in the most transparent and relevant manner
- For claims and settlement of electricity payment from the state utility every month
- Renewal of contracts with OEMs, insurance etc
- Periodical meter checking, calibration etc
- Meet the training needs of the personnel other than from the O&M contract at site
- Extracting, checking and Maintenance of data both manual and electronic form and preservation for the entire crediting period

The authority and responsibility of project overall project coordination in relation to the VCS validation would be with the project proponent.

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

Describe each data and parameter using this table.

Data / Parameter:	EG Gross,y
Data unit:	kWh
Description:	Gross Electricity export to

	the grid by the project during the year y
Source of data to be used:	From the certified joint meter readings
Value of data applied for the purpose of calculating expected emission reductions	Gross electricity generated by the WTGs. Annual electricity supplied to the grid by the Project (A) = 14.85 MW (Capacity) x 25.20% (PLF) x 8760 (hours) / 1000 GWh - Transmission losses computed by Tamil Nadu Electricity Board (TNEB) (assumed transmission losses as zero for the purpose of calculation) = 31640000kWh
Description of measurement methods and procedures to be applied:	Gross electricity generated by each WTG is recorded with the aid of energy meter for that WTG. The procedures for metering and meter reading will be as per the provisions of the power purchase agreement, and are described in Section 3.4.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by TNEB - state government utility. The meters used are calibrated annually to ensure accuracy of data.
Any comment:	All records relating to the project are kept in a secure and retrievable manner for atleast two years after the end of the project crediting period.

Data / Parameter:	EG net,y
Data unit:	MWh/year
Description:	Net electricity supplied to the grid
Source of data to be used:	Monthly joint Energy Meter Reading Reports of 9 energy meters covering 9 numbers of WTG
Value of data applied for the purpose of calculating expected	Measurement from records submitted to TNEB – monthly

emission reductions	
Description of measurement methods and procedures to be applied:	Continuous measurement and monthly recording. The monitoring of 'net Electricity supplied to the grid' would be as per the details provided in Power Purchase Agreement signed between the TNEB and NSL. The HTSC No. for the individual or group of turbines represents the unique identification of the joint meter. The net electricity supplied to the grid is calculated by the summation of the net electricity export figures of individual WTGs.
QA/QC procedures to be applied:	Every month these meter readings will be recorded by TNEB representative and plant personnel. The meters at the sub station will be two-way meters and will be in the custody of TNEB. The quantity of net electricity supplied will be cross-verified from the invoice raised on TNEB by the project proponent
Any comment:	All records relating to the project are kept in a secure and retrievable manner for atleast two years after the end of the project crediting period.

Data / Parameter:	EG import,y
Data unit:	kWh
Description:	Electricity imported from the grid by the project during the year y
Source of data to be used:	From the certified joint meter readings
Value of data applied for the purpose of calculating expected emission reductions	Estimated to be zero for ex ante calculations
Description of measurement methods and procedures to be applied:	Calculated as measurement from the energy meters available at the generation

	points.
QA/QC procedures to be applied:	The electricity imported by the individual WTG is recorded. The electricity imported is adjusted against the gross export by the project activity to the grid. To be cross-checked with monthly invoices or receipts of payments
Any comment:	All records relating to the project are kept in a secure and retrievable manner for atleast two years after the end of the project crediting period.

3.4 Description of the monitoring plan

The small scale CDM methodology AMS I-D version 14, defines the monitoring plan as "Monitoring shall consist of metering the electricity generated by the renewable technology".

The data to be monitored is the net electricity supplied to the grid. The various procedures for accurate and transparent monitoring are in place and are detailed as given below.

Procedures for internal audit and Management review:
An internal audit of the project activity would be done on an annual basis by a special audit team. The audit team would comprise competitive persons who would be appointed by the General Manager in charge.

The audit team after the audit would submit their observations to the Manager for his review and necessary action. The Manager would instruct the VCS team to take the required corrective action if any, suggested by the audit team.

