Project design document form
(Version 11.0)

BASIC INFORMATION	
Title of the project activity	Grid Connected Wind Power Project in Tamil Nadu.
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	09
Completion date of the PDD	06/09/2020
Project participants	M/s CLP Wind Farms (India) Private Limited
Host Party	India
Applied methodologies and standardized baselines	Methodology: Grid-connected electricity generation from renewable sources, ACM0002, Version 20, EB 105
Sectoral scopes	Sectoral Scope 1: Energy Industries (renewable - /non-renewable sources)
Estimated amount of annual average GHG emission reductions	113,643 tCO_{2e} / annum

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The project is being implemented by CLP Wind Farms (India) Private Limited ("**CLP**") in the state of Tamil Nadu. The Wind Turbine Generators ("**WTG**") have been supplied by Vestas Wind Technology India Private Limited ("**Vestas**"). Vestas will be responsible for technology and equipment supply, as well as the operation and maintenance of the WTGs.

The proposed project activity involves generation of electric power using WTG. The objective of the project activity is to commission and operate a wind farm of 49.5 MW ("the Project") in the Indian state of Tamil Nadu. The electricity generated from the wind farm will be exported to the Integrated Indian electricity grid. Distribution Licensee thereby marginally contributing towards reduction in the energy demand supply gap in the state of Tamil Nadu, diversification of grid supply and reduction of greenhouse gas emissions. Initially, the Indian electricity system is divided into two regional grids, the synchronous Northern, Eastern, Western, and North Eastern (NEWNE) grid and the Southern grid. Each grid covers several states. However, Govt. of India has decided to integrate all the regional grid systems and thus, regional grids are not existed now. Thus, now the project activity is connected to Integrated Indian Grid system..

Nature of Project

The project activity entails the installation and operation of 30 WTGs (Model V-82) supplied by Vestas. Each WTG is having a rated capacity of 1.65 MW. The generated power will be supplied to the high voltage electrical grid through Kamachipuram 110 kV/33-22kV substation. The power will be sold under a power purchase agreement ("**PPA**") to Tamil Nadu Electricity Board ("**TNEB**").

Project technology

The equipments that form part of the project boundary are enlisted below:

Table A.1: Project Technology

S. No	Equipment	Specifications
1.	WTG	30 WTG of 1.65 MW each supplied by Vestas. Model No. V-82

The project technology has been provided in detail under section A.4.

Project Boundary:

The Indian electricity system is an integrated grid system now which encompasses all regional grids, viz Northern, Eastern, Western, and North Eastern (NEWNE) grid and the Southern grid (SR Grid). Each grid covers several states. The project activity is connected to Integrated Indian Grid and this has been considered as the project boundary.

Baseline Scenario:

In accordance with ACM0002, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as

reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" (version 17, EB 100).

The project activity involves installation of wind power plant at locations where no renewable power plant was operated prior to the implementation of the project activity (green-field plant). Hence, pre-project scenario and baseline scenario are the same.

The project will replace anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 113,643 tCO2e per year, thereon displacing 120,650 MWh/year amount of electricity from the generation-mix of power plants connected to the Indian electricity grid, which is mainly dominated by thermal/ fossil fuel based power plant. The estimated emission reductions over the 7 years renewable crediting period would be 795,501 tCO2e.

Contribution to greenhouse gas (GHG) emissions reduction

The project activity harnesses wind energy to generate and supply electricity to the IntegratedIndian Grid. The Project displaces non-renewable fossil fuel based electricity that would have otherwise been generated by the operation and expansion of the fossil fuel based power plants in the Integrated Indian Grid. The Project thereby leads to reduction in emission of GHGs associated with fossil fuel based electricity generation and enables sustainable economic and environmental development.

The views of the project participant on the contribution of the project activity to sustainable development

The National CDM Authority ("**NCDMA**") which is the Designated National Authority ("**DNA**") for the Government of India (GoI) in the Ministry of Environment and Forests ("**MoEF**") has stipulated four indicators for sustainable development in the interim approval guidelines for Clean Development Mechanism ("**CDM**") projects from India[1]. The contribution of this project activity to these four indicators is provided below:

1. **Social well-being:**
   - The project activity will have positive impacts through direct and indirect employment in India. At the local level, the project activity will lead to the creation of skilled and unskilled jobs throughout the construction and ongoing operation and maintenance of the project. At a national level, employment in turbine and balance of plant component manufacturing will be promoted.
   - The project activity in its execution will lead to development of infrastructure in the region and at the same time promote business in the region through the improvement in electricity generation capacity of the grid.

2. **Environmental well-being:**
   - The project activity will generate electricity using a zero-carbon renewable energy source. This will avoid the air quality impacts and emissions of gaseous, liquid and/or solid effluents/wastes associated with fossil-fuel combustion.
   - The project will help in conserving natural resources including land, forests, minerals and ecosystems that are impacted by traditional forms of power generation. For example, unlike both fossil-fuel and nuclear generation, wind energy does not require

[1] Source: http://www.cdmindia.gov.in/approval_process.php

the use of water for cooling and therefore eliminates a strain on local freshwater resources.

3. **Economic well-being:**
   - Use of a renewable source of energy reduces the dependence on imported fossil fuels and associated price variation thereby leading to increased energy security.
   - It will also narrow the existing electricity supply gap in the State of Tamil Nadu.
   - The project activity requires temporary and permanent, skilled and semi-skilled manpower at the Project site; it will also create additional employment opportunities from new business development.
   - The project activity leads to an investment in the region accompanied with business and employment benefits along with improvement of grid supply which otherwise would not have happened in the absence of project activity.
   - The clean electricity generated through wind power by the project activity would be fed into the Integrated IndianGrid thereby improving the grid frequency and availability of electricity in the region. This would provide a better scenario for local industries and businesses to improve their production capacities thereby contributing towards the overall economic development of the region

4. **Technological well-being:**
   - Increased interest in wind energy projects will further push R&D efforts by technology providers to develop more efficient and better machinery in future and hence encourage project investors towards investment in the sector.
   - The project activity uses WTGs for large scale power generation thereby demonstrating the viability of wind based renewable energy generation in the region, which is fed into the nearest sub-station (part of the Integrated Indian Grid), thus increasing energy availability and improving quality of power under the service area of the substation. Hence the Project leads to technological well being.
   - The project proponent will contribute 2% of the net revenue realized from sale of Certified Emission Reductions (CERs) arising from this CDM Project towards sustainable development including initiatives towards society / community development in line with the measures indicated in the sections above.

A.2. Location of project activity

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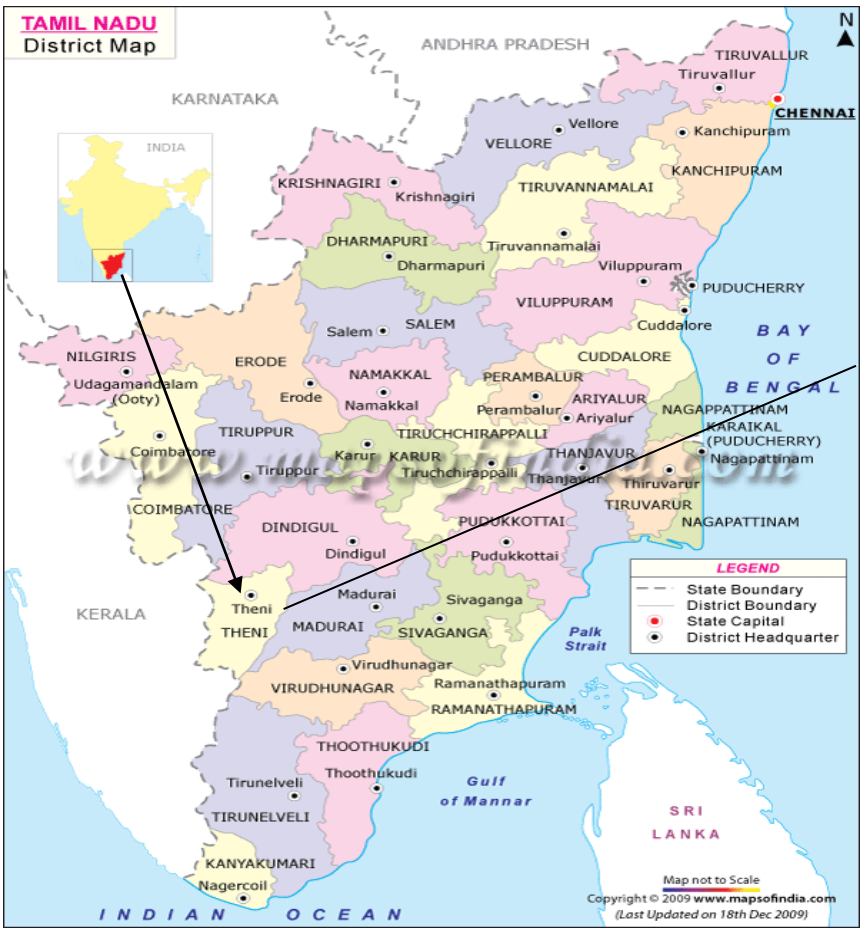
The Project is (all 30 WTGs) located in Theni District, Tamil Nadu, India.

