**PROJECT DESIGN DOCUMENT FORM
FOR SMALL-SCALE CDM PROJECT ACTIVITIES (F-CDM-SSC-PDD)
Version 04.1**

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	13.2 MW Wind Mill Power Project in Theni district of Tamil Nadu, by JISL-India
Version number of the PDD	Version: 1.8
Completion date of the PDD	15/10/2013
Project participant(s)	Jain Irrigation Systems Limited
Host Party(ies)	Government of India
Sectoral scope(s) and selected methodology(ies)	**Type: I** – Renewable Energy Projects **Category D:** Electricity Generation for a system **Sectoral Scope: 1-** Energy industries (renewable / non-renewable sources) **Methodology:** **Title**: Grid connected renewable energy generation **Reference:** AMS I.D (grid connected renewable electricity generation), version 17, EB 61, valid from 17 June 2011
Estimated amount of annual average GHG emission reductions	27,992 t-CO_2

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>

The project activity consists of setting up of Wind Turbine Generators (WTG) of total capacity 13.2 MW (1.65 MW x 8 nos.) in Tamil Nadu by Jain Irrigation Systems Limited (hereafter referred as JISL). The WTGs in the project activity are manufactured by Vestas Wind Technology India Private Limited. The project activity forms a part of the Southern Grid of India. The project activity generates power by using the kinetic energy of wind, thus resulting in zero emissions during electricity production. The power produced displaces an equivalent amount of power from the grid, which is fed mainly by fossil fuel fired power plants. The project activity results in the average annual electricity generation of 29.71 GWh/annum and hence results in reduction of GHG emissions of 27,992 tCO_2/ annum on an average.

JISL is a premier organization engaged in promoting advanced agriculture and food processing systems including drip irrigation, improved tissue-culture cultivation, fruit processing, dried/frozen food products etc. JISL is committed towards environmentally friendly practices and sustainable development goals of the country. The investment in WTGs is a step towards the same. JISL has awarded EPC and O&M contract for this project to Vestas Wind Technology India Private Limited, a well-known Wind Energy Equipment Manufacture, Supplier and Wind-Farm Developer. Power from 6 WTGs shall be sold to the state grid of Tamil Nadu and power from the remaining two WTGs (T 27 and T 28) shall be wheeled via the state grid of Tamil Nadu to the industrial facility of JISL situated at Udumalpet in Tamil Nadu. JISL has entered into an Energy Purchase Agreement (EPA) with Tamil Nadu Electricity Board (TNEB) for 6 WTGs and has entered into an Energy Wheeling Agreement (EWA) for wheeling of power to the JISL facility.

The project activity contributes to the sustainable development goals of the host country in the following ways:

- **Social well-being**: The project activity generates clean power, without emitting any GHGs during its operations. Hence, it leads to a cleaner environment, reducing the adverse impacts of GHG emissions on the people. The project activity aids in providing employment in the construction and operation phase of the project activity to the people around the project site and thus contribute in improving the quality of life of the people.
- **Economic well-being**: The project activity generates additional employment as people are required for its operations, manufacture, etc. The project activity indirectly helps in conserving the natural resources of the country which can be utilized for some other important uses.

- **Environmental well-being**: The electricity generated shall replace an equivalent amount of electricity from the respective state grids, which are mainly supplied by fossil fuel fired power plants. Generation of electricity by WTGs does not result in any type of GHG emissions, leading to a cleaner environment. It also reduces a part of the energy deficit being faced by the country.

- **Technological well-being**: The generation of electricity by the project activity will improve availability of electricity to the state grid and also it will help in providing more opportunities for industries to invest in such cleaner technologies

A.2. Location of project activity

A.2.1. Host Party(ies)

>>

India

A.2.2. Region/State/Province etc.

>>

State: Tamil Nadu

A.2.3. City/Town/Community etc.

>>

Taluk: Aundipatty
District: Theni

A.2.4. Physical/ Geographical location

>>

The site is approximately 70 km to the west of Madurai and 10 km to the southeast of Theni. The site is connected by NH 49. The nearest airport is at Madurai and the nearest Railway Station is at Theni. The coordinates of the WTGs (as provided by the technology supplier)[1] are as follows:

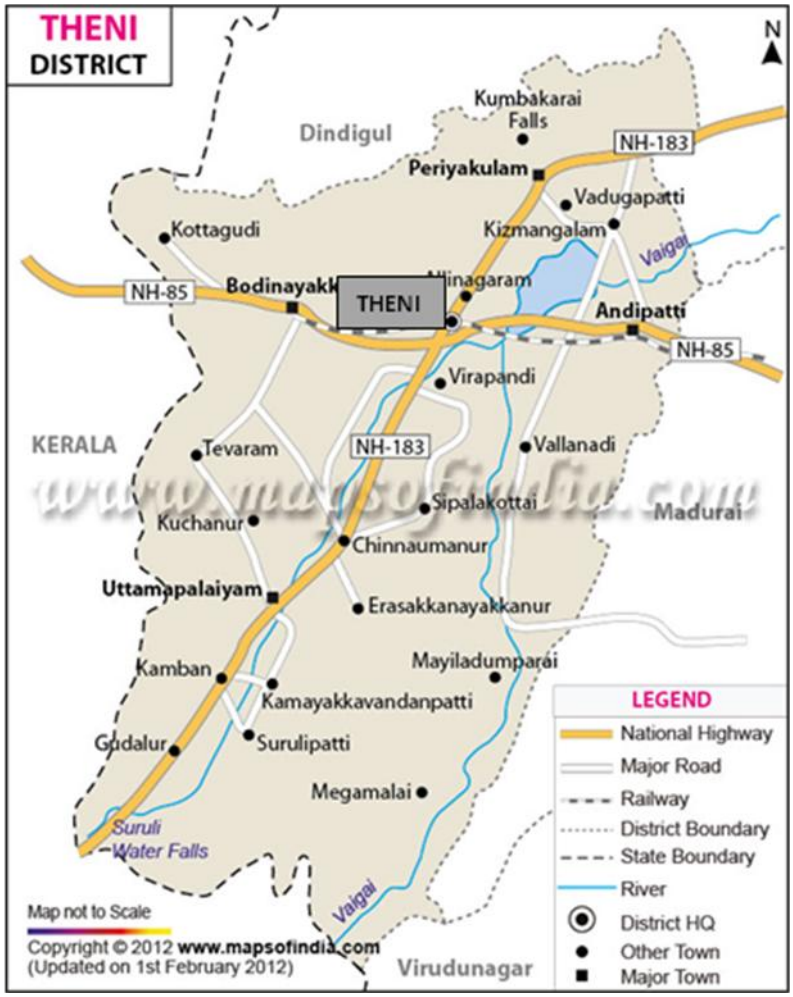
Sl. No.	WTG ID	Village name	Latitude	Longitude
1	HTSC T 21	Mottanuthu	09° 57' 49.39" N	77° 33' 58.48" E
2	HTSC T 22	Mottanuthu	09° 57' 23.90" N	77° 33' 55.59" E
3	HTSC T 23	Mottanuthu	09° 57' 11.69" N	77° 34' 32.60" E
4	HTSC T 24	Mottanuthu	09° 57' 33.58" N	77° 32' 45.94" E
5	HTSC T 25	Mottanuthu	09° 57' 34.64" N	77° 34' 42.00" E
6	HTSC T 26[2]	Mottanuthu & Marikundu	09° 58' 03.98" N	77° 34' 21.10" E
7	HTSC T 27	Mottanuthu	09° 57' 53.01" N	77° 34' 31.22" E
8	HTSC T 28	Mottanuthu	09° 58' 14.40" N	77° 34' 03.07" E

The physical location of the WTGs is as follows:

[1] The latitude and longitude can be further cross-checked from google earth (http://maps.google.com/).
[2] The land are for the WTG falls under two villages, as also mentioned in the commissioning certificate


INDIA
States and Union Territories
N
JAMMU & KASHMIR
Srinagar
HIMACHAL PRADESH
PAKISTAN
CHINA (TIBET)
ARUNACHAL PRADESH
HARYANA
NEPAL
SIKKIM
BHUTAN
RAJASTHAN
Jaipur
UTTAR PRADESH
Lucknow
Patna
BIHAR
ASSAM
NAGALAND
MEGHALAYA
MANIPUR
TRIPURA
MIZORAM
GUJARAT
Bhopal
MADHYA PRADESH
JHARKHAND
WEST BENGAL
MYANMAR
CHHATTISGARH
DIU
DAMAN
MAHARASHTRA
DADAR & NAGAR HAVELI
Mumbai (Bombay)
ORISSA
Bhubaneshwar
BANGLADESH
Hyderabad
ANDHRA PRADESH
ARABIAN SEA
GOA
YANAM (Pondicherry)
BAY OF BENGAL
KARNATAKA
LAKSHADWEEP
PONDICHERRY (Puduchchery)
MAHE (Pondicherry)
TAMILNADU
KARAIKAL (Pondicherry)
Port Blair
ANDAMAN & NICOBAR ISLANDS
KERALA
Thiruvananthapuram
Map not to Scale