Procedures for corrective actions for better future monitoring and reporting:
Errors or deviations will be identified during the annual internal audits. The VCS team Head (i.e., General Manager in charge) would take up these matters during the annual VCS team meetings (that normally would happen a few days after internal audit reports are prepared and submitted). The root cause of these errors would be discussed and appropriate action would be taken for better future

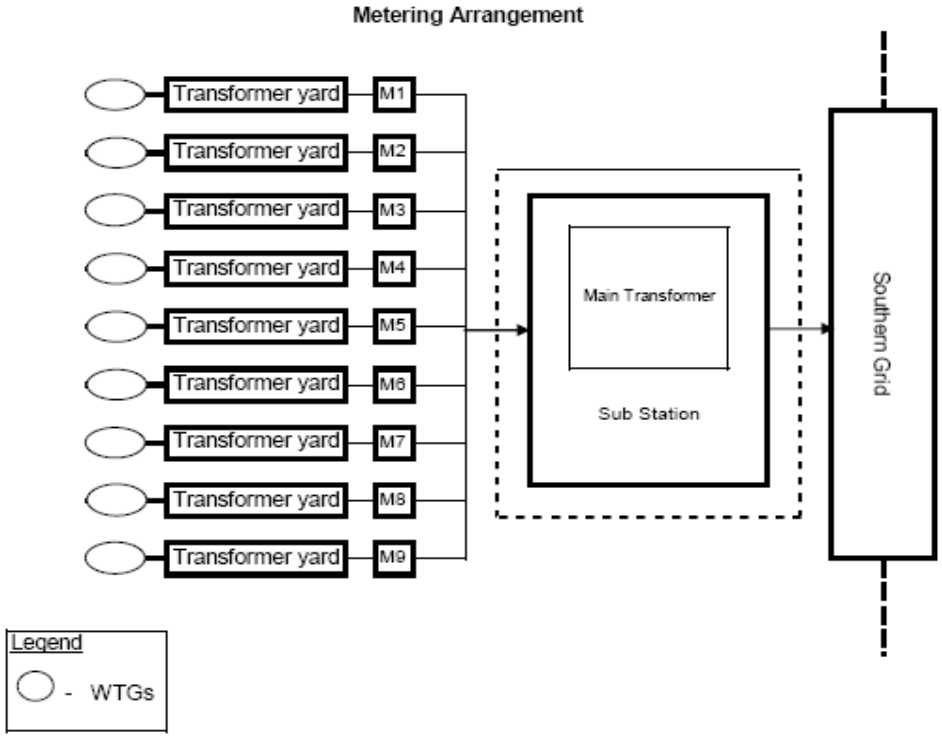
monitoring and reporting. The corrective actions may include:

- Training of monitoring personnel where ever required
- Replacement or repair of equipments

Procedures for maintenance of monitoring equipments:

- The Site Engineer would conduct a physical inspection of all the energy meters once a month
- Any maintenance requirements would be immediately attended
- The energy meters will undergo a preventive maintenance one a year
- The responsibility of maintenance will be with the Site Engineer
- Maintenance history card would be maintained for all energy meters

The schematic diagram of the project activity is as given below:



Meter details

TNEB Load details		Turbine ID	TNEB Energy Meter details			
Feeder Name	Substation Name		Make	Model	Sl.No	Manufacture Year
Balu	Anthiyur 110/22 KV (Transformer Capacity: 4 x 25 MVA)	69483	SECURE	Premier	KAB 10100	2008
Gomangalam	Anthiyur 110/22 KV (Transformer Capacity: 4 x 25 MVA)	69807	ELSTER	Alpha D +	4954987	2008
Balu	Anthiyur 110/22 KV (Transformer Capacity: 4 x 25 MVA)	69482	ELSTER	Alpha D +	4954988	2008
Gomangalam	Anthiyur 110/22 KV (Transformer Capacity: 4 x 25 MVA)	69812	ELSTER	Alpha JL	4681456	2004
Gomangalam	Anthiyur 110/22 KV (Transformer Capacity: 4 x 25 MVA)	69472	ELSTER	Alpha JL	4691234	2005
Hindustan	Anthiyur 110/22 KV (Transformer Capacity: 4 x 25 MVA)	69806	ELSTER	Alpha JL	4681455	2004
NSL	Anthiyur 110/22 KV (Transformer Capacity: 4 x 25 MVA)	69810	SECURE	Premier	KAB 05700	2007