Village: Jangalpatti, Poomalaikundu, Govindanagram & Seepalakottai
Taluka: Theni & Uttamaplayam
District: Theni

Project Location Map:



Project Site

The locational spread of the project is as follows:

Sr No.	Loc No.	Village	Taluk	District	HTSC No.	DOC	Latitude	Longitude
1	TPK 746	Poomalaikundu	Theni	Theni	WEG T 53	24-Mar-2010	N77°27'29.01"	E9°53'48.72"
2	TPK 569	Poomaaikundu	Theni	Theni	WEG T 54	24-Mar-2010	N77°27'22.27"	E9°54'00.71"
3	TPK 664	Poomalaikundu	Theni	Theni	WEG T 61	24-Mar-2010	N77°26'42.04"	E9°52'39.96"
4	TPK 397	Poomalaikundu	Theni	Theni	WEG T 55	24-Mar-2010	N77°26'57.69"	E9°55'14.05"
5	TPK 642	Poomalaikundu	Theni	Theni	WEG T 60	24-Mar-2010	N77°27'10.13"	E9°53'28.95"
6	TPK 369	Poomalaikundu	Theni	Theni	WEG T 56	24-Mar-2010	N77°26'40.99"	E9°54'43.89"
7	TJP 120	Jangalpatti	Theni	Theni	WEG T 51	24-Mar-2010	N77°28'15.04"	E9°54'02.40"
8	TPK 101	Poomalaikundu	Theni	Theni	WEG T 58	24-Mar-2010	N77°25'59.63"	E9°54'15.04"
9	TPK 336	Poomalaikundu	Theni	Theni	WEG T 57	24-Mar-2010	N77°26'35.01"	E9°54'16.47"
10	TJP 258	Jangalpatti	Theni	Theni	WEG T 63	24-Mar-2010	N77°28'35.18"	E9°53'34.44"
11	TPK 757	Poomalaikundu	Theni	Theni	WEG T 52	24-Mar-2010	N77°27'48.47"	E9°53'54.27"
12	TPK 772	Poomalaikundu	Theni	Theni	WEG T 62	24-Mar-2010	N77°28'04.62"	E9°53'32.52"
13	TPK 139	Poomalaikundu	Theni	Theni	WEG T 59	24-Mar-2010	N77°25'22.51"	E9°53'28.33"
14	TGN 147	Govindhanagaram	Theni	Theni	WEG T 85	18-May-2010	N77°29'44.58"	E9°55'20.08"
15	TGN 241	Govindhanagaram	Theni	Theni	WEG T 84	18-May-2010	N77°29'23.42"	E9°54'41.52"
16	TPK 58	Poomalaikundu	Theni	Theni	WEG T 127	29-Jul-2010	N77°26'16.84"	E9°54'52.23"
17	TJP 247	Jangalpatti	Theni	Theni	WEG T 135	29-Jul-2010	N77°28'54.39"	E9°53'19.14"
18	TJP 391	Jangalpatti	Theni	Theni	WEG T 133	29-Jul-2010	N77°28'35.14"	E9°52'32.08"
19	TPK 520	Poomalaikundu	Theni	Theni	WEG T 124	29-Jul-2010	N77°27'59.91"	E9°54'45.33"
20	TPK 221	Poomalaikundu	Theni	Theni	WEG T 110	2-Jul-2010	N77°26'10.50"	E9°52'46.15"

Sr No.	Loc No.	Village	Taluk	District	HTSC No.	DOC	Latitude	Longitude
21	TPK 130	Poomalaikundu	Theni	Theni	WEG T 129	29-Jul-2010	N77°25'37.12"	E9°53'52.07"
22	TPK 603	Poomalaikundu	Theni	Theni	WEG T 126	29-Jul-2010	N77°27'00.05"	E9°54'29.73"
23	TSK 447	Seepalakottai	Uttamaplay am	Theni	WEG T 131	29-Jul-2010	N77°27'22.31"	E9°52'36.71"
24	TPK 108	Poomalaikundu	Theni	Theni	WEG T 128	29-Jul-2010	N77°25'34.54"	E9°54'07.38"
25	TPK 529	Poomalaikundu	Theni	Theni	WEG T 125	29-Jul-2010	N77°27'31.72"	E9°54'30.80"
26	TJP 78	Jangalpatti	Theni	Theni	WEG T 123	29-Jul-2010	N77°28'35.82"	E9°54'08.24"
27	TJP 198	Jangalpatti	Theni	Theni	WEG T 136	29-Jul-2010	N77°29'16.57"	E9°53'23.69"
28	TJP 324	Jangalpatti	Theni	Theni	WEG T 134	29-Jul-2010	N77°28'51.89"	E9°52'56.42"
29	TSK 470	Seepalakottai	Uttamapla yam	Theni	WEG T 132	29-Jul-2010	N77°28'10.93"	E9°52'32.26"
30	TPK 228	Poomalaikundu	Theni	Theni	WEG T 130	29-Jul-2010	N77°26'27.69"	E9°52'59.62"

The nearest railway station and airport from project activity site is Madurai, which is approximately 75 km from the project site.

A.3. Technologies/measures

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The project activity involves 30 WTGs of 1.65 MW capacity each of Vestas make. The WTGs are supplied by Vestas, which is considered to be one of the leading manufacturers of site-specific WTGs. The technical specifications of these 1.65 MW WTG are provided in the table below.

Table A.3: Technical Specification of Vestas 1.65 MW WTG Model V-82

TECHNICAL DESCRIPTION	SPECIFICATION
Rotor Diameter	82 m
Hub Height	78 m
Power regulation	Active-Stall®
Air Brake	Full blade pitch by three separate hydraulic pitch cylinders.
Nominal Revolutions	14.4 rpm
Rated voltage	690V
Generator	
Type of generator	Asynchronous water cooled
Rated power output	1650 kW
Rotor	
No of blades	3
Swept area	5,281 m^2
Control	
Type	Microprocessor-based monitoring of all turbine functions with the option of remote monitoring. Output regulation and optimization via Active-Stall
Operational Data	
Cut- in wind speed	3.5 m/s
Nominal wind speed	13 m/s
Cut-out wind speed (10	20 m/s
Gearbox	
Type	Planetary/helical stages

These WTGs generate power at 690 V which is then stepped up to 33 kV through 3 phase transformers located near the WTG. The metering point is located near each of the 30 WTGs of the project activity. A TNEB meter is located near each WTG where the Joint Meter Reading is taken. The electricity generated by the project activity is supplied to the Integrated IndianGrid through Kamachipuram 110kV/33-22kV Substation[2]

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of India (host Party)	M/s CLP Wind Farms (India) Private	No

A.5. Public funding of project activity

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No public funding or Official Development Assistance (ODA) has been used on this project activity.