TAMIL NADU
DISTRICT MAP
N
ANDHRA PRADESH
KARNATAKA
KERALA
INDIA
TIRUVALLUR
Tiruvallur
CHENNAI
Vellore
VELLORE
Kanchipuram
KANCHIPURAM
KRISHNAGIRI
Krishnagiri
TIRUVANNAMALAI
DHARMAPURI
Tiruvannamalai
Dharmapuri
Viluppuram
PUDUCHERRY
VILUPPURAM
Salem
SALEM
Cuddalore
Bay of Bengal
NILGIRIS
ERODE
CUDDALORE
NAMAKKAL
Udagamandalam (Ooty)
Erode
PERAMBALUR
Namakkal
Perambalur
ARIYALUR
Ariyalur
NAGAPPATTINAM
KARAIKAL (PUDUCHERRY)
TIRUCHCHIRAPPALLI
TIRUPPUR
Coimbatore
Karur
KARUR
THANJAVUR
Nagapattinam
Tiruppur
Tiruchchirappalli (Trichy)
Thanjavur
Thiruvarur
COIMBATORE
DINDIGUL
PUDUKKOTTAI
TIRUVARUR
NAGAPATTINAM
Dindigul
Pudukkottai
LEGEND
State Boundary
District Boundary
State Capital
District Headquarter
Theni
Madurai
Sivaganga
THENI
MADURAI
SIVAGANGA
Virudhunagar
Ramanathapuram
VIRUDHUNAGAR
RAMANATHAPURAM
Palk Strait
THOOTHUKUDI
Thoothukudi (Tuticorin)
Gulf of Mannar
Tirunelveli
SRI LANKA
TIRUNELVELI
KANYAKUMARI
Nagercoil
Map not to Scale
Copyright © 2012 www.mapsofindia.com
(Last Updated on 24th January 2012)
INDIAN OCEAN



A.3. Technologies and/or measures

>>

As per Appendix B of the simplified modalities and procedures for small scale CDM project activities, the project activity comes under **Type I (renewable energy activities)** and **Category I.D (grid connected renewable electricity generation)**.

The project activity harnesses the kinetic energy of wind to generate electricity. It uses a wind turbine generator (WTG) to achieve its target. A wind turbine can be divided into three basic components: The rotor component, which includes the blades for converting wind energy to low speed rotational energy; the generator component, which includes the electrical generator, the control electronics, and a gearbox component for converting the low speed rotational energy to electricity. The structural support component includes the tower and rotor pointing mechanism.

The project activity employs environmentally safe and sound technology as the WTG uses the kinetic energy of the wind to produce energy. Hence, it does not result in any GHG emission during its operation.

The technology is sourced from Vestas Wind Technology India Private Limited and involves no technology transfer from Annex 1 countries.

The technical specifications of the WTGs[3] are as follows:

Parameter	Specifications
	1.65 MW - Vestas
Installed electrical output	1650 kW
Diameter	82 m
Cut-in wind speed	3 m/s
Rated wind speed	12 m/s
Cut-out wind speed	20 m/s
Rotor swept area	5281 m^2
Rotational speed	14.4 RPM
Regulation	Active stall
Type	1 speed; 6 poles
Rated output	1650 kW
Rotational speed	1012 RPM
Operating voltage	690 V
Frequency	50 Hz
Insulation class	F/B
Cooling system	Water cooled
Type	3 stage gear box; 1 planetary and 2 helical
Manufacturer	Winergy
Gear Ratio	1:70.2
Nominal Load	1800 kW
Drive	4 active electrical yaw motors
Bearing	Polyamide slide bearing
Aerodynamic brake	
Mechanical brake	Active; steel mounted disc brake

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of India (host party)	Jain Irrigation Systems Limited (Private entity)	No

A.5. Public funding of project activity

>>

There is no public funding available for the project activity. The project proponents have arranged funds from bank loans and internal resources.

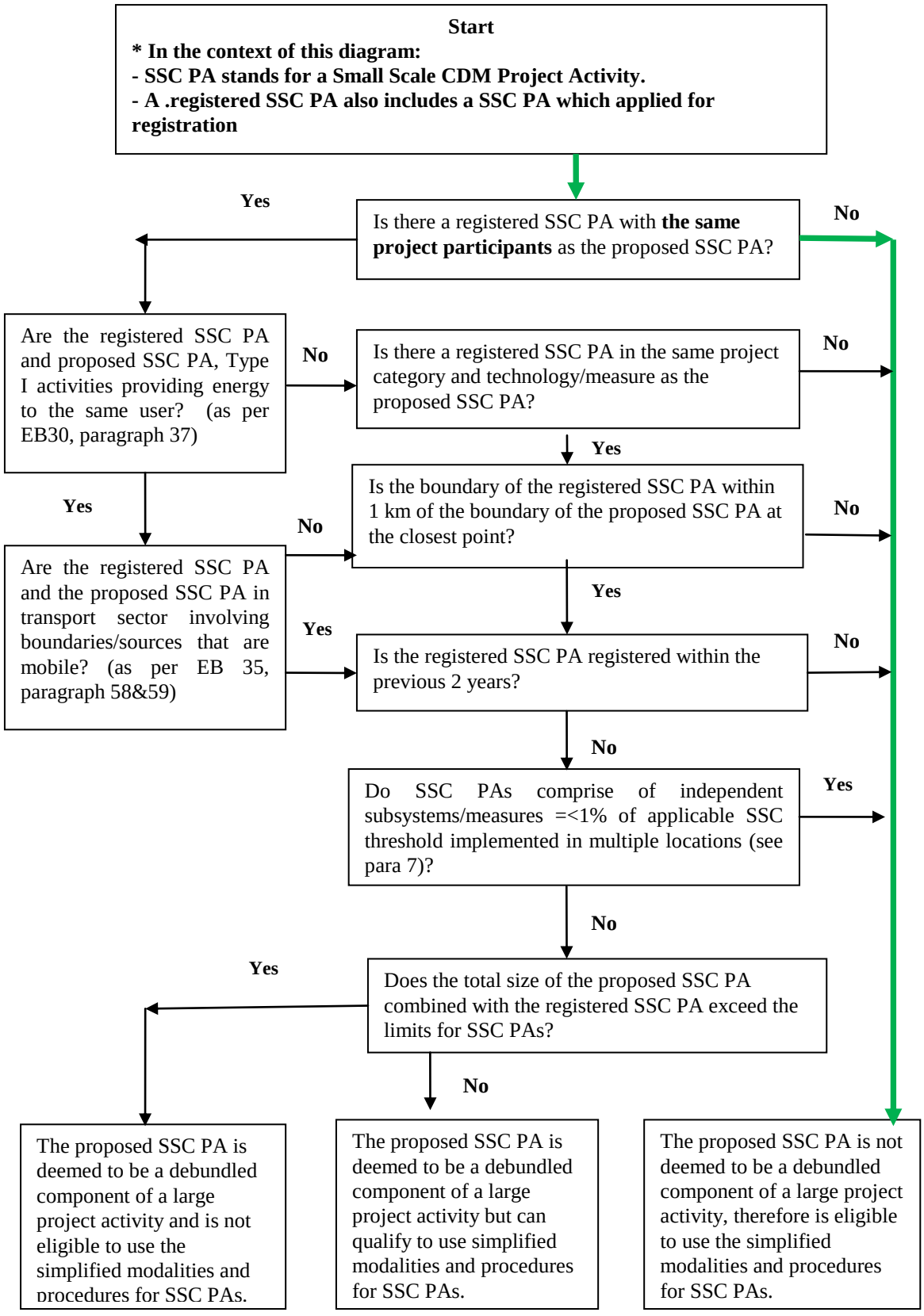
A.6. Debundling for project activity

>>

As per Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities and "Guidelines on assessment of de-bundling for SSC project activities (Version 03; EB 54, Annex 13)":

[3] Please note that all the WTGs have same technical specifications.

"A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:



The project activity is not a de-bundled component of a large project activity as –

There is no small scale CDM project activity or an application registered by the project proponent, in the same project category in the last two years within 1 km of the project boundary of the proposed small-scale project activity.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

>>

Title: AMS I.D (grid connected renewable electricity generation), version 17, EB 61
Reference: Appendix B of the Simplified Modalities and Procedures for small-scale project activities.
Project Type: Type I – Renewable Energy Projects
Category I D: Grid Connected Renewable Electricity Generation

AMS I.D directs to use the following tool to calculate the emission factor for the project activity:
"Tool to calculate the emission factor for an electricity system"
Version 02.2.1, EB 63 Annex 19.

B.2. Project activity eligibility

>>

The wind power based project activity has a total capacity of 13.2 MW (which is less than 15 MW) and all the WTGs are newly installed WTGs. Hence, the project activity is justified to use the project category.