NSL	Anthiyur 110/22 KV (Transformer Capacity: 4 x 25 MVA)	69491	ELSTER	Alpha D +	4901444	2007
Sakthi	Anthiyur 110/22 KV (Transformer Capacity: 4 x 25 MVA)	69484	ELSTER	Alpha D +	7862925	2006

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

As per the version 14 of AMS-I.D methodology for "Grid connected renewable electricity generation" the baseline is the kWh produced by the renewable generating unit multiplied by baseline emission factor of Southern Grid (measured in kg CO_2e/kWh) calculated in a transparent and conservative manner.

A combined margin emission factor (CM), consisting of the combination of operating margin emission factor (OM) and build margin emission factor (BM) according to the procedures prescribed in the "Tool to calculate the emission factor of an electricity system".

Calculation of CM according to the Tool

The Indian power system is divided into two independent regional grids, namely NEWNE and Southern Grid. The state of Tamil Nadu falls within the boundary of Southern grid.

Version 4.0 of the Carbon dioxide Baseline database[17] of CEA has been used for the estimation of the baseline emission factor. The procedure for estimation of the baseline emission factor is in line with the version 1.1 of the "Tool to calculate emission factor for an electricity system". The detailed procedure is as given below.

Calculation Procedure:

Operating Margin Emission Factor

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 Southern Grid, not including low-cost/must-run power plants/units. It has been calculated based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the Southern Grid.

The formula applied for the calculation of Simple Operating Margin is

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

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{grid,OMsimple,y}$	=	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,m,y}$	=	Amount of fossil fuel type i consumed by power plant / unit m in year y (mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	=	Net electricity generated and delivered to the grid by power plant / unit m in year y (MWh)
m	=	All power plants / units serving the grid in year y except low-cost / must-run power plants / units
i	=	All fossil fuel types combusted in power plant / unit m in year y
y	=	The three most recent years for which data is available.

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 i.e. The CO_2 Baseline Database provides information about the Combined Margin Emission Factors of all the regional electricity grids in India. The Combined Margin in the CEA database is calculated ex ante. We have, therefore, used the Combined Margin data published in the CEA database, for calculating the Baseline Emission Factor.

The CEA database uses the data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit, to calculate the OM of the different grids.

The simple operating margin for the past three years 2005-06, 2006-07 and 2007-08 was 1.0056, 0.9991 and 0.9906 respectively. The net generation for 2005-06, 2006-07 and 2007-08 in the operating margin are 100978.37, 109116.37 and 114701.73MWh respectively. Thus the weighted average operating margin is calculated is 0.9981 and would be fixed ante for the entire crediting period. The Operating Margin calculations have been provided in Annexure-1.

OM = 0.9981

Build Margin Emission Factor

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available.

The build margin BM is calculated by CEA and is the generation weighted average emission factor of the most recent power plants consisting of the capacity additions that represent 20% of the system generation (in MWh) and that have been built most recently. This option is considered for calculation as it represents the larger sample. The data pertaining to the units thus identified are detailed in the Version 4.0 of the Baseline Carbon Dioxide Baseline database of the CEA.

The build margin emission factor is calculated as

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m	=	Power units included in the build margin
y	=	Most recent historical year for which power generation data is available

The Build Margin calculated is based on the most recent data available and the build margin thus calculated is 0.713. This value would be fixed ante for the project activity during the entire crediting period.