A.6. History of project activity

>>
The project activity has neither applied before for registration as a CDM project activity nor included as a component project activity (CPA) in a registered CDM programme of activities (PoA);

A.7. Debundling

>>
Not applicable

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

>>
The approved consolidated baseline and monitoring methodology ACM0002 (Version 20, EB105)[3], has been used to determine the baseline emissions and emission reduction due to the project activity. The title of this baseline methodology is "Grid-connected electricity generation from renewable sources". The other UNFCCC documents referred are as below:

- Tool for the demonstration and assessment of additionality (Version 06.0.0, EB 65)
- Tool to calculate the emission factor for an electricity system (Version 7.0, EB 100)
- Guidance on assessment of investment analysis (05, EB 62)
- Guidelines on demonstration of and assessment of prior consideration of the CDM (Version 04, EB
- Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (ver 3.0.1, Annex 47 of EB 66)

B.2. Applicability of methodologies and standardized baselines

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[2] Explained in detail in section B.2

[3] https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG

This methodology is applicable to grid-connected renewable power generation project activities under the following conditions:

Table B.1 Justification for the choice & applicability of the methodology

S.N.	Applicability conditions of ACM0002	Project under consideration
1.	This methodology is applicable to grid-connected renewable energy power generation project activities that: a) Install a Greenfield power plant; b) Involve a capacity addition to (an) existing plant(s); c) Involve a retrofit of (an) existing operating plants/units; d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or e) Involve a replacement of (an) existing plant(s).)/unit(s)	The project activity is installation of Wind power plant at locations where no renewable power plant was operated prior to the implementation of the project activity (green-field plant). The proposed project activity is a Greenfield, grid connected renewable power project. The project activity uses renewable wind source to generate electricity that will be fed into the Indian grid. In the absence of the project activity this power would have been produced by the current grid generation mix which is predominantly fossil fuel based, thus the project activity meets this criterion.
2.	The methodology is applicable under the following conditions: a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects) the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the	The proposed project activity involves the installation of a new greenfield wind power generation plant. Therefore, the project activity is satisfying the said criteria.

S.N.	Applicability conditions of ACM0002	Project under consideration
	start of this minimum historical reference period and the implementation of the project activity.	
3.	In case of hydro power plants, one of the following conditions shall apply[4]: a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density, calculated using equation (7), is greater than 4 W/m2; or c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (7), is greater than 4 W/m^2; or d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (7), is lower than or equal to 4 W/m^2, all of the following conditions shall apply: I. The power density calculated using the total installed capacity of the integrated project, as per equation (8), is greater than 4 W/m^2; II. Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; III. Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 shall be: a) Lower than or equal to 15 MW; and b) Less than 10 per cent of the total installed capacity of integrated hydro power project.	Not applicable as the proposed project activity involves electricity generation by installation of a wind power generation plant/unit. As the criteria are related to hydro power project, therefore, the said criteria are not applicable.

[4] Project participants wishing to undertake a hydroelectric project activity that results in a new reservoir or an increase in the volume of an existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology.

S.N.	Applicability conditions of ACM0002	Project under consideration
4.	In the case of integrated hydro power projects, project proponent shall: a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore, this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum of five years prior to the implementation of the CDM project activity.	Not applicable as the proposed project activity involves electricity generation by installation of a wind power generation plant/unit. As the criteria are related to hydro power project, therefore, the said criteria are not applicable.
5.	The methodology is not applicable to: a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; b) Biomass fired power plants/units	The proposed project activity involves installation of a wind power plant. As the given criteria. are related to switching from fossil fuel and biomass fired power plants, therefore, the said criteria are not applicable.
6.	In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual	The proposed project activity involves the installation of a new wind power plant. Hence, this is a greenfield project. Thus, criterion is not relevant to the project activity, thus, not applicable.

S.N.	Applicability conditions of ACM0002	Project under consideration
	maintenance".	
7.	In addition, the applicability conditions included in the tools referred to below apply.	Please refer tables below:

Tool to calculate the emission factor for an electricity system - Version 07.0 (EB 100, Annex 04)

Applicability Criteria	Project Case
This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	The project is a grid connected Greenfield wind power project and thus the tool is applicable.
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option II.a and option II.b. If option II.a is chosen, the conditions specified in "Appendix 2: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	Steps involved in calculation of Emission Factor are included in section B.6.1 of the PDD as per the requirement of the tool.
In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	Project is located in non-Annex I country and hence the tool is applicable
Under this tool, the value applied to the CO2 emission factor of bio fuels is zero.	The project is a wind project and there is no involvement of biofuels

In light of the above discussion it can be stated that the present project activity is in compliance with the applicability condition stipulated in the approved consolidated baseline and monitoring methodology ACM0002, Version 20.

B.3. Project boundary, sources and greenhouse gases (GHGs)

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According to ACM0002 for the baseline emission factor, the spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

Initially, the Indian electricity system is divided into two regional grids, the synchronous Northern, Eastern, Western, and North Eastern (NEWNE) grid and the Southern grid (SR Grid). Each grid covers several states. However, Govt. of India has decided to integrate all the regional grid systems and thus, regional grids are not existed now. Thus, now the project activity is connected to Integrated Indian Grid and this has been considered as the project boundary.

Power generation and supply is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Depending on the demand and generation, there are electricity exports and imports between states in the Indian grid. A small power exchange also takes place with neighbouring countries like Bhutan and Nepal.

The project activity is located in the state of Tamil Nadu which is connected to the Integrated Indian Electricity Grid. The Electricity Grid represents the “electricity system” of the project. Accordingly, the project boundary encompasses the physical extent of the Integrated Indian grid which includes the project sites and all power plants connected physically to the electricity system.

Table B.3: Sources and gases included in the Project Boundary

	Source	GHG	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source. The project activity is aimed at displacing the grid power, and thus reducing the CO2 emissions resulting from the power generation.
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project activity	Electricity generation from the wind power Project	CO_2	No	Not applicable for wind projects
		CH_4	No	Not applicable for wind projects
		N_2O	No	Not applicable for wind projects

Since the proposed project activity is a wind power project according to the methodology, the baseline emission sources are limited to the CO2 emissions from the power plants displaced by the project activity.

The flow diagram clearly demarcating the project boundary of the proposed project activity is as under:

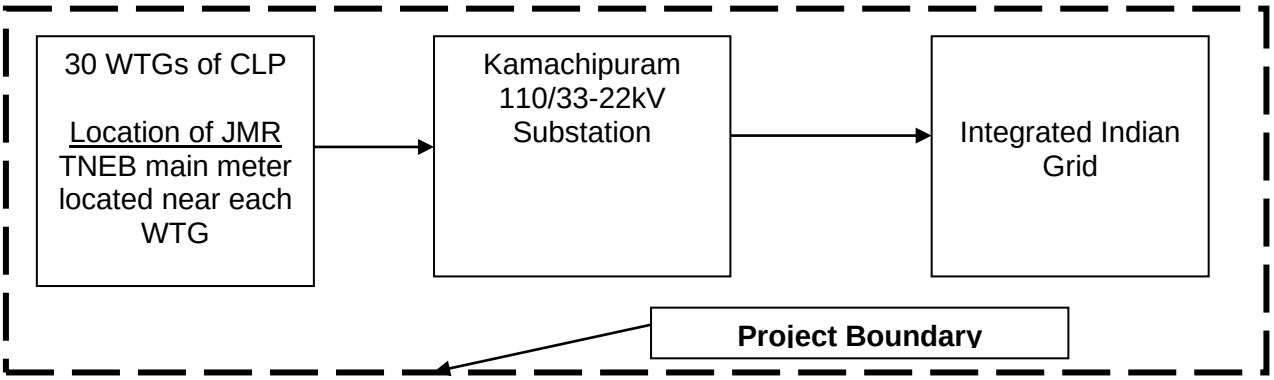

Fig. B.1: Representation of the Project Boundary

B.4. Establishment and description of baseline scenario

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The proposed project is located in the state of Tamil Nadu, which is a part of Integrated Electricity Grid of the Indian electricity system. Generated power from the project activity will be exported to the integrated Indian Electricity Grid. The proposed project activity is the installation of a new wind power project and is not a modification/retrofit of an existing grid-connected renewable power plant/unit. Thus, the methodology ACM0002 Version 20 clearly states that if the proposed project activity is the installation of a new grid-connected renewable power unit/plant, the baseline scenario is the following:

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

In the absence of the proposed CDM project activity the electricity delivered to the grid by the project would be generated in the future by the continued operation of grid-connected power plants and by the addition of new generation sources to meet the existing and future power requirement.

Accordingly, the baseline is all the generation sources connected to the Integrated Indian grid to which the power generated by the proposed project activity would be exported. This consists of the existing grid mix along with newly built additions to the grid and is calculated based on data published by the Central Electricity Authority, Government of India under the CO_2 Baseline Database (Version 15.0) [5].

In line with the "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (EB66 Annex 47), the demonstration of the validity of the original baseline or its update does not require a reassessment of the baseline scenario, but rather an assessment of the emissions which would have been resulted from that scenario. The "CDM project standard for project activities" (Version 02.0) states in paragraph 284 that project participants shall assess and incorporate the impact of national and/or sectoral policies and circumstances existing at the time of requesting renewal of the crediting period, on the current baseline GHG emissions, without reassessing the baseline scenario.