The following table shows the applicability conditions of the project activity with respect to the chosen project type and category:

<table>
<tr><th>Applicability conditions</th><th>Project activity status</th></tr>
<tr><td>1. This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass:
a. Supplying electricity to a national or a regional grid; or
b. Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.</td><td>The project activity is a renewable energy based electricity generation project. The power generated displaces and equivalent amount of electricity from state electricity grid which would have otherwise been supplied by fuels like coal/diesel etc. Power from 6 WTGs is being sold directly to the state grid while power from two WTGs is being wheeled to the industrial facility of JISL, which was earlier drawing an equivalent amount of power from the state grid of Tamil Nadu.</td></tr>
<tr><td>2. Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A[4]) applies is included in Table 2.
<table>
<tr><th></th><th></th><th>AMS-I.A</th><th>AMS-I.D</th><th>AMS-I.F</th></tr>
<tr><td>1</td><td>Project supplies electricity to a national/regional grid</td><td></td><td>√</td><td></td></tr>
</table>
</td><td>Electricity from 6 WTGs is supplied to national grid hence it's meeting the criteria 1 given in the table 2. Electricity from remaining two WTGs is used for captive consumption via national grid through wheeling agreement hence meeting criteria 3 given in table 2.
Hence the methodology AMS-ID is applicable for the project activity.</td></tr>
</table>

[4] AMS-I.D "Grid connected renewable electricity generation", AMS-I.F "Renewable electricity generation for captive use and mini-grid" and AMS-I.A "Electricity generation by the user"

2	*Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)*			√	
3	*Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)*		√		
4	*Project supplies electricity to a mini grid17 system where in the baseline all generators use exclusively fuel oil and/or diesel fuel*			√	
5	*Project supplies electricity to household users (included in the project boundary) located in off grid Areas*	√			

3. This methodology is applicable to project activities that *(a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant);* *(b) involve a capacity addition;* *(c) involve a retrofit of (an) existing plant(s); or* *(d) involve a replacement of (an) existing plant(s).*	Project activity is the installation of new power plant at a site where there was no renewable energy power plant operating prior to implementation of the project activity (Greenfield plant). In this regard, PP had already provided all the relevant land lease documents to the DOE.
4. Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology *• 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*	Not Applicable

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/m2; *• 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/m2.*	
5. *If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fue1, the capacity of the entire unit shall not exceed the limit of 15MW.*	The project activity has only renewable energy component with the total capacity of 13.2 MW, which is below the mentioned limit of 15 MW. The total capacity same can be validated by the Purchase order placed to Vestas Wind Technology India Private Limited.[5]
6. *Combined heat and power (co-generation) systems are not eligible under this category.*	The project activity is not a co-generation facility.
7. *In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.*	The project activity is a new installation of Wind turbines (13.2 MW) and is not an addition to any existing power generation facility.
8. *In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.*	The project activity is not a retrofit or modification of any existing facility.

B.3. Project boundary

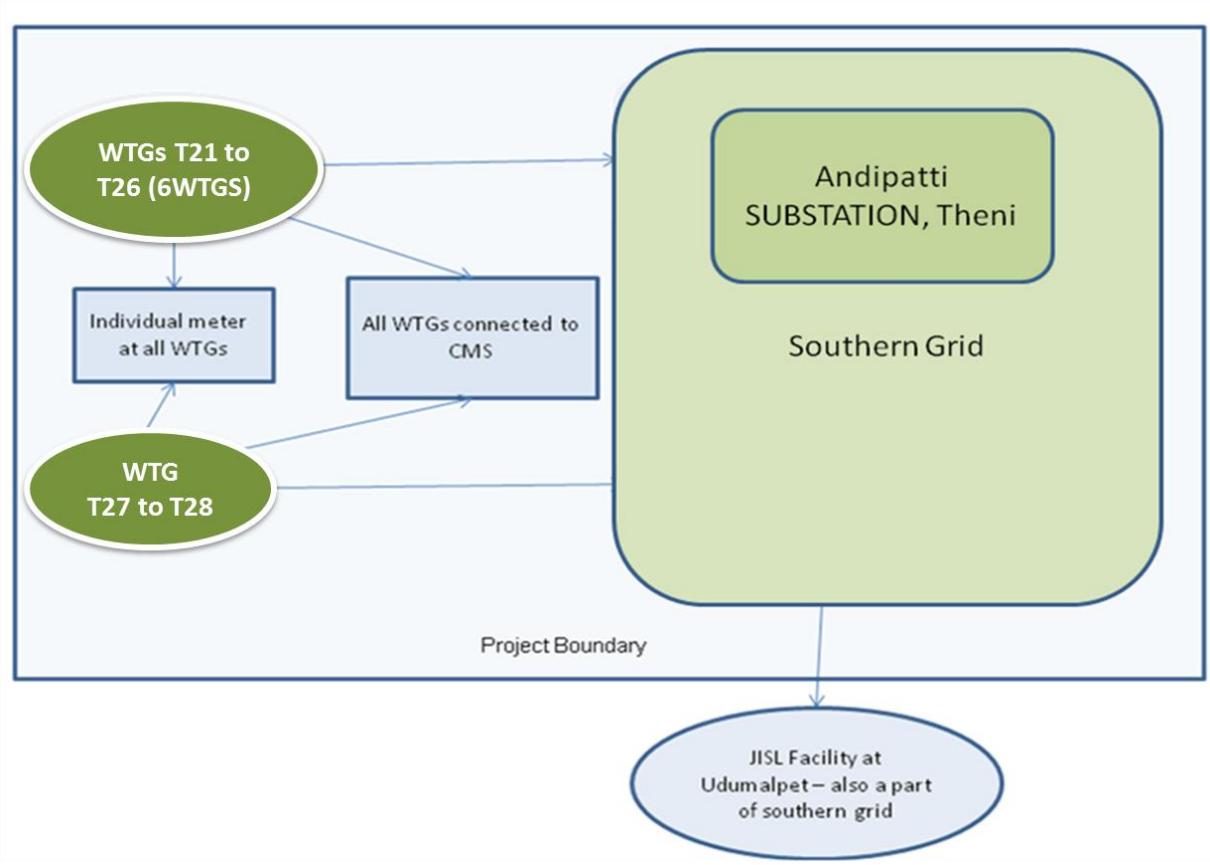
>>

As per the methodology, the project boundary is defined as "*The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system*[6] *that the CDM project power plant is connected to*".

The project boundary consists of the WTGs, the allied equipment, the substation and the TNEB grid, which is a part of the southern regional grid of India.

[5] Please refer the P.O. placed dated 12/05/2009 already submitted to the DOE.

[6] Refer to the latest approved version of the "Tool to calculate the emission factor for an electricity system-version02.2.1" for definition of an electricity system.



B.4. Establishment and description of baseline scenario

>>

The project activity involved setting up of WTGs to harness the power of wind to produce electricity and supply to the grid. In the absence of the project activity, the equivalent amount of power would have been supplied by the state grid (part of southern regional grid), which is fed mainly by fossil fuel fired plants.

In the absence of the project activity, the equivalent amount of power would have been drawn from the state grid. Hence, the baseline for the project activity is the equivalent amount of power from the Southern regional grid.

As per the approved small scale methodology AMS I.D para 11, for all other systems, "The baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor".

The Emission Factor can be calculated in a transparent and conservative manner as follows (as per para 12 of AMS I.D version 17):

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

(b) The weighted average emissions (in kg CO2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Calculations must be based on data from an official source (where available) and made publicly available.

For determining the baseline emissions, the "tool to calculate the emission factor for an electricity system" version 02.2.1 has been used.

Baseline Methodology procedure:

Step 1. Identify the relevant electricity systems:

A **project electricity system** is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.
The Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into two regional grids[7].

NEWNE Grid				**Southern Grid**
Northern	Eastern	Western	North-Eastern	Southern
Chandigarh	Bihar	Chattisgarh	Arunachal Pradesh	Andhra Pradesh
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryana	Orissa	Daman & Diu	Manipur	Kerala
Himachal Pradesh	West Bengal	Dadar & Nagar Haveli	Meghalaya	**Tamil Nadu**
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Pondicherry
Punjab	Andaman-Nicobar	Maharashtra	Nagaland	Lakshadweep
Rajasthan		Goa	Tripura	
Uttar Pradesh				
Uttarakhand				

The WTGs in the project activity lie in the state of Tamil Nadu. The state forms a part of the Southern grid (as per the latest CEA guidelines, version-5.0). Hence, relevant Operating margins and Build margins shall be used for calculations.

Step 2. Choose whether to include off-grid power plants in the project electricity system (optional):

For calculating the grid emission factor for the project activity, "*Option I (only grid power plants are included in the calculation)*" of this step has been chosen. PP has chosen not to include off-grid power plants in the project electricity system.

Step 3. Select a method to determine the Operating Margin (OM):

For the purpose of this project activity, the ex-ante option of the simple OM method has been used. However, as per the tool, *the simple OM method (option a) can only be used if low-cost/must-run*

[7] http://www.cea.nic.in/reports/planning/cdm_co2/database_publishing_ver5.zip

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.

As per the tool, in case the ex-ante option is followed, for grid power plants, *use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.*

As per CEA Data version 5, the share of low cost must run sources are as follows[8]

Year	2004-05	2005-06	2006-07	2007-08	2008-09
Southern Grid	21.6%	27%	28.3%	27.1%	22.8%

Hence, simple OM can be used as the share of low cost must run source is less than 50% for the Southern grid of India.

Step 4. 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.

For the project activity, the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission has been considered. The data is published annually by the Central Electricity Authority. Thus:

Simple OM	**Southern Grid (tCO_2/MWh)**	**Generation (GWh)**
2006-07	0.99912	109116.38
2007-08	0.99062	114701.74
2008-09	0.97292	121471.25

Step 5. Calculate the build margin emission factor:

As per the Tool to calculate emission factor for an electricity system, the sample group m consists of either:

a. *The set of five power units that have been built most recently or*
b. *The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently*

The value of the BM has been taken from the data published by the CEA. The BM has been calculated as per option 1 (*Calculate the Build Margin emission factor* $EF_{BM,y}$ ***ex-ante*** *based on the most recent information available on plants already built for sample group m at the time of PDD submission*)
Option 1 as described above is chosen in the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PDD and is fixed for the entire crediting period.