Therefore,

BM = 0.7133

Calculation of Combined Margin emission factor

The combined margin will be calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

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 (%)

As per the Version 1.1 of "Tool to calculate the emission factor for an electricity system", the default values to be used for Wind Power projects are

$$\mathbf{w_{OM} = 0.75}$$
$$\mathbf{w_{BM} = 0.25}$$

Hence, the Combined margin CO_2 Emission Factor is calculated as below:

$$\mathbf{EF_{Grid,CM} = w_{OM} * OM + w_{BM} * BM}$$

$$= 0.75 * 0.9981 + 0.25 * 0.7133$$

$$\mathbf{= 0.9269\ tCO_2/MWh}$$

Therefore, the baseline is the kWh produced by the renewable wind power generating unit multiplied by 0.9269 tCO2/MWh calculated in a transparent and conservative manner. The emission factor for the project activity would be fixed during the entire crediting period.

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

Following table estimates the baseline emission reductions. The project activity accounts for 293210 tCO_2e of baseline emission reductions over the crediting period of 10 years.

Baseline Emissions:

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants connected to the Southern Grid that are displaced by the project activity.

The net electricity exported to the grid per annum by the project activity is 31634 MWh in the year 2006-2007. Hence the baseline emissions are calculated as below.

The Baseline Emissions would be calculated using the formula

$BE_y = EG_{BL,y} \times EF_{CO2}$

Where,
BEy is Baseline Emissions in year y (tCO_2e/y)
$EG_{BL,y}$ is Energy Baseline in year y, kWh
EF_{CO2} is CO_2 Emission Factor in year y; t CO_2 / kWh

Baseline Emissions for the year 2006-2007 & onwards
= 31634 MWh x 0.9269 tCO2/MWh
= 29,321 tonnes of CO_2

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

Project Emissions

As per methodology, for wind power projects PEy = 0 tonnes of CO_2

Leakage

As per the methodology, no leakage is considered from the project activity.

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

Emission Reductions

ERy = BEy – PEy - LEy

Where
ERy = Emission reductions in year y (tCO_2e/y)
BEy = Baseline Emissions in year y (tCO_2e/y)
PEy = Project Emissions in year y (tCO_2e/y)
LEy = Leakage Emissions in year y (tCO_2e/y)

Emission Reductions (ER) for the period 2006-07 & onwards
= 29321 – 0 – 0 = 29321 tCO_2 e

Period	Emission Reductions (tCO2)
01-April-2006 to 31- March - 2007	29,321
01-April-2007 to 31- March - 2008	29,321

01-April-2008 to 31- March - 2009	29,321
01-April-2009 to 31- March - 2010	29,321
01-April-2010 to 31- March - 2011	29,321
01-April-2011 to 31- March - 2012	29,321
01-April-2012 to 31- March - 2013	29,321
01-April-2013 to 31- March - 2014	29,321
01-April-2014 to 31- March - 2015	29,321
01-April-2015 to 31- March - 2016	29,321
Total	**2,93,210**

5 Environmental Impact:

In India, Ministry of Environment and Forest is the host party. As per the prevailing host party laws, (the Schedule 1 of Ministry of Environment and Forests, Government of India notification dated September 14, 2006), 38 activities are required to undertake environmental impact assessment studies. The details of these activities are available at http://envfor.nic.in/legis/eia/so1533.pdf . However the Environmental Impact Assessment study is not required for wind mill project as there is no negative environmental impact due to the project activity and wind energy is one of the cleanest sources of energy.

6 Stakeholders comments:

NSL identified the following local stakeholders to be associated with the project activities, directly or indirectly.

The typical groups of the stakeholders identified are

- ✓ Employees of the TNEB
- ✓ Local people
- ✓ Farmers
- ✓ Contractors (Vestas (India) Pvt. Ltd.)

All the stakeholders were informed about the agenda, venue and date of the meeting through notices issued 15 days prior to the meeting. Further, a project concept note, which gives a clear idea on the project activity including the measures taken under the project and the

benefits achieved by the project, was also issued along with the notice as information to the concerned stakeholders.