[5] http://cea.nic.in/tpeandce.html

As such and in accordance with above Tool and ACM0002 version 20, the "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" is applied for the demonstration of the validity of the current baseline;

Step 1: Assess the validity of the current baseline for the next crediting period

The validity of the current baseline is assessed using the following sub-steps:

Step 1.1: Access compliance of the current baseline with relevant mandatory national and/or sectoral policies

The Project has received necessary approvals for development and commissioning for wind project from the state nodal agencies and is in compliance to the local laws and regulations. The Project activity conforms to all the applicable laws and regulations in India, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution. The project activity comes under white category, thus there shall be no necessity of obtaining the Consent to Operate'' for White category of industries. Since project activity falls under white category and the non-polluting nature of project fulfils the compliance to the local laws and regulations.

The relevant national laws and regulations pertaining to generation of energy in India are:

- Electricity Act 2003
- National Electricity Policy 2005
- Tariff Policy 2006

The Project activity conforms to all the applicable laws and regulations in India:

- Power generation using renewable energy is not a legal requirement or a mandatory option
- There are state and sectoral policies, framed primarily to encourage Renewable power projects
- These policies have also been drafted realizing the extent of risks involved in the projects and to attract private investments
- The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation
- There is no legal requirement on the choice of a particular technology for power generation

Thus, the project is in compliance with laws and regulations required. There is no mandatory requirement to implement the project activity. Thus, the present national and/or sectoral policies and circumstances toward installation of any electricity generation is similar compared to at the time of project registration. Thus, baseline of this project has not changed.

Step 1.2: Assess the impact of circumstances

An assessment of the impact of circumstances exists at the time of requesting renewal of the crediting period on the current baseline emissions has been conducted, without reassessing the baseline scenario. The emission factor for the Indian grid as well as the current grid matrix in the

country has been revised. Accordingly, Baseline CO2 Emission Database, Version 15, published by Central Electricity Authority (CEA), Government of India has been used for estimation of baseline emissions.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

Since the project activity is a Greenfield project with a life time of 20 years, the baseline scenario identified during the validation of the project was electricity generation in power plants which are connected to Indian Integrated grid, that are displaced due to the project activity and was not the continued use of the current equipment(s) or investment for the crediting period of which the renewal is being requested. Hence this sub step is not applicable for this project activity.

Step 1.4: Assessment of the validity of the data and parameters

The emission factor for the grid as well as the current grid matrix in the country has been revised. Accordingly, Baseline CO2 Emission Database, Version 15, published by Central Electricity Authority (CEA), Government of India has been used for estimation of baseline emissions.

Step 2: Update the current baseline and the data and parameters

As a result of Step 1.4 above, this Step 2 is applied.

Step 2.1: Update the current baseline

Based on the latest approved ACM0002 and the assessment results of Steps 1.1, 1.2 and 1.4 above, the current baseline has been updated.

Step 2.2: Update the data and parameters

In line with Step 1.4, the following data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are updated according to relevant data sources listed in table below. All parameters regarding the grid emission factor are updated in the second crediting period. These data and parameters are applied to calculate the grid emission factors are described under section B.6.2 as well as described below;

As per the approved consolidated Methodology ACM0002 (Version 20) para 22:

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

The project activity involves setting up of wind project 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 Indian 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 Indian grid. Hence, the baseline for the project activity is the equivalent amount of power from the Indian grid.

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source [6] (where available) and made publicly available. Since the project activity is a new grid-connected power plant, the above stated baseline is applicable for the project. Further, as per paragraph 39, Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$BE_y = EG_{PJ,y} \times EF_{grid,y}$

Where:

BE_y = Baseline emissions in year y; (t CO_2)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid,y}$ = Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO2/MWh)

$EG_{PJ,y}$ = $EG_{PJ,facility,y}$ (for Greenfield projects and as per paragraph 41 methodology ACM0002 (Version 20)

Where,

$EG_{PJ,facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

As per ACM0002 Version-20, para 39, The emission factor can be calculated in accordance with the procedure provided in the "Tool to calculate the emission factor for an electricity system", Version 7.0.

Following information would be used for the calculation of baseline emissions:

1) Net electricity supplied by the project activity to the grid in year y taken from monthly Energy Statement / Joint Meter Reading sheets

2) CO2 Baseline Database (Version- 15) published by Central Electricity Authority (CEA), Government of India under Baseline Carbon Dioxide Emissions from Power Sector

Sr.	Parameters	Unit	Value	Reference

[6] http://cea.nic.in/tpeandce.html

No.				
1.	$EF_{grid,OM,y}$	tCO_2/MWh	0.9622	Operating margin CO_2 emission factor for the project electricity system. The value is calculated for year 2016-17, 2017-18 and 2018-19
2.	$EF_{grid,BM,y}$	tCO_2/MWh	0.8811	Build margin CO_2 emission factor for the project electricity system. The value is calculated for year 2018-19
3.	$EF_{grid,CM,y}$	tCO/ MWh	0.9419	Combined margin CO2 emission factor for the project electricity system

The steps to calculate the combined margin emissions factor is detailed in section B.6.1

B.5. Demonstration of additionality

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The project activity is generating electricity from wind for which there is no GHG emission. The generated electricity is supplied to TNEB. Thus the power generated in the project activity is actually displacing the electricity generated from the fossil fuels in the Integrated IndianGrid. In case the project activity would not have been there, the same amount of electricity would have been generated from the power plants connected to the grid of which majority of the power plants are based on fossil fuels. Thus the project is replacing the anthropogenic GHG emission from the fossil fuel based power plant connected to the electricity grid.

Demonstration the seriousness of consideration of CDM

The project start date (31/08/2009) is prior to the date of validation of the project activity and to demonstrate that the incentive from the CDM was seriously considered in the decision to proceed with the project activity; the project proponent presents the following evidence:

1. Board resolution dated 28 August 2009: The document clearly mentions that the CDM benefits will be considered to improve the financial viability of the project activity.
2. Contract with CDM consultant: CLP appointed their CDM consultant vide letter dated 11 December 2009.

Additionally to comply with CDM EB "*Guidelines on demonstration of and assessment of prior consideration of the CDM*[7]" CLP within 6 months of the start date (31/08/2009) of the project activity had

3. Informed the National CDM Authority, Ministry of Environment and Forest, Government of India of CLP's intent of developing its wind energy project as CDM project via email communication dated 03/09/2009.
4. Informed United Nation Framework Convention on Climate Change (UNFCCC) of CLP's intent of developing its wind energy project as CDM project via email communication dated 03/09/2009.

A brief chronological sequence of the project activity is as follows:

[7] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid04.pdf

S.No	Event	Date
1	Quotation from WTG supplier	12/05/2009
2	Board Approval for project	28/08/2009
3	Intimation to UNFCCC & MoEF	01/09/2009
4	Contract with CDM consultants	11/12/2009
4	Financial Closure	31/08/2010
5	Stakeholders' Consultation	18/02/2010
6	Offer from DOE	24/05/2010
7	Appointment of DOE	05/07/2010
8	Commissioning of the first WEG	24/03/2010
9	Commissioning of the last WEG	29/07/2010
10	DOE validation visit	10/02/2011

The project was conceptualized by CLP India Private Limited (CLPI, formerly Gujarat Paguthan Energy Corporation Private Limited) and it also proposed that the project be owned by a Special purpose Vehicle (SPV). This is evident from the meeting of Board of directors of CLPI dated 28/08/2009. The project is being implemented by CLP Wind Farms (India) Private Limited which was incorporated on 29/07/2008 and majority shares of which are held by CLPI.

Demonstrating of project additionality

According to decision 17/CP.7 para 43, a project will be defined additional if the anthropogenic GHG emissions from the source are reduced below that would have occurred in the absence of the registered project activity. Within the scope of the adopted baseline methodology, the additionality of the project activity has been demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality[8]" (Version 06.0.0, EB 65). The tool prescribes the following steps for proving additionality of a project.

Step 1. Identification of alternatives to the project activity consistent with current laws and Regulations

Define realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps:

Sub-step 1a. Define alternatives to the project activity:

Alternative(s) that provide outputs or services similar to that of the project activity (i.e. electricity generation) available to the project participants or similar project developers include:

[8] Source: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

a. The Project is not undertaken as a CDM project activity.
b. Continuation of the current situation where no project activity is undertaken

Alternative 1: The Project is undertaken without being considered as a CDM project activity

In this alternative, the proposed project activity is implemented (without CDM benefits) and connected to the TNEB Grid, which is a part of the Integrated Indian Grid, and displaces an amount of electricity equivalent to the generation mix of the Integrated Indian Grid. Wind power being a clean source of energy would not result in any GHG emissions due to implementation of the candidate project activity. This is a realistic and credible alternative to the project activity. However, without CDM benefits, the project is not financially viable as indicated in the investment analysis section below. Therefore this option is not considered most plausible baseline option.