As per the CEA CO_2 Baseline Database, the BM for the 2008-09 has been calculated to be $EF_{grid, BM,y}$

[8] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

BM	Southern Grid
2008-09	0.81792

STEP 6. Calculate the combined margin (CM) emissions factor ($EF_{grid, CM, y}$)

The combined margin emission factor is calculated by option (a) weighted average CM. It is as follows:

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

Where:

$EF_{grid, OM,y}$ = Build Margin CO_2 emission factor in the year *y* (tCO_2/GWh)
$EF_{grid, BM,y}$ = Operating Margin CO_2 emission factor in the year *y* (tCO_2/GWh)
W_{OM} = Weighting of operating margin emission factor (%)
W_{BM} = Weighting of build margin emission factor (%)

Owing to their intermittent and non-dispatchable nature, the default weights for wind and solar projects are as follows: w_{OM} = 75% and w_{BM} = 25%

In the project activity, **combined margin has been chosen as the baseline emission factor** for grid emission factor. The value chosen is taken from relevant official sources (CEA database, version 5) and is publicly available[9].

Parameter	Southern grid
OM, Operating Margin – Generation weighted average	0.98708
BM, Build Margin	0.81792
CM, Combined Margin (tCO2/ MWh)	**0.94479**

The combined margin thus obtained shall be fixed ex-ante for the entire crediting period of the project activity.

The OM and BM have been fixed *ex-ante* for the entire crediting period of the project activity.

B.5. Demonstration of additionality
>>
The project activity is the installation of WTGs in the state of Tamil Nadu for the purpose of generating electricity and selling it to the state grid from 06 WTGs and wheeling power from 02 of the WTGs to the industrial facility of JISL present in the nearby region. This would increase the electricity available to the southern regional grid, thereby improving the power scenario. In the absence of the project activity, an equivalent amount of electricity would have been supplied from the southern regional grid, which is mainly fed by fossil fuel fired power plants.

There are only two alternatives to the project activity, viz.,

1. the proposed project activity *not undertaken as a CDM project activity*;

[9] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

2. *no project activity*, in which case equivalent amount of electricity would be generated by the grid electricity system through its currently operating power plants and by new capacity additions (which are mostly thermal), i.e., *status quo*.

Option 1 is an unattractive proposition as in the project activity is financially unviable without additional benefits from carbon credits (demonstrated in following sections).

Option 2 is considered as credible and realistic alternative to the project activity since the project activity is displacing the equivalent amount of electricity in the carbon intensive grid system. In the absence of the project activity, the equivalent amount of electricity would be generated by grid electricity system through its currently operating power plants and by the new capacity addition in the grid.

Electricity generation from wind farm is not a legal requirement or a mandatory choice. There are states and sectoral policies which are primarily framed to encourage investment in wind based power project to attract more private investment as there are many anticipated risks under the project and requires good amount of equity to be involved. The Indian Electricity Act of 2003 does not restrict or empower any authority to restrict the fuel choice for power generation. In addition, it may be noted that the draft National Electricity Policy (revised in August 2004) asserts 'coal would necessarily continue to remain the major fuel'. The applicable environmental regulations do not restrict the use of wind energy for power generation.

The description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity has been done as per "*Guidelines on the demonstration of additionality of small-scale project activities*" version 9.0 (EB 68, annex 27)[10]. The guidelines on demonstration of additionality of small-scale project activities mentions various barriers and requires explanation to show that the project activity would not have occurred due to at least any one of the following barriers:

a) Investment barrier
b) Technological barrier
c) Barrier due to prevailing practice and
d) Other barriers

Of the barriers listed above, the project proponents have decided to demonstrate the additionality of the project activity by investment barrier (discussed below). The investment risks associated with the project activity have been shown in the investment barrier section. In the following sections, additionality of the project activity is established based on the barriers faced by the project activity.

The project activity consists of generation of electricity through 06 of the WTGs and selling it to the TNEB state grid and wheeling power generated from another two WTGs (T 27 and T28) to the facility of JISL. Thus, the project proponent earns revenues through the sale of electricity to the state grid, as per the power purchase agreement (PPA) signed with the TNEB and savings in the form of reduced electricity bills due to wheeling of power as per Energy Wheeling Agreement signed with TNEB. As per the tool for the demonstration of additionality [sub step 2(a) point 1], since the project activity generates economic benefits in the form of savings in electricity bills and revenues from sale of power, simple cost analysis cannot be applied. For demonstration of additionality, benchmark analysis has been applied as per the guidelines in the "**Tool for the demonstration and assessment of additionality**" version 6.0 and "**Guidance on the Assessment of Investment Analysis**" version 5, EB 62, Annex5. With the help of this analysis, the economic or financial attractiveness of a particular project activity is determined. As per para 19 of the guidance on the assessment of investment analysis, "*if the alternative to the project*

[10] http://cdm.unfccc.int/Reference/Guidclarif/meth/methSSC_guid05.pdf

activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate". Hence, use of benchmark analysis for demonstration of additionality is appropriate as in the absence of the project activity, the equivalent amount of electricity would have been supplied by the gird.

The project proponent has invested in WTGs as part of its corporate responsibility towards cleaner energy. For funding this project activity, the proponent has used its internal resources and has also obtained loans from financial institutions. Thus, Project IRR has been chosen as the financial indicator for the project activity.

As per para 13 of EB 62 Annex 5, "*in the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on parameters that are standard in the market* ". As per para 12 of "guidance on the assessment of investment analysis" (EB 62 annex 5), Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR.

For the purpose of the project activity, the higher end of the PLR (12.25%[11]) has been taken as a benchmark, which is lower than the benchmark given in the webhosted PDD and is also lower than the contracted rate of interest with YES bank (12.75%). Hence, the benchmark is conservative.

Calculation of Financial Indicator:

Financial Analysis:
The project proponents have used **Project Internal Rate of Return (IRR)** as the financial indicator to identify the investment barriers for the project activity. The IRR is then compared to the chosen benchmark. The spreadsheet versions of the calculations shall be provided to the DOE during validation.

The parameters and assumptions used for calculations have been mentioned below. A sensitivity analysis has also been done for the IRR with change in certain parameters, to show the robustness of the analysis.

- The input values used in the financial analysis were valid at the time when the investment decision was made.
- The IRR has been calculated for a period of 20 years, the expected operational lifetime of the project activity.
- The tax benefits arising due to depreciation have been taken into account while calculating the returns to the project activity.

All in INR million unless otherwise stated

Financial parameters	**Value**	**Remarks/Source**
O&M cost	1.26	Vestas Offer Letter dated 29/09/2008
Escalation on O&M cost	7.50%	Vestas Offer Letter dated 29/09/2008
Depreciation rate	5.28%	Schedule XIV of Companies Act, 1956 (SLM Method)
Total Insurance , *A+B*	487981.0	INR per annum at actuals
Standard Fire and special Perils, A	294895.0	INR per annum at actuals
Burglary, B	193086.0	INR per annum at actuals
Debt	640.0	Loan sanction letter from Yes bank of 17/07/2009

[11] RBI PLR for 24/04/2009, http://www.rbi.org.in/scripts/WSSView.aspx?Id=13608

Interest Rates	12.75%	Loan sanction letter from Yes bank of 17/07/2009
Upfront fee on loan amount	7.06	Loan sanction letter from Yes bank of 17/07/2009
Admin charges	3.5	Assumption made at the time of decision making
Escalation on admin cost	10%	Experience of the company. Documentary evidence submitted
IDC[12] charges per MW paid to TNEB	2.58	Vestas Offer Letter dated 29/09/2008
Repayment schedule	13 years including moratorium	Loan sanction letter of Yes bank dt. 17/07/2009
Moratorium	3 months	Loan sanction letter of Yes bank dt. 17/07/2009
Tariff rate for sale to grid	3.39	INR/ kWh . Fixed for 20 years, as per wind energy purchase agreement
Transmission and Wheeling Charges	5%	As per TNERC tariff order of 2009, page 23
Captive power savings rate	3.68	INR/kWh - HT tariff rate for the state of Tamil Nadu, Electricity bill dated 31/03/2009
Corporate Tax Rate	33.99%	Finance Act, 2009-10
Service tax	10.30%	Finance Act, 2009-10
Salvage value	5%	Assumed[13]
Tax holiday	10 years	As per Sec. 80IA of the Income Tax Act, company is entitled to claim tax holiday for any 10 consecutive years in the first 15 years of operation.

Technical parameters	**Value**	**Remarks/ Sources**
WTG Cap – vestas, MW/WTG	1.65	Vestas Offer Letter dated 29/09/2008
No. of WTGs – Vestas	8	Purchase order dated 12/05/2009
PLF[14]	25.70%	Assumption at the time of decision making and also evidence by WRI report as provided by WinDForce dated June 2009
Derating	1.0%	TNERC tariff order dated March 2009, page16
Working days - full year	365	days per annum
In first year	219	Date of commissioning is 25/08/2009
In 21th year	146	
Working hours per day	24	Hours
Grid emission factor	0.94479	tCO2e/ MWh

Project cost in INR Million

Particulars	**Values**	**Source**

[12] Infrastructure development charge
[13] PP has depreciated 100% of depreciable project cost and hence assumption of 5% salvage value is conservative.
[14] Capacity Utilization Factor:- PLF is defined as the ratio of estimated generation and maximum generation based on installed capacity of WTG for given number of days.