The consultation meeting was conducted by the project proponent on 21st April 2008 at the Anthiyur Village in Tamil Nadu at the wind farm site office. The stakeholder consultation meeting at Anthiyur wind farm site was attended by participants representing various groups of the stakeholder (as mentioned above), details on the participants has been recorded. The meetings started with a brief presentation on Clean Development Mechanism under Kyoto Protocol. There after it was explained to the stakeholder as how the wind farm project by the project proponent has lead to significant reduction in emissions of greenhouse gases either directly or indirectly and hence how it helps in contributing to the global efforts towards combating global warming. The project proponent further explained the other sustainable development benefits associated with the project. The stakeholders viewed the project proponent as a reputed company contributing to local socio-economy. Overall there was unanimous agreement that the proposed project was a beneficial project from sustainability viewpoint.

Description of how comments by local stakeholders have been invited and compiled

Concerns and responses as recorded during the meeting at the sites of the wind farm area:
All the stakeholders were happy in knowing that a project activity in their locality is contributing to a global cause and they commended the project proponent management for their initiatives in the areas of climate change and sustainable development. In particular, the stakeholders lauded the project promoters for the environment friendly power generation using wind.

Summary of the comments received

The stakeholder meeting was conducted at the project proponent's plant site at Anthiyur and was attended by the residents of the nearby villages, the employees of the project proponent and representative of relevant Electricity Board. Summary of the comments received from the stakeholders

Local Population: The villagers expressed their pleasure with the setting up of the power project as it had provided the rural population with permanent employment opportunities. Indirect employment generated as result of

the project activity was highlighted by the villagers. The increase in the land prices subsequent to the setting up of the project was a welcome boon for the villagers.

Representative of relevant Electricity Board: Stated the setting up of the power project has helped in reducing the transmission & distribution losses.

Employees: The local population hired for the project activity are pleased with the employment opportunity available to them which was absent in the region prior to the commissioning of the plant.

Report on how due account was taken of any comments received

No account of the comments was taken as all the received comments were positive.

7 Schedule:

The chronology of the events pertaining to the project proponent project activity has been given below;

S. No	DATE	DESCRIPTION
1	30 December 2004	Purchase Order Agreement between the project proponent and Vestas (India) Private Limited
2	01 January 2005	Agreement for erection and commissioning between the project proponent and Vestas (India) Private Limited
3	26 March 2005	Commissioning Date of the 14.85 MW project at Anthiyur, Tamil Nadu
4	25 May 2007	Registration Date of the NSL 27.65 MW Wind Power Project in Karnataka (Ref No: 998)
5	10 December 2007	Engagement of Ernst & Young Pvt. Ltd as advisor to the project proponent for GHG abatement program.
6	02 September 2008	Quotes for the appointment of the DOE

8 Ownership:

8.1 Proof of Title:

All the activities of the project are done in the name of Nuziveedu Seeds Limited (NSL). The purchase of equipment, power purchase agreement and all clearances have been done in the name of NSL, which will be provided as evidence of proof of title.

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

Not applicable

Annexure – 1: Baseline Information

The latest data available for the period 2005-06 to 2007-08 has been used for the estimation of the baseline emissions. The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, has estimated the Build Margin and the Simple Operating Margin for the Southern grid, the details of which is available on the following website and is detailed below as well:

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

Version 4.0 of the CEA carbon Dioxide Baseline Database has been used.

Emission Factor

Simple Operating Margin (tCO_2/MWh) (incl. Imports)

	tCO2e/MWh	Net generation in operating margin (GWh)
Simple operating Margin 2005-06	1.0056	100978.3759
Simple operating Margin 2006-07	0.9991	109116.3775
Simple operating Margin 2007-08	0.9906	114701.73927
Weighted Average operating margin for last three years	0.9981	

Build Margin (tCO_2/MWh) (not adjusted for imports)

	tCO2e/MWh
Build Margin for the year 2007-08	0.7133

Combined Margin Calculations

	Weights	tCO2e/MWh
Operating Margin	0.75	0.9981
Build Margin	0.25	0.7133
Combined Margin	**(0.75*0.9981 + 0.25*0.7133) = 0.9269**	

Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at www.cea.nic.in.