Alternative 2: Continuation of the current situation where no project activity is undertaken

In this case an equivalent amount of electricity would have been generated by existing and future addition to the southern grid dominated by fossil fuel as demonstrated by table below which gives the percentage contribution of thermal power plants to the total installed capacity in Southern region and also in the state of Tamil Nadu as on 28th February, 2009[9]

	Total installed capacity (MW)	**Thermal (MW)**	**Thermal as percentage of total installed capacity**
Southern Region	40,130.20	21,267.92	53%
Tamilnadu	14,088.85	6,957.87	49.38%

This is considered as the most plausible baseline option as this is the status quo situation and faces no barriers.

Sub-step 1b. Consistency with mandatory laws and regulations:

All the above alternatives are consistent with current laws and regulations and there are no legal and/or regulatory requirements that prevent the Alternatives from occurring.

Outcome of step 1

Alternatives to the project activity have been identified in the section above and none of these alternatives are prohibited by laws and regulations.

Step 2. Investment analysis

Determine whether the proposed project activity is economically or financially less attractive than at least one other alternative, identified in step 1, without the revenue from the sale of certified emission reductions (CERs).

Sub-step 2a. Determine appropriate analysis method

[9] http://www.cea.nic.in/archives/exec_summary/feb09.pdf

The project proponent will seek to export the electricity generated from the project activity to the TNEB under a Power Purchase Agreement (PPA). The principal source of revenue for the project activity is the sale of electricity.

Methodology ACM0002 offers three possible options to perform the investment analysis, namely:

Option I	Simple Cost Analysis	
Option II	Investment Comparison Analysis	Project proponent has used Benchmark Analysis
Option III	Benchmark Analysis	**Chosen for Investment Analysis.** The post-tax internal rate of return (IRR) for the project cash flows serves as the financial indicator and compared with suitable benchmark (Weighed Average Cost of Capital) for assessment of the financial attractiveness of the project.

Since the project activity will generate income by sale of power, Simple cost analysis (Option I) is ruled out. Further, according to the "*Guidelines on the assessment of investment analysis*" Version 05, EB 62, paragraph 19[10], "If the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate."

Further it states that "The benchmark approach is therefore suited to circumstances where the baseline does not require investment or is outside the direct control of the project developer, i.e. cases where the choice of the developer is to invest or not to invest." The baseline in the case of project activity is no project activity in which case equivalent amount of electricity would have been generated by existing and future additions to the southern grid dominated by fossil fuel i.e. status quo. Therefore benchmark analysis has been chosen and is in conformity with above mentioned guidance.

Sub-step 2b – Apply benchmark analysis (Option III)

Choice of Financial Indicator:

Project IRR (post –tax) has been chosen as the financial indicator. It is commonly used and suitable financial indicator to analysis the financial viability of various investment projects.

Choice of Benchmark:
Further, paragraph 12 of the "*Guidelines on the assessment of investment analysis*" Version 05, EB 62 states that, "Local commercial lending rates ("PLR") **or** weighted average costs of capital ("WACC") are appropriate benchmarks for a project IRR".

Further, paragraph 13 of the same guidance states that "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."

[10] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

In the present context it is worth mentioning that the subject project is a Greenfield wind power generation activity that generates and supplies electricity to the regional electricity grid, therefore the project has more than one possible developer. Therefore, as per guidelines the benchmark is based on parameters that are standard in the market.

Hence Weighted Average Cost of Capital (WACC) based on parameters that are standard in the market has been considered in order to establish the investment benchmark in the present context.

WACC is calculated as illustrated below:

WACC = [D/(D+E)]*[Cost of Debt] + [E/(D+E)]*[Cost of Equity]

Cost of Debt:
Cost of debt is defined as the rate at which the lenders agree to lend money to the project. The additionality tool and the guidance on investment analysis clarifies that the benchmark for projects with more than one potential developer should not be based on project specific parameters but should represent the standard in the market. Prime Lending Rate (PLR) is defined as the benchmark rate for all bank loans. Historically the PLR is the rate at which banks lends to the best borrower-one who is the safest or least likely to default the loan. Accordingly PLR at the time of investment decision has been considered as the cost of debt. The PLR at the time of investment decision was in the range of 11.00% - 12.00% [Average PLR at the time of investment decision http://www.rbi.org.in/scripts/WSSView.aspx?Id=13930], thus average PLR or 11.50% has been considered as cost of debt.

Cost of Equity:
The cost of equity as been determined using the Capital Asset Pricing Model (CAPM) considering Beta values for power generating companies in India that were listed at the time of this investment.

Detailed calculation of cost of Equity and WACC along with and elaboration of approach are provided in Appendix 3.

The WACC for the project works out to be 12.50%

Investment Analysis:

The project activity involves power generation from wind energy project. The power generated by the project activity will be sold to the state utility. It is apparent that a distinct revenue stream would be generated as a result of the candidate project activity. In due consideration of the fact stated above an investment analysis of the project activity was conducted considering project IRR (Post-tax) as the most suitable financial indicator for the project type and decision making context.

Computation of IRR:

In this regard it is to be noted that the project IRR has been computed using following assumptions:

Table B.4: Data & Assumption Used in Computation of IRR

Assumptions for Financial Model	Value	Remarks
Capacity of Machines in kW	1650	As per the offer received from Vestas dated 12.05.09
Number of Machines	30	Nos
Project Capacity in MW	49.50	Calculated value
Project Commissioning Date	31-Jan-10	Expected commissioning date. Also gets reflected in E&C agreement with Vestas (Page no. 7 of the agreement)
Project Cost per MW (INR Millions)	59.64	Calculated value
Operations		
20 Year Long Term Annual Energy Output from 99 MW wind farm at 90% confidence level (GWh)	241.30	Page no. 52, Third party assessment, LTAEO Report dated 13.07.2009
20 Year Long Term Annual Energy Output from 49.5 MW wind farm at 90% confidence level (MWh)	120,650	Page no. 52, Third party assessment, LTAEO Report dated 13.07.2009
Plant Load Factor considered (%)	27.82%	Calculate Value
Insurance Charges	0.163	Mn /WTG/year (Expected Value). Based upon quotation received dated 12/05/2009
O & M Charges	0	Free for first three years. As per the offer received from Vestas dated 12.05.09
	1.5	Mn/WTG/year from 4th year. As per the offer received from Vestas dated 12.05.09
Escalation on O&M charges	5%	From 5th year. As per the offer received from Vestas dated 12.05.09
Service tax on O&M	10.30%	http://www.etaxindia.org/2011/04/service-tax-rates-from-year-2001-to-up-to-date.html
Asset Management Charges	0.75	Mn/year (Expected Value). Expenses towards site engineer appointed to manage the assets. Based upon agreement between CLP Wind Farms (India) Private Limited and SGS dated 09/03/2009 (Page No. 25, 0.125 Million / Engineer / Month).
Escalation in asset management charges	5%	Considered same as escalation on O&M
Security & trustee fee	0.22	Mn/year (Assumed value). Conservatively considered from letter from IDBI trustee services limited dated 21/10/2008
Tariff		
Base year Tariff INR/kWh	3.39	http://tnerc.tn.nic.in/orders/draft%20order%2020-3-2009%20complete%20final.pdf (page 36 of 190)
Annual Escalation (INR/kWh per Year)	0.00	http://tnerc.tn.nic.in/orders/draft%20order%2020-3-2009%20complete%20final.pdf