Land cost – purchased	0.000	
WTG and accessories	822.85	Vestas Offer dt. 29/09/2008
Erection & commissioning charges	32.00	Vestas Offer dt. 29/09/2008
Service tax on the above	3.96	Vestas Offer dt. 29/09/2008
Total project (WTG) cost	858.81	Calculated
Consultancy charges to WinDForce	4.41	WinDForce Offer dt. 16/04/2009
Loan upfront fee	7.06	Assumed at 1% plus ST
IDC charges to TNEB for 31.2 MW	33.99	Vestas Offer dt. 29/09/2008
Total	**904.271**	Calculated
Depreciable cost (Plant & Machinery)	**865.869**	Calculated

All in INR million unless otherwise stated

Loan	640.00	71%	Yes Bank sanction letter dt. 17/07/2009
Equity	264.27	29%	Calculated

IT Depreciation rate WTG commissioned before 30th Sep

Depreciation rate (WDV)	80%	Sec. 32, Income Tax Act

Tariff breakup details:

Total units consumed (kWh)	200980	Electricity Bill dated 31/03/2009
Total energy charges (INR)	720252	Electricity Bill dated 31/03/2009
Electricity duty	5%	Electricity Bill dated 31/03/2009
Power Factor incentive	16745.6	Electricity Bill dated 31/03/2009
Applicable tariff (INR/kWh)	3.68	Calculated

Based on the above parameters and assumptions, the project IRR (without CDM benefits) for the project activity comes out to be 9.29%.

Thus, we see that the IRR of the project activity is below the chosen benchmark. Since the IRR of the project activity is below the chosen benchmark, the project activity is financially not attractive without additional revenues.

Sensitivity analysis:
A sensitivity analysis for Project IRR has been carried out for various parameters. As per para 17 of guidance on investment analysis, "*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*". For this project activity, the following parameters were identified which can have a direct impact on the revenues or cost streams:

- Project cost
- O & M cost
- PLF achieved
- Tariff rate - captive
- Tariff rate – sale to grid

Each of the parameters have been subjected to a sensitivity of +10% and -10%, in line with para 21 of EB 62 Annex 5, which states that "*the sensitivity analysis should at least cover a range of +10% and -10%*".

Project Cost:

Variation in the Project cost can have a direct impact on the returns to the project activity. The results of the sensitivity analysis of the IRR w.r.t project cost are as follows:

% Change in project cost	IRR
10%	6.83%
Base value	9.29%
-10%	12.53%

The IRR crosses the benchmark in case of a 9.50% decrease in the project cost. However, the investment has already been incurred for the project and the likelihood of the project cost decreasing by 10% is not possible.

O & M cost:
During the course of its lifetime, a WTG experiences wear and tear in almost all of its moving parts. Thus, regular maintenance is required for proper operations of the equipment. This also results in recurring maintenance costs. Wear and tear of a machine is something which is entirely not in the service provider's control. Increase in the O & M costs can increase the expenses significantly, resulting in lesser returns to the project activity. Thus, variation in O & M cost is a crucial factor in determining the return to a project activity. Thus, a sensitivity analysis w.r.t. O & M costs becomes logical. The project proponent has O&M contracts with the service provider, but these are for a few initial years only and hence O&M cost is subjected to sensitivity analysis. The results of the sensitivity analysis are as follows:

% Change in O & M cost	IRR
10%	8.97%
Base value	9.29%
-10%	9.61%

Hence, we see that the project IRR does not reach the benchmark value even with a 10% decrease in O&M costs and with time, a machine shall need more in terms of repair and maintenance, thereby increasing the O&M costs. Also, in this case, the project IRR crosses the benchmark with decrease of 118% in the O & M cost. However, the O&M agreement has already been signed between PP and WTG supplier and hence the decrease of the same in near future is not possible.

PLF achieved:
A WTG works due to the kinetic energy of wind. Although wind flow patterns have been established for many parts of the world, they are not 100% accurate. The generation achieved by a WTG depends largely on the wind flow. Any change in wind flow will have a direct effect on the performance of the WTG. Less performance would mean less generation than expected, thereby having a direct impact on the return of the project activity. In case of this project activity, lesser generation would mean that project proponent will have to purchase more electricity from the grid in case of captive power and shall result in fewer revenues in case of export to grid. , resulting in lower savings.
Thus, a sensitivity analysis has been carried out w.r.t. the changing PLF values. The results of the sensitivity analysis are given below:

% change in PLF	IRR
10%	11.17%
Base Value	9.29%
-10%	7.30%

The IRR crosses the benchmark in case of a 16.0% increase in the base value. However, this is an unlikely scenario. The PLF value considered has been obtained through a wind resource assessment study and is thus representative of the actual conditions. Moreover, the PLF achieved in the previous financial year by the WTGs of the project activity was 25.30%. Hence, sustaining a high PLF year on year seems unlikely.

Tariff Rate:

Tariff rate – grid sale:

The tariff at which electricity generated is sold to the grid has a direct impact on the returns of the project activity. However, the tariff rate has been fixed for 20 years (as per PPA with TNEB). However, a sensitivity analysis has been carried out for the tariff rate:

% change in tariff rate	IRR
10%	10.70%
Base value	9.29%
-10%	7.82%

In case of the tariff rate, the IRR crosses the benchmark in case sale rate increases by 20.4% (INR4.08/kWh). However, the project proponent has entered into a long term PPA with the state electricity board (20 years) and a possibility of a change in tariff is absent.

Tariff rate – captive:

The power sale rate shall determine the savings arising out of wheeling the power to the industrial facility. Thus, a sensitivity analysis has been carried out with respect to change in power sale rate.

% change in tariff rate	IRR
10%	9.78%
Base value	9.29%
-10%	8.80%

In this case, the IRR does not cross the benchmark even with a 100% increase in the savings rate.

Thus, from the above analysis it can be concluded that the project is financially not attractive on its own. The IRR of the project activity is below the chosen benchmark. This is the first time JISL is investing in WTGs and the company has no prior experience of wind power projects. The project proponent thus decided to apply for CDM benefits during the conceptualisation of the project itself as demonstrated in the above section.

Hence, the project carries substantial risks and would not have taken place without the help of CDM benefits.

CDM consideration:

Early consideration of CDM for the project activity has been demonstrated using the "Guidance on the Demonstration and Assessment of Prior Consideration of CDM" (EB 62, Annex 13).

JISL was well aware of the CDM process at the time of decision making for the project. The detailed project report of the project activity, prepared by Windforce Management Services Pvt. Ltd. also mentions CDM benefits and includes the same while calculating returns on the project activity. The project proponent has also taken services of a consultancy firm to take the project activity through the CDM process.

As per para 2 of guidance on the demonstration and assessment of prior consideration of CDM:
"for project activities with a starting date on or after 02 August 2008, the project participant must inform a Host Party DNA and/or the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months of the project activity start date and shall contain the precise geographical location and a brief description of the proposed project activity".

Following the guidelines, the project proponent sent intimations to both the host party DNA and the UNFCCC (email/letters dated 13/06/2009 sent to UNFCCC and to the host DNA) about the project activity and intentions of the project proponent to apply for registration under the Clean Development Mechanism of UNFCCC. The purchase order of the equipments was placed earlier on 12/05/2009. The stakeholder meeting of the project activity was conducted on 30/01/2010 and the PDD was uploaded for the global stakeholder consultation on 29/07/2010[15].

Following is the chronology of events for the project activity:

Stage of project implementation	Date	Remarks
Board resolution	30/04/2009	Board of JISL decides to invest in WTGs, while considering CDM benefits
Purchase Order (PO)	12/05/2009	PP issues Purchase Order to the technology supplier for supply to WTGs (Project Start Date)
Intimation to UNFCCC and MoEF	17/06/2009	PP informed UNFCCC about its intent of installing the WTGs considering the CDM through email on 13.06.2009. It has been uploaded on UNFCCC website on 17.06.2009 [16] . PP has got the confirmatory mail on 18.06.2011 from UNFCCC secretariat. (This is within six months of project start date.)
CDM Consultants' Engagement	15/06/2009	PP signs work order with CDM consultant for carrying out the CDM work for the project activity
Commissioning Completion of WTGs in the project activity	25/08/2009 (T21 to T27) and 26/09/2009 (T28)	WTGs in the project activity got commissioned.
Stakeholder consultation	30/01/2010	PP conducts Stakeholder consultation for CDM project at WTG site

Based on the above, it is evident that PP took substantial steps towards CDM registration of the project along-with the implementation of it. The project proponent has selected the date of purchase order for supply of WTG dated on 12.05.2009 as the start date of the project activity as this was the first real action from the project proponent towards its commitment for starting the project activity.

Hence, it has been demonstrated that the project proponent was aware of the CDM benefits during the conceptualisation of the project activity and took adequate steps towards achieving the same.

[15] http://cdm.unfccc.int/Projects/Validation/DB/CTAB1JW6OXS0HR09NM29ZH3R43EETT/view.html
[16] http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html

B.6. Emission reductions
B.6.1. Explanation of methodological choices
>>
As per the procedures laid down in AMS I.D ver. 17:

The baseline emissions are the product of electrical energy baseline EGBL, y expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor[17].

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

or

B. *The weighted average emissions (in kg CO2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used*[18].

For the purpose of this project activity, the combined margin (as per procedures prescribed in the "tool to calculate emission factor for an electricity system", version 2) has been used.

Parameter	**Southern grid**
OM, Operating Margin – Generation weighted average	0.98708
BM, Build Margin	0.81792
CM, Combined Margin (tCO_2/ MWh)	**0.94479**

Hence, as per AMS I.D, version 17,

$BE_y = EG_{BL,y} * EF_{CO2.grid,y}$ (Equation 1)
In this case, **$EF_{CO2.grid,y} = EF_{grid,CM,y,}$**

Where,
BE_y = Baseline emissions in year y (tCO_2)
$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{CO2,grid,y}$ = CO2 emission factor for the grid in year y (tCO_2e/MWh)

$EG_{BL,y}$ shall be the sum of net power supplied from the Six WTGs and the energy wheeled to the factory premises from two of the WTGs which are part of the project activity.

Project emissions:
There are no GHG emissions due to the project activity.