Assumptions for Financial Model	Value	Remarks
		(page 36 of 190)
Tariff applicable (INR/kWh)	3.39	http://tnerc.tn.nic.in/orders/draft%20order%2020-3-2009%20complete%20final.pdf (page 36 of 190)
Total Project Cost (INR Million)	2,952.40	Estimate project cost based upon EPC offer from Vestas dated 12/05/2009, applicable taxes and soft costs etc.
Means of Finance I		
Own Source	30%	TNERC tariff order dated 20th March, 2009 (Reference: http://tnerc.tn.nic.in/orders/draft%20order%2020-3-2009%20complete%20final.pdf)
Term Loan	70%	TNERC tariff order dated 20th March, 2009 (Reference: http://tnerc.tn.nic.in/orders/draft%20order%2020-3-2009%20complete%20final.pdf)
Own Source (INR Million)	886	Calculated Value
Term Loan (INR Million)	2,067	Calculated Value
Total Source (INR Million)	2,952.40	
Terms of Loan		
Interest Rate	12.0%	TNERC tariff order dated 20th March, 2009 (Reference: http://tnerc.tn.nic.in/orders/draft%20order%2020-3-2009%20complete%20final.pdf)
Tenure (Years)	10	TNERC tariff order dated 20th March, 2009 (Reference: http://tnerc.tn.nic.in/orders/draft%20order%2020-3-2009%20complete%20final.pdf)
Moratorium (months)	12	TNERC tariff order dated 20th March, 2009 (Reference: http://tnerc.tn.nic.in/orders/draft%20order%2020-3-2009%20complete%20final.pdf)
Income Tax Depreciation Rate (Written Down Value basis) on Wind Energy Generators	80%	Income Tax Act
Book Depreciation Rate (Straight Line Method basis) On all assets	5.28%	Income Tax Act
Book Depreciation up to (% of asset value)	100%	Income Tax Act
Salvage Value (% of project cost)	10%	
Income Tax rate	33.99%	As per Income Tax Act
Minimum Alternate Tax	16.995%	http://articles.economictimes.indiatimes.com/2009-07-07/news/27634848_1_mat-rate-zero-tax-companies-minimum-alternate-tax

Based on the assumptions presented above, the project IRR with a 20 years cash flow and without consideration of CDM revenues works out to be 10.05%.

It can be seen that the Project IRR 10.05 % is less than the WACC 12.50%
The CDM benefits would enable the project to become financially attractive as the project IRR with CDM benefits (12.96%) would cross the benchmark (12.50%) and hence CDM benefits would enable the project developer to overcome the barrier.

Sub-step 2d. Sensitivity analysis (only applicable to options II and III):

A sensitivity analysis has been carried out on the project IRR to determine whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions. Further, as per the **GUIDELINES ON THE ASSESSMENT OF 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". The parameters thus identified are Project Cost, Plant Load Factor and Tariff. In addition, sensitivity analysis has been carried out on O&M cost although it constitute less than 20% of either total project costs or total project revenues as it can vary and to some extent impact financial viability

The analysis on Project IRR is done to analyse how the financial attractiveness of the project activity varies with changes in Project Cost, Plant Load Factor (PLF), Tariff & O&M costs. The base case for the PLF of 27.82% is based on a study conducted by an independent consultant[11] for CLP for the specific project location. A copy of this due diligence report has been shared with DOE.

Further, sensitivity analysis is carried out to analyse the impact of GBI incentive which are applicable for the project activity. Relevant assumptions for the same are provided below:

Generation Based Incentive (GBI) INR/kWh	0.50	Scheme for Implementation of Generation Based Incentives (GBI) for Grid Interactive Wind Power Projects published by Ministry of New and Renewable Energy (http://www.mnre.gov.in/gbi-scheme.htm)
Maximum limit (Million INR per MW)	6.20	Scheme for Implementation of Generation Based Incentives (GBI) for Grid Interactive Wind Power Projects published by Ministry of New and Renewable Energy (http://www.mnre.gov.in/gbi-scheme.htm)

The results of sensitivity analysis are presented in the table below:

Table B.5: Result of Sensitivity Test

Parameter	Variation	Value applied	Project IRR without CDM revenue
Project Cost (INR Million)	-10%	2,657.16	11.63%
	Base case	2,952.40	10.05%

[11] Source: CLP has appointed independent Australian Agency to conduct the PLF assessment of the project site. The Long Term Annual Energy Output (LTAEO) assessment report provided by the consultant will be made available to the DOE for validation.

Parameter	Variation	Value applied	Project IRR without CDM revenue
	10%	3,247.64	8.65%
Plant Load Factor (%)	-10%	25.04%	8.28%
	Base case	27.82%	10.05%
	10%	30.60%	11.67%
Tariff (INR/kWh)	-10%	3.05	8.28%
	Base case	3.39	10.05%
	10%	3.73	11.67%
O&M Cost (INR million/WTG/year)	-10%	1.35	10.24%
	Base case	1.50	10.05%
	10%	1.65	9.86%
GBI	GBI Applicable	0.50 INR/kWh, maximum of INR 6.20 million /MW	11.21%

It can be inferred from the sensitivity analysis that the project IRR in all the optimistic scenarios is less than the applicable benchmark which makes the project financially unattractive for the project proponent.

The variation in each parameter at which the project IRR crosses the benchmark is presented below:

PLF: The benchmark is crossed at ~15.3% increase in PLF i.e. at PLF of around 32.08% each year for the entire 20 years lifetime. The PLF is based upon the assessment done at the site by a third party. Further, TNERC tariff order -2009 has considered a CUF of 27.15%. Therefore, in light of above it doesn't seem possible for PLF to increase to around 32.08% each year for the lifetime of the project activity (20 years).

Project Cost: The benchmark is crossed only when project cost in decreased by 14.8%. Actual project cost incurred for the project activity is INR 2921 million as evident from the Charted Accountant's certificate. Therefore reduction of cost by 14.8% (i.e. Reduction of Project Cost to ~2515 million INR) is not possible.

Tariff: The benchmark is crossed at ~15.3% increase in tariff rate i.e. at tariff rate of around 3.91 INR/kWh for the entire 20 years lifetime. It needs to be noted that Power Purchase Agreements has already been signed with the state utility at INR 3.39/kWh for entire 20 years lifetime. Therefore, it doesn't seem possible for tariff to increase by 15.3% for entire lifetime and breach the benchmark.

O &M: The benchmark is never crossed even when entire O&M cost is completely removed, which is also not possible as actual O&M agreements have been signed.

GBI incentive: Even after considering GBI incentive, benchmark is not crossed.

Outcome of step 2:

The project activity is not most financially attractive we proceed to step 4 –common practice analysis

Step 4. Common practice analysis

As per "Tool for the demonstration and assessment of additionality" Version 06.0.0, for measures that are listed in paragraph 6, following steps have been considered to carry out common practice analysis:

Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

The capacity of the project activity is 49.5 MW, therefore +/- 50% is calculated as 24.25 MW to 74.25 MW.

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number Nall. Registered CDM project activities and projects activities undergoing validation shall not be included in this step;

Applicable geographical area

As per paragraph 5 of "Tool for the demonstration and assessment of additionality", applicable geographical area covers the entire host country as a default. In accordance with the above guidelines, host country (i.e. India) has been considered as the applicable geographical area as a default.

All plants which deliver power to grid and having the capacities between 24.25 MW to 74.25 MW and started commercial operation prior to start date of the project activity are identified. Registered CDM project activities and project activities undergoing validation are excluded from the list. The power generation plants identified in this step are hydro, thermal, solar, nuclear and wind power projects[12]. The total no. of power plants thus identified is 361[13].

Project Type	N_{all}
Thermal	139
Hydro	211
Nuclear	0
Wind	11
Solar	0
Total	361

Therefore N_{all}=361

Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.

[12] Other power generation sources mainly biomass based and also other renewable energy sources tidal, geo-thermal etc (if any) have been excluded as a conservative approach

[13] List of projects is provided to DOE in an worksheet

In accordance with the "Tool for the demonstration and assessment of additionality", following criteria have been applied to identify plants that apply technology different than that applied in the project activity:

(a) Energy Source / fuel:

The project activity involves electricity generation from wind. The other project activities identified in Step 2 are hydro and thermal power plants. These use different energy source than wind such as water, conventional fuels (coal, natural gas, diesel etc). Therefore, all the projects falling under above category, except wind power plants, are considered as plants with different technologies and included under N_{diff}

(b) Investment climate in the date of the investment decision:

The wind tariff and other regulations concerning installations are governed by the respective state regulatory commissions in India. The project activity is located in the state of Tamil Nadu and exports power to the state grid. Therefore, the wind projects outside the state (Tamil Nadu) have been included under N_{diff}

Further, over the years there have been two different regulatory / investment regimes in the state of Tamil Nadu for wind power projects.