Leakage:
As the energy generating equipment is not transferred from another activity or the existing equipment is transferred to another activity, hence leakage is not to be considered.

Hence, Emission reductions are calculated as:

[17] Para 11 of AMS I.D version 17
[18] Para 12 of AMS I.D version 17

$ER = BE_y – PE_y – LE_y$

Where,
BE_y = Baseline emissions
PE_y = Project emissions
LE_y = Leakage emissions

As per the methodology, for all renewable energy project, $PE_y = 0$

Also, as per the methodology, leakage is to be considered if the energy generating equipment is transferred from another activity. Since this is not the case in the project activity, $LE_y = 0$.

Thus,
$ER = BE_y$

B.6.2. Data and parameters fixed ex ante

Data / Parameter	**$EF_{grid,OM,y,}$**
Unit	tCO_2/MWh
Description	This is the operating margin for the Southern grid of India
Source of data	CEA data has been used
Value(s) applied	0.98708
Choice of data or Measurement methods and procedures	The data is used to calculate the combined margin for the Southern grid of India as per the procedures laid down in the tool to calculate emission factor for an electricity system, version 2
Purpose of data	Calculation of baseline emissions
Additional comment	This is fixed ex-ante and the value would be fixed for the entire crediting period.

Data / Parameter	**$EF_{grid,BM,y,}$**
Unit	tCO_2/MWh
Description	This is the build margin for the Southern grid of India
Source of data	CEA data has been used
Value(s) applied	0.81792
Choice of data or Measurement methods and procedures	The data is used to calculate the combined margin for the Southern grid of India as per the procedures laid down in the tool to calculate emission factor for an electricity system, version 2
Purpose of data	Calculation of baseline emissions
Additional comment	This is fixed ex-ante and the value would be fixed for the entire crediting period.

Data / Parameter	$EF_{grid,CM,y,}$
Unit	tCO_2/MWh
Description	This is the combined margin for the Southern grid of India
Source of data	CEA data has been used
Value(s) applied	0.94479
Choice of data or Measurement methods and procedures	The data is used to calculate the emission factor for the Southern grid of India as per the procedures laid down in the tool to calculate emission factor for an electricity system, version 2
Purpose of data	Calculation of baseline emissions
Additional comment	This is fixed ex-ante and the value would be fixed for the entire crediting period.

B.6.3. Ex-ante calculation of emission reductions

>>

Baseline emissions:

$BE_y = EG_{BL,y} * EF_{CO2.grid,y}$ (In this case, **$EF_{CO2.grid,y} = EF_{grid,CM,y,}$**)

Where,
BE_y = Baseline emissions in year y (tCO_2)
$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{CO2,grid,y}$ = CO_2 emission factor for the grid in year y (tCO_2e/MWh)

$EG_{BL,y}$ shall be the sum of net power supplied from the all eight WTGs to the grid.

$EG_{BL,y}$ is calculated as :

$EG_{BL,y}$ = Total electricity export by all WTGs – Total electricity import by all WTGs

Capacity of WTGs:
Vestas: 1.65 MW *8 = 13.2 MW
Total Capacity: 13.2 MW
Run hours = 24*365 = 8760 hrs
PLF: 25.70% (third party assessment, in line with EB 48 Annex 11)
Hence, net power displaced by the project activity, $EG_{BL,y}$ = 29717 MWh/ annum[19]
Baseline emission factor, $EF_{CO2,grid,y}$ = 0.94479 tCO_2/MWh

Hence, Baseline emissions, BE_y = 29717*0.94479 = 28,076 tCO_2

Project emissions:
There are no GHG emissions due to the project activity.
Hence, PE_y = 0

Leakage:

[19] The detailed calculation spreadsheet for the same shall be provided to the DOE during validation

As the energy generating equipment is not transferred from another activity, hence leakage is not to be considered.
Hence, $LE_y = 0$

Hence, Emission reductions are calculated as:
$ER_y = BE_y – PE_y – LE_y$
Since PE_y and LE_y are zero,
$ER_y = BE_y$

Emission reductions
Hence, total emission reductions for the project activity = 28,076 tCO2 per annum

B.6.4. Summary of ex-ante estimates of emission reductions

Year	Baseline emissions (tCO_2 e)	Project emissions (tCO_2 e)	Leakage (tCO_2 e)	Emission reductions (tCO_2 e)
2012-2013	28,076	0	0	28,076
2013-2014	28,076	0	0	28,076
2014-2015	28,076	0	0	28,076
2015-2016	28,076	0	0	28,076
2016-2017	28,076	0	0	28,076
2017-2018	28,076	0	0	28,076
2018-2019	28,076	0	0	28,076
2019-2020	28,076	0	0	28,076
2020-2021[20]	27,796	0	0	27,796
2021-2022	27,518	0	0	27,518
Total	**279,922**	**0**	**0**	**279,922**
Total number of crediting years	10 years			
Annual average over the crediting period	**27,922**	**0**	**0**	**27,922**

[20] Due to derating of machines there will be reduction in generation from 11th year onward from the date of commissioning. Since all the machines got commissioned in 2009 and hence derating of machines has been considered from 2020 year onward.

B.7. Monitoring plan
B.7.1. Data and parameters to be monitored

Data / Parameter	$EG_{import,y}$
Unit	MWh
Description	Grid electricity import to the project activity during the year y
Source of data	Statement showing the Energy Generated through wind mill issued by TNEB
Value(s) applied	- (This value will be monitored at actual during monitoring period however net electricity has been considered for emission reduction calculation and the value for the same has been provided below.)
Measurement methods and procedures	Data Type : Measured Recording frequency : Monthly Credit Notes/JMR Reports Archiving Policy: Paper & Electronic The meter reading will be recorded jointly by the TNEB officials & the representative of the project proponent.
Monitoring frequency	Monitoring : Tri-vector / ABT meter will be used for monitoring Accuracy : 0.5 for Tri-vector energy meter and 0.2 S for ABT meter Monitoring frequency : Continuous monitoring Calibration Frequency: The energy meter will be calibrated atleast once in three years
QA/QC procedures	The energy meter will be sealed and will be in the custody of TNEB. Measurement results will be cross checked with records of electricity sold (invoices / receipts)
Purpose of data	Calculation of baseline emissions
Additional comment	There was replacement of the installed TVM meters by ABT meters. This action was beyond the control of PP as it is in purview of state electricity board. The accuracy of the ABT meters is 0.2 class compared to that of the TVM meters which had accuracy class of 0.5 class (Please refer section B.7.3 of the PDD for details. Data will be archived for two years after the end of crediting period or of the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter	$EG_{export,y}$
Unit	MWh
Description	Electricity export to the grid by the project activity during the year y
Source of data	Statement showing the Energy Generated through wind mill issued by TNEB
Value(s) applied	29717
Measurement methods and procedures	Data Type : Measured Recording frequency : Monthly Credit Notes/JMR Reports Archiving Policy: Paper & Electronic Calibration Frequency: The energy meter will be calibrated atleast once in three years The meter reading will be recorded jointly by the TNEB officials & the representative of the project proponent.
Monitoring frequency	Monitoring : Tri-vector/ABT meter will be used for monitoring Accuracy : 0.5 class for Tri-vector and 0.2 class for ABT meter Monitoring frequency : Continuous monitoring Calibration Frequency: The energy meter will be calibrated at least once in three years
QA/QC procedures	The energy meter will be sealed and will be in the custody of TNEB. Measurement results will be cross checked with records of electricity sold (invoices / receipts)
Purpose of data	Calculation of baseline emissions
Additional comment	There was replacement of the installed TVM meters by ABT meters. This action was beyond the control of PP as it is in purview of state electricity board. The accuracy of the ABT meters is 0.2 class compared to that of the TVM meters which had accuracy class of 0.5 class (Please refer section B.7.3 of the PDD for details. Data will be archived for two years after the end of crediting period or of the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter	$EG_{BL,y}$
Unit	MWh
Description	Quantity of net electricity supplied to the grid by the project activity per annum.
Source of data	Statement showing the Energy Generated through wind mill issued by TNEB
Value(s) applied	29717
Measurement methods and procedures	Data Type : Measured & calculated Recording frequency : Monthly Credit Notes/JMR Reports Archiving Policy: Paper & Electronic The meter readings (import and export) will be recorded jointly by the TNEB officials & the representative of the project proponent. The net electricity supplied by the project activity to the grid will be calculated as under: Net electricity supplied to grid for given month = $EG_{export,y} - EG_{import,y}$
Monitoring frequency	Monitoring : Tri-vector/ABT meter will be used for monitoring Accuracy: 0.5 class for Tri-vector energy meter and 0.2 class for ABT meter Monitoring frequency : Continuous monitoring Calibration Frequency: The energy meter will be calibrated atleast once in three years
QA/QC procedures	The energy meter will be sealed and will be in the custody of TNEB. Measurement results will be cross checked with records of electricity sold (invoices / receipts)
Purpose of data	Calculation of baseline emissions
Additional comment	There was replacement of the installed TVM meters by ABT meters. This action was beyond the control of PP as it is in purview of state electricity board. The accuracy of the ABT meters is 0.2 class compared to that of the TVM meters which had accuracy class of 0.5 class (Please refer section B.7.3 of the PDD for details. Data will be archived for two years after the end of crediting period or of the last issuance of CERs for this project activity, whichever occurs later.

Data / Parameter	EG_{WEG}
Unit	MWh / annum
Description	Electricity generated at WEG Controller during the year y
Source of data	Monthly Power Generation Report supplied by Vestas
Value(s) applied	- (This value will be monitored at actual during monitoring period however net electricity has been considered for emission reduction calculation and the value for the same has been provided above.)
Measurement methods and procedures	• **Measurement**: There is a micro-processor based intelligent controller. A software program reads and displays the parameters such as voltage, current, power factor, kVAh, kVArh, and kWh. The measurement will be on continuous basis. • **Recording frequency**: The energy generated will be recorded internally in the control system and the O&M contractor Vestas will supply energy generation reports as and when required.
Monitoring frequency	Monitoring frequency : Continuous monitoring
QA/QC procedures	**Calibration**: Calibration of the controller is not possible and not required as it is only a relay which displays the energy generated through a software program and moreover turbine cannot run without this relay.
Purpose of data	Calculation of baseline emissions
Additional comment	--

B.7.2. Sampling plan

>>

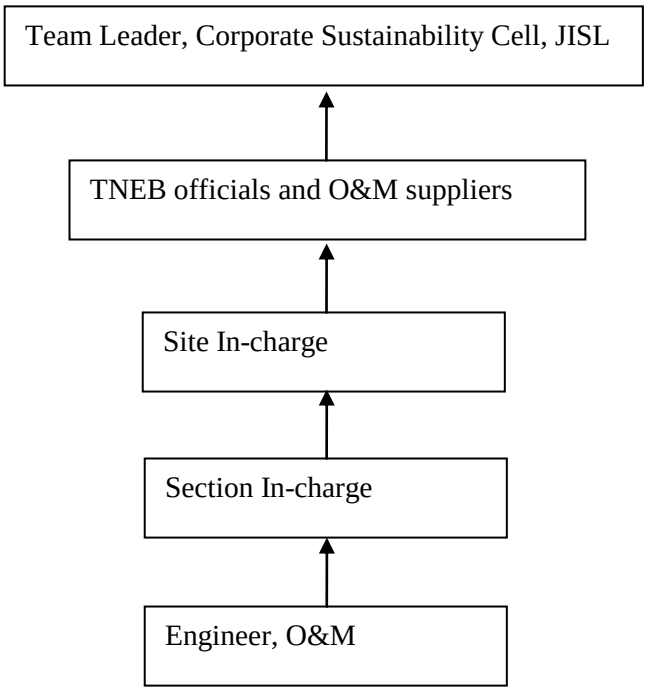
There are no parameters in section B.7.1 that are to be determined by sampling approach.

B.7.3. Other elements of monitoring plan

>>

The methodology AMS-I.D. Grid connected renewable electricity generation, Version 17 requires monitoring of "Quantity of net electricity supplied to the grid". The value of net electricity supplied to the grid for the estimation of emission reductions will be considered from the "Statement showing the Energy Generated through wind mill issued by TNEB".

Operational and Management Structure for monitoring of emission reductions for the crediting period is furnished below:



Roles & Responsibility Structure:
The following table details the roles and responsibilities of the people involved in the project activity:

Role	Person Responsible for	Remarks
WTG maintenance	Engineer, O & M	Responsible for regular maintenance of the WTGs
O & M of the section	Section In-charge	The section in charge will be responsible for overall operations of WTGs at the site.
O & M of a particular site	Site In-charge, O & M	Responsible for O & M activities of a particular site. Is also responsible for ensuring QA/QC at site and informing TNEB in case of any meter related error.
Meter readings and Calibration	TNEB officials and O&M suppliers	Responsible for taking meter readings together with the team of technology provider and regular calibration of meters
Record keeping and archiving	Team Leader, Corporate Sustainability Cell, JISL	Responsible for all CDM related activities, including archiving of monitored data.

The description of the monitoring plan is furnished below:

As per the purchase order placed for the WTG, Vestas will operate and maintain the WTG.

The proposed scope of work of Vestas includes:

i. Monitoring the functioning of the metering arrangements and getting them calibrated as per the TNEB norms, so that the accuracy and reliability levels are maintained.
ii. Ensure monthly recording of the generation particulars by the TNEB authorities.
iii. Obtaining and archiving the generation certificates properly for aggregation at the required intervals.

Data Collection procedures:
The data collection procedure for estimation of emission reductions is furnished below:

a. There is a trivector energy meter installed adjacent to the WTG at the site. The meter is of 0.5 accuracy class.

b. Monthly recording of the electricity supplied by the WTG is done by the representatives of the Project Participant and the Tamil Nadu Electricity Utility (TNEB).

c. Based on this monthly recording of the electricity generated by the WTG, TNEB generates and submits to the Project Participant, the 'monthly statement showing the energy generated through the wind mill'. This statement shows the date of initial and final reading, values of export and import of electricity and net generation.

d. The Project Participant , based on this monthly statement , prepares the invoice and submits it to the TNEB for release of payment.

e . The cross checking will be carried out with invoices/ receipts, which indicates the payment made by the TNEB to the Project Participant for the net electricity delivered by the Project Activity to the grid.

Internal Audit:
Internal audit will be conducted for every six months by the team leader, Corporate Sustainability Cell, JISL. The audit includes verification of data viz., Statement showing the Energy Generated through wind mill issued by Tamil Nadu Electricity Board (TNEB), billed units as per bills raised to TNEB etc., and cross checking of payment receipts with monthly statement of energy generated which will be submitted by the O & M Contractor every month. The internal audit report will be furnished to the board of directors for their review.

Emergency procedure for monitoring system:
The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. However, in case monitoring equipments get failed or found faulty, they shall be rectified or replaced immediately by TNEB officials. The common problem being faced is with display and the reading can be retrieved after rectifying the display problem.
If difference between the readings of main and check meter vis-à-vis main meter reading exceeds twice the percentage error, both meters will be tested and the one found defective will be replaced and reading of the other will be considered. If both main and check meters found to have errors beyond permissible limits, the bill will be revised for the previous 3 months or as agreed by both TNEB and project proponent by applying correction as determined by the meter testing wing of transmission utility / distribution licensee to the reading registered by the meter with less error. However, for the estimation of CERs the corrections will be applied till the last calibration date.

Procedure for data apportioning in case the dates of the monitoring period do not match with the dates of the billing cycle
In case monitoring period does not match with the dates of initial and final readings of Statement showing Energy Generated through wind mill issued by TNEB, the emission reductions of that particular period will be calculated based on the apportioning procedure as described below.

The apportioning of the net exported electricity from the WEG would be done by multiplying the net electricity exported as per the Statement showing the Energy Generated through wind mill issued by Tamil Nadu Electricity Board and the ratio of the WEG controller readings of the intervening period. The sample calculation is furnished below:

Generation at WEG Controller (MWh)
(for the intervening period) = A

Total generation at WEG Controller (MWh) = B
(Total generation of particular month)

C = Ratio of A & B = A/B*100

Generation as per statement showing energy generated
issued by TNEB (MWh) Generation report = D

Generation used for calculation of emission reduction
Calculations for the intervening period (MWh) = (D * C/100)

The same procedure will be followed if the mismatch occurs at the end of the crediting period.

Calibration procedure:
The energy meter will be calibrated once in a year as per the terms of Energy Purchase Agreement executed with TNEB. The permissible variation in the meter is +/- 0.5% (applicable for TVM meter) and +/- 0.2% (applicable for ABT meter). If the variation is more than the permissible limit, the defective meter will be replaced /rectified by electricity board with new one. Generation will not be taken into account for that particular period.

Data storage and archiving:
All of the above parameters monitored under the monitoring plan would be kept for 2 years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. The data viz., the monthly statements showing the energy generated through wind mill issued by Tamil Nadu Electricity Board (TNEB), sales invoices raised on the utility, bank statement etc., will be archived electronically and in hard copy and kept in safe storage.

Personnel training:
In order to ensure a proper functioning of the project activity and a properly monitoring of emission reductions, the staff will be trained. The Engineer O & M, Section In-charge and Site In-charge O & M will be trained in equipment operation, data recording, operation and maintenance and emergency procedures in compliance with the monitoring plant.

QA/QC procedures:
The project would employ latest state-of-the-art microprocessor based on high accuracy of 0.5 class (applicable for TVM meter) and 0.2 class (for ABT meter) metering equipment. Hence, high quality of data monitoring system would be ensured. The meters are calibrated by TNEB at-least once in three years; which is in-line with UNFCCC guidelines which say that meters have to be calibrated at-least once in three years[21]. Records of calibration certificates will be maintained for verification. Hence, high quality is ensured with the above parameters.
Sales records would be used and kept for checking consistency of the recorded data. The sales records are basically the invoices raised and the payment received from the utility for power exported to the grid.

Schedule of replacement of TVM meters by ABT meters:

S No.	WEG HTSC No.	OLD METER NO	NEW ABT METER NO	METER REPLACED ON
1	**T-21**	05031948	13192367	16.07.2013
2	**T-22**	04961984	13192442	16.07.2013
3	**T-23**	04961987	13192437	16.07.2013
4	**T-24**	04961989	13191918	21.05.2013
5	**T-25**	05031949	13192455	16.07.2013
6	**T-26**	04961988	13192480	16.07.2013
7	**T-27**	TN902473	HT02120276	26.05.2012
8	**T-28**	04961982	13192538	16.07.2013

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>
12/05/2009 (Date of PO of the WTGs)

[21] http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf ,Para17, Page5

C.1.2. Expected operational lifetime of project activity
>>
20 years from the date of commissioning[22]

C.2. Crediting period of project activity
C.2.1. Type of crediting period
>>
Fixed

C.2.2. Start date of crediting period
>>
15/11/2012 (or the date of complete submission of the project activity to UNFCCC by the DOE, whichever is later)
C.2.3. Length of crediting period
>>
10 years 0 months

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts
>>
Generation of electricity using wind power is a clean process and does not involve any type of emissions during its operations. There are no significant environmental impacts of the project activity.