Regime 1 – Central regime (MNES policy)

- Projects installed prior to September 2001
- Wind power projects were governed by MNES policy with tariff set at INR 2.25 per unit for the base year 1994-95 with a 5% annual escalation, wheeling and banking charges of 2%, etc.
-

Regime 2 – State regime (TNEB and TNERC policies / orders)

- Projects installed after September 2001
- Wind power projects were governed by (a) TNEB order of 2001 with fixed tariff of INR 2.70 per unit, wheeling and banking charged of 5%, etc. (b) TNERC order of 2006 with fixed tariff of INR 2.9 per unit, (c) TNERC order of 2009 with fixed tariff of INR 3.39 per unit etc.

The different tariffs under regime 1 and regime 2 are presented below:

Table B.6: Tariffs Under Regime 1 & Regime 2

Electricity tariff (INR/kWh)	2006 -07	2007 -08	2008 -09	2009 -10	2010 -11	2011 -12	2012 -13	2013 -14	2014 -15	2015 -16	Average
REGIME 1											
MNES Policy[14]	3.60	3.72	3.83	3.94	4.05	4.17	4.28	4.39	4.50	4.62	4.11
REGIME 2											
TNEB order 2001[15]	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
TNERC Order 2006[16]	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
TNERC Order 2009[17]				3.39	3.39	3.39	3.39	3.39	3.39	3.39	3.39

Wind projects prior to September 2001 were governed by the MNES policy. However this regime was superseded by the state policy and post September 2001 all project fell into the state regime (regime 2). As can be seen above, Regime 1 projects are of a different regulatory and investment environment and hence cannot be compared to the proposed project activity which falls under the Regime 2. Therefore all projects commissioned till September 2001 have been considered under N_{diff}.

Further, projects considering other financial flows such as projects under voluntary carbon standard have been considered under N_{diff}

No. of projects of different project type included under N_{diff} is given below:

Project Type	**N_{diff}**
Thermal	139
Hydro	211
Nuclear	0
Wind	9
Solar	0
Total	359

Total no. of plants thus identified under N_{diff} is 359.

Step 4: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

Factor F as calculated above is 0.006 and $N_{all} - N_{diff}$ is 2.

Further, as per the additionality tool, "The proposed project activity is a "common practice" within a sector in the applicable geographical area if both the following conditions are fulfilled:

[14] INR2.25 for 1994-95 and 5% annual escalation thereafter

[15] INR2.70 for 2001 fixed for next 10 years, It was later revised to INR 2.75/kWh as per TNERC order 2006

[16] INR 2.90 for 2006, fixed for next 10 years

[17] INR 3.39 for 2009, fixed for the next 20 years

(a) the factor F is greater than 0.2, and

(b) N_{all}-N_{diff} is greater than 3."

Since F < 0.2 and also $N_{all} - N_{diff}$ is less than 3, it is concluded that the project activity is not a common practice.

Based on the above considerations, the project activity is considered to be additional

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

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As per para 39 of ACM0002 version 20.0, Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$\mathbf{BE_y = EG_{PJ,\ y} * EF_{grid,\ CM,\ y}} \quad (1)$$

Where:

BE_y	Baseline emissions in year y (tCO_2)
$EG_{PJ,\ y}$ result	Quantity of net electricity generation that is produced and fed into the grid as a of the implementation of the CDM project activity in year y (MWh/yr)
$EF_{grid,\ CM,\ y}$	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2e/MWh)

Calculation of $EG_{PJ,\ y}$

The methodology ACM0002 (Version 20) has procedures for calculation of $EG_{PJ,y}$ for the following cases:

(a) Greenfield plants,

(b) Capacity addition to wind, solar, wave or tidal plant

(c) Capacity addition to hydro or geothermal power plant

(d) Retrofit or rehabilitation or replacement of an existing renewable energy power plant

The proposed CDM project activity are Greenfield plants, option (a) as provided in the methodology ACM0002 (Version 20) shall be applicable and is described below:

"If the project activity is the installation of a new grid-connected renewable power plant:

$$EG_{PJ,\ y} = EG_{facility,\ y} \quad (2)$$

Where:

$EG_{PJ,y}$ *Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)*

$EG_{facility,y}$ *Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)"*

Calculation of $EF_{grid,CM,y}$

The methodology ACM0002 (Version 20.0) requires that the combined margin for the grid be calculated in accordance with the procedure provided in the "Tool to calculate the emission factor for an electricity system", Version 7.0.

As per version 7 of Tool to calculate emission factor for an electricity system, following steps are included in the calculation of the emission factor for the baseline scenario:

Step1. Identify the relevant electricity systems

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

STEP 3: Select a method to determine the operating margin (OM).

STEP 4: Calculate the operating margin emission factor according to the selected method.

STEP 5: Calculate the build margin (BM) emission factor

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

The Central Electricity Authority (CEA) has published CO_2 baseline database in its version 15.0[18] (December 2019). The values for OM, BM, CM are given excluding and including imports. For the present project activity, including imports are considered.

Step 1: Identifying the relevant electricity system

The tool defines that "for the purpose of determining the electricity emission factors, identify the relevant electricity system. Similarly, identify any connected electricity systems". It also states that "If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used". Keeping this into consideration, the Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern.

However, since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this CO2 Baseline Database. In April 2016, the Southern grid has also been synchronized with the NEWNE grid, hence forming one unified Integrated Indian Grid. The project activity is located in the state of Tamilnadu which come under Integrated Indian grid system. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the Indian grid as per CM calculations will serve as the baseline for this project.

[18] http://cea.nic.in/tpeandce.html

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

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

The project participant has chosen Option I for the calculation of the operating and build margin emission factor i.e. off-grid power plants are not being included in the calculation.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods which are described under step 4 (Refer "Tool to calculate the emission factor for an electricity system", version 07.0):

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

The simple OM method (option a) can only be used if low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long term averages for hydroelectricity production. The low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. Thus, for the proposed project activity simple OM method has been chosen to calculate the operating margin emission factor ($EF_{grid, OM, y}$).

The Share of Low Cost / Must-Run (% of Net Generation) in the generation profile of the Integrated Indian grid in India in the last five years is as follows:

Grid	2014-15	2015-16	2016-17	2017-18	2018-19
Integrated Indian Grid	16.8%	15.1%	14.6%	14.3%	14.5%

Source: CEA Baseline Carbon Dioxide Emission Database Version 15

Ref: CO_2 Baseline Database for the Indian Power Sector – CEA, Version 15[19]

In Indian Grid, the low-cost/must run resources vary from 14.3% to 16.8% of the total net grid generation (From Year 2014-15 to Year 2018-19). The calculation above shows that the generation from low-cost/must-run resources always constitutes less than 50% of total grid generation, hence usage of the Simple OM method in the project case is justified.

The Simple OM emission factor can be calculated using either of the two following data vintages for years(s) y:

[19] http://cea.nic.in/tpeandce.html

- Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period,

or

- Ex post option: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

As observed in the CEA database, (Version 15, Dec'19) the percentage of total grid generation by low-cost/must-run plants (on the basis of average of five most recent years) for the Indian grid is much lesser than 50% of the total generation. Thus, Simple OM method has been used for calculating the emission factor.

The project proponents choose the *Ex ante* option for estimating the simple OM emission factor wherein as described above 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, without requirement to monitor and recalculate the emissions factor during the crediting period will be undertaken.

Step 4: Calculation of the OM according to the Simple OM method

The simple OM method has been selected as justified above. The simple OM emission factor is calculated based on the net electricity generation of each power unit and a CO_2 emission factor for each power unit, as follows:

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

Where:

$EF_{grid,OMsimple,,y}$	=	Simple operating margin CO_2 emission factor of in year y (tCO_2/MWh)
$FC_{i,m,y}$	=	Amount of fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	=	Net electricity generated and delivered to the grid by power unit m in year y (MWh)
m	=	All power units serving the grid in year y except low-cost / must-run power units
I	=	All fuel types combusted in power plant / unit m in year y
y	=	Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

In India, the Central Electricity Authority (CEA) has estimated the baseline emission factor for the power sector. This data is the most authentic information available in the public domain. The details of same can be found on CEA website at http://cea.nic.in/tpeandce.html.

The operating margin emission factor has been calculated using a 3 years data vintage:

Net Generation in Operating Margin (GWh) (incl. imports)		
2016-17	**2017-18**	**2018-19**
916,278	960,693	995,957

Simple Operating Margin Emission Factors (tCO2/MWh) (incl. Imports)		
2016-17	**2017-18**	**2018-19**
0.9636	0.9543	0.9685

Therefore, weighted OM average for Indian grid comes out to be 0.9622 tCO_2/MWh

i.e. $EF_{grid,OM,y}$ = 0.9622 tCO_2/MWh

In this PD *ex-ante* vintage has been fixed and will not be changed during the crediting period.