Furthermore, as per the EIA notification number S.O. 1533[23], the generation of electricity using WTGs does not require a prior EIA assessment.

Apart from that, the project proponent has acquired all the necessary consents and approvals required for the installation and operation of the WTG. PP has obtained approval for installation of WTGs from TNEB and the copy of the same has been provided to DOE for assessment during validation.

SECTION E. Local stakeholder consultation
E.1. Solicitation of comments from local stakeholders
>>
It is to be noted that the present project activity is also applying for Gold Standard.
The following stakeholders affected/likely to be affected were identified by the project proponent:

- Villagers living in the vicinity of the project activity. Some of them have been hired as the security personnel (approximately 8 in number)
- Employees working in the related offices.
- Panchayat members of the villages
- Local NGOs (Dhan foundation, Sevanilayam, etc) and Self Help groups working in the area

Through the newspaper advertisement (dated 06/01/2010) in Dina Malar and Daily Thanthi, PP had expressed its plan to develop the proposed wind power project as a CDM project activity (Gold Standard Project) and invited stakeholders to offer their valuable suggestions to re-align the project to suit the region's priorities. PP has also sent invitation letters to various stakeholders for meeting on 14/01/2010. In line with the advertisement and invitation letters, a meeting was held with the stakeholders as per the

[22] Operational life of the WTG, in line with the technical spec sheet supplied. Please refer page12.
[23] http://envfor.nic.in/legis/eia/so1533.pdf

published date and venue in the news paper advertisement on 30/01/2010 at Okkaraipatty village, Theni district, Tamil Nadu. The local stakeholders were also invited through public notice.

The stakeholders were explained about the project activity and the various benefits arising out of the project activity. A discussion was held in which the views of the local stakeholders were addressed. The reporters from various daily magazines, listed as below, covered the programme:

- Dinamalar
- Dinathanthi
- Dinakaran among others
- SUN TV state Television

All the comments received from local stakeholders, responses provided by PP and outcome of the meeting have been documents in the minutes of meeting.

E.2. Summary of comments received

>>

The local stakeholders expressed satisfaction on the project activity. They were happy about the fact that local people gained employment at the sites, improving the financial conditions. The villagers appreciated the fact that roads have been constructed in the area, making the area more accessible. The stakeholders expressed that the activities have improved the business in the area and the financial condition of the villages has improved.

Following comments were received from stakeholders:-

Comment 1 by Narayanasamy: -What is meant by carbon trading?
Response from PP:- In developed countries, emissions are high. They are unable to reduce C02 emissions after a certain level. So they are giving & helping developing countries to reduce emission as emissions are not bound by geographical boundaries.

Comment 2 by Narayanasamy:- Is there any agriculture contribution in carbon trading?
Response from PP:-The data collection in agriculture is difficult. So the data in agriculture contribution for carbon trading is less.

Comment 3 by Jeyaram, Dinathanthi:- What will be the benefits given to village people due to wind mill installation?
Response from PP:- The benefits which are going to be provided by JISL to the local people will be decided after the detailed discussion with the village heads. JISL has plans to initiate further developmental activities in the region under a world level scheme of Gold Standard CDM wind power Project .The main objective of the Standard is to promote sustainable developmental activities such as Development of the school library, Scholarship to meritorious girls students , Distributing books & Notebooks for students in local panchayat run schools , Improvement in IT facilities of local school, Free medical checkups camps, eye check up for the villagers and students staying close to Identifying NGO's, Self Help Group (SHG) and join hands with them in completion of any of their on-going projects or New projects for under village development programme such as Solar lantern ,Women self employment irrigation, Rain water harvesting ,sustainable agriculture practices, Public sanitation etc.

Comment 4 by Seetharaman:- 40 ft length earth rods are used to give earth connection for wind Our people have thought that chances are there to deplete the groundwater. Is it true?
Response from PP:- It is a wrong thought. There is no connection between earth rod installation and ground water depletion. The earthings are given to drain the excess electrical load into the earth. Similar

earthings are also given to all tall buildings many mega projects that we have in already. Hence this myth is baseless. Even the village temple where the dome was constructed has earthing given.

Comment 5 by Laxumaan, Professor and Head, Seva Nilayam, NGO:- Is there any possibility to supply the electricity produced from wind mill at subsidized rate to the local people?
Response from PP:- TNEB is the authorized organization for selling of electricity. The companies which are producing the electricity using wind mill should supply power to grid or wheel power from grid for captive consumption purpose. TNEB can supply power to rural areas under various government schemes.

Comment 6 by Nagarajan, Farmer:- What is the purpose of the meeting? Will JISL do any agricultural development activities to local people? Can JISL give any technology support pertaining to agriculture? Can JISL establish a factory pertaining to agriculture and subsequently can JISL arrange for any employment opportunities to local people?
Response from PP:- JISL has been giving priority only to the local people for employment opportunity in JISL Udurnalpet farm. Similarly JISL will give priority only to the local people for employment opportunity in the upcoming Banana Farm at Chinnamanoor area. Cashew plantation is more in okkaraipatty village. So there may be a chance to establish a cashew processing unit.

Comment 7 by Shanmugam, farmer:- Is there any possibility to manufacture wind operated pump for agricultural use?
Response from PP:- The R&D is already being carried out. Now, 2 HP pumps are available. But it costs around 0.5 million. The R&D is being carried out to manufacture pumps with capacity of 5 HP or more at low cost.

The meeting ended with a Vote of Thanks by Tamilselvan.

E.3. Report on consideration of comments received

>>

No negative reports were received on the project activity. The queries raised by the villagers were satisfactorily answered by the PP. The same has been duly documented in the minutes of the meeting and submitted to DOE for the cross-check during validation

SECTION F. Approval and authorization

>>

A letter of approval reference no. 4/16/2010-CCC dated 14/03/2011 received from the host party DNA has been obtained for the project activity and is submitted to the DOE for its validation.

- - - - -

Appendix 1: Contact information of project participants

Organization	Jain Irrigation Systems Limited
Street/P.O. Box	Jain Energy Park, Jain Valley, Shirsoli Road
Building	P.O. Box – 20
City	Jalgaon
State/Region	Maharashtra
Postcode	425001
Country	India
Telephone	+91-257-2258011
Fax	+91-257-2258111
E-mail	-
Website	http://www.jains.com/
Contact person	
Title	Team Leader
Salutation	Mr.
Last name	Deshmukh
Middle name	
First name	Santosh
Department	Corporate Sustainability Cell
Mobile	+91-9403080103
Direct fax	+91-257-2258111
Direct tel.	+91-257-2258011
Personal e-mail	deshmukh.santosh@jains.com

Appendix 2: Affirmation regarding public funding

No public funding is available for the project activity. The project proponent has used loans from financial institutions and its internal funds for the project activity.

Appendix 3: Applicability of selected methodology

The applicable approved baseline and monitoring methodology for the Project Activity is the AMS-I.D "Grid Connected Renewable Electricity Generation" (Version 17, EB 61) and has been referred from the approved methodologies for small-scale CDM project activities in the UNFCCC web site viz.,

http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

The applicability of the selected methodology is provided in detail in Section B.2 of the PDD. No further information is added to the same.

Appendix 4: Further background information on ex ante calculation of emission reductions

The project activity uses the data published by Central Electricity Authority of India to calculate the grid emissions factor[24].

Operating margin for the Southern grid:

Simple OM	Southern Grid	Generation
2006-07	0.99912	109116.38
2007-08	0.99062	114701.74
2008-09	0.97292	121471.25
Generation weighted Average	**0.98708**	

Build Margin for the Southern grid:

BM	Southern Grid
2008-09	0.81792

Combined Margin for the Southern grid (as calculated):

Parameter	Southern grid
OM, Operating Margin	0.98708
BM, Build Margin	0.81792
CM, Combined Margin (tCO_2/ MWh)	**0.94479**

[24] CEA database, version 5, http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Appendix 5: Further background information on monitoring plan

Refer to Section B.7 for details of monitoring information.

Appendix 6: Summary of post registration changes

The Project activity was conceptualised with 7 WTGs (T-21 to T27) supplying electricity and one (T-28) wheeling to the Southern Grid. The capacity of each WTG installed under project activity was 1.65 MW resulting into total capacity of 13.2 MW. The project got commissioned between 25/08/2009 (T21 to T27) and 26/09/2009 (T28) as per the project description mentioned in the PDD. The project continued to supply electricity by 7 wind mills and wheel by one wind mill till 2nd August 2011. After the said date one more WTG from project (i.e. T27) started wheeling electricity for captive consumption at JISL's own facility at Udumalpeth. In the changed scenario the capacity of the project activity remained unaffected, moreover, the project still continued to export electricity to Southern Grid (6 WTGs) and also wheeled the electricity (2 WTGs). No changes in the physical set up or monitoring plan occurred, also the project remains additional in changed scenario as assessed by DOE during validation[25]. The Post Registration Changes in Project design are requested along with the request for issuance during first verification (from 15/11/2012 to 10/07/2013).

- - - - -

History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change history box by adding EB meeting and annex numbers in the Date column.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for small-scale CDM project activities" (EB 66, Annex 9).
03	EB 28, Annex 34 15 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.
02	EB 20, Annex 14 08 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
01	EB 07, Annex 05 21 January 2003	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		

[25] Please refer revised IRR sheet for revised IRR analysis