Step 5: Calculate the build margin (BM) emission factor

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 1 has been considered for this project activity

Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor.

The sample group of power units *m* used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%,}$ in MWh);

(c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin.

In India, the installed capacity and corresponding annual generation from power plants is quite high. The Central Electricity Authority (CEA) has estimated the annual electricity generation from $SET_{\geq 20\%}$ to be larger than the generation from $SET_{5\text{-units}}$. The details of same can be found on CEA website at http://cea.nic.in/tpeandce.html.

Further, none of the power units in $SET_{\geq 20\%}$ started to supply electricity to the grid more than 10 years ago.

Therefore, SET_{sample} is selected as $SET_{\geq 20\%}$ for the estimation of build margin.

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, calculated as follows:

$$EF_{grid,BM,simple,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

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 electricity generation data is available

Calculations for the Build Margin emission factor $EF_{gid,\,BM,\,y}$ is based on the most recent information available on the plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of the power plant capacity additions in the electricity system that comprise 20 % of the system generation and that have been built most recently ($SET_{\geq 20\%}$). PP has sourced the data from CEA website at http://cea.nic.in/tpeandce.html and same in inline with the Tool to calculate the emission factor of the electricity system.

Build margin emission factor is calculated, ex-ante as per the most recent data available. So, build margin emission factor for Indian grid for 2018-19 is 0.8811 tCO2/MWh

$EF_{grid, BM, y}$ = 0.8811 tCO2e/MWh

The build margin emissions factor is the generation-weighted average emission factor (tCO_2e/MWh) of all power units m during the most recent year y for which power generation data is available and will be calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \quad (4)$$

Where:

$EF_{grid, BM, y}$: Build margin CO_2 emission factor in year y (tCO_2e/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_2e/MWh)

m: Power units included in the build margin

y: Most recent historical year for which power generation data is available

As described above, the Build Margin would be calculated annually during the entire crediting period. For the purpose of ex-ante emission reduction calculations the most recent data available (from CEA for 2018-19) has been used and the build margin thus calculated is 0.8811 (tCO_2e/MWh)

Therefore, $EF_{grid,BM,y}$ = 0.8811 (tCO_2e/MWh)

Step 6: Calculate the combined margin (CM) emissions factor

The combined margin emissions factor is 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 (%)

The following default values should be used for w_{OM} and w_{BM}:

- Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.

- All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

As per the 'Tool to calculate the Emission Factor for an electricity system' version 07, the default values for w_{OM} and w_{BM} are taken as 0.75 and 0.25 respectively as per the guidance provided for wind project activities for the first crediting period and subsequent crediting periods.

Hence, the Baseline Emission Factor is calculated using the formula stated below:

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

$EF_{grid, CM, y} = 0.75* 0.9622 + 0.25* 0.8811 (tCO_2/MWh)$

$EF_{grid, CM, y} = 0.9419\ tCO_2/MWh$

Estimation of Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 20, there will be no project emissions in the project activity

$PE_y = 0$

Estimation of Leakage Emissions

As per ACM0002 Version 20, no leakage has been considered for the calculation of emission factor.

The details on OM, BM and CM estimates as provided by the CEA are shown in Appendix-4.

B.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2e/MWh
Description	Weighted average (net electricity generation) Operating Margin (OM) Emission Factor of Southern Regional Electricity Grid
Source of data	The CO_2 Baseline Database for the Indian Power Sector - Ministry of Power: Central Electricity Authority (CEA) Version 14. Also refer Appendix-4
Value(s) applied	See nested table below
Choice of data or measurement methods and procedures	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with "Tool and BM values as per Version 7.0 of methodological tool to calculate the emission factor for an electricity system" and using data base of CEA. Computed once during PDD finalization.
Purpose of data	Baseline Emission For the calculation of Emission Factor of the grid
Additional comment	Operating margin emission factor is fixed ex-ante. The data will be archived for two years beyond the crediting period

Year	Simple operating margin of Integrated Indian grid (tCO_2e/MWh)	Net electricity generation in the year (GWh)
2016-17	0.9636	916,278
2017-18	0.9543	960,693
2018-19	0.9685	995,957
Generation weighted average Operating Margin emission factor in the last three years		0.9622 tCO_2e/MWh

Data/Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2e/MWh
Description	Build Margin (BM) Emission Factor of Integrated Indian Grid
Source of data	The CO_2 Baseline Database for the Indian Power Sector - Ministry of Power: Central Electricity Authority (CEA) Version 15. Also refer Appendix-4
Value(s) applied	0.8811
Choice of data or measurement methods and procedures	The Build Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with "Tool to calculate the emission factor for an electricity system"
Purpose of data	Baseline Emission calculation
Additional comment	Build margin emission factor is fixed ex-ante

Data/Parameter	Ratio OM:BM
Data unit	-
Description	Ratio of Operating margin to build margin used for calculation of combined margin for wind energy project
Source of data	The CO_2 Baseline Database for the Indian Power Sector - Ministry of Power: Central Electricity Authority (CEA) Version 15. Also refer Appendix-4
Value(s) applied	75:25
Choice of data or measurement methods and procedures	Same ratio has been selected in accordance with "Tool to calculate the emission factor for an electricity system"
Purpose of data	Baseline Emission calculation
Additional comment	Ratio is fixed ex-ante.

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO2/MWh
Description	Combined Margin Emission Factor
Source of data	The CO2 Baseline Database for the Indian Power Sector - Ministry of Power: Central Electricity Authority (CEA) Version 15. Also refer to Appendix-4
Value(s) applied	0.9419
Choice of data or measurement methods and procedures	The Combined Margin Emission Factor has been calculated using the simple OM approach in accordance with "Tool to calculate the emission factor for an electricity system"
Purpose of data	Baseline Emission calculation
Additional comment	Combined margin emission factor is fixed ex-ante

B.6.3. Ex ante calculation of emission reductions

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The project activity reduces carbon dioxide through displacement of grid electricity generation with fossil fuel based power plants by renewable-wind electricity. The emission reduction ER_y due to project activity during a given year y is calculated as the difference between baseline emissions (BE_y) and project emissions (PE_y) as per formula given below. As per ACM0002, Version 20, there are no leakage emissions:

ERy = BEy – PEy

Since PE_y is zero, the emission reductions by the project activity during a given year y is:

$ER_y = BE_y - 0$

$ER_y = BE_y$

Where BE_y is calculated as

$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$

Where,

BE_y	Baseline emissions in year *y* (tCO_2)
$EG_{PJ,y}$	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

Since the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, therefore as per the methodology:

$EG_{PJ,y} = EG_{facility,y}$

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh)

As described above, the emission factor $EF_{grid,CM,y}$ of the grid is represented as a combination of the Operating Margin and the Build Margin. Considering the emission factors for these two margins as $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$, then the $EF_{grid,CM,y}$ is given by:

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

With respective weight factors w_{OM} and w_{BM} (where $w_{OM} + w_{BM} = 1$); as per the "Tool to calculate the emission factors for an electricity system" for a wind project, the weightage for operating margin has been taken as, $w_{OM} = 0.75$ and that for build margin, $w_{BM} = 0.25$ has been considered.

The details of the values to arrive into combined margin emission factor are provided in Appendix 4 (baseline information)

Ex-ante calculation of emission reductions is equal to ex-ante calculation of baseline emissions as project emissions and leakage are nil.

Table B.9: Ex-ante Calculation of Emission Reductions

	Data parameter	Value	Unit
Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y	$EG_{PJ,y}$	= 49.5 MW (Capacity) x 27.82% (PLF) x 8760 (hours) MWh = 120,650 MWh/year	MWh/year
Baseline emission factor (combined margin)	$EF_{grid,CM,y}$	0.9419	tCO_2e/MWh
Annual baseline emissions	BE_y	= 0.9419 tCO_2e/MWh x 120,650 MWh/year = 113,643 MWh/year	tCO_2e/year
Emission Reductions	ER_y	113,643	tCO_2e/year

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

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1[20]	113,643	0	0	113,643
Year 2	113,643	0	0	113,643
Year 3	113,643	0	0	113,643
Year 4	113,643	0	0	113,643
Year 5	113,643	0	0	113,643
Year 6	113,643	0	0	113,643
Year 7	113,643	0	0	113,643
Total	**795,501**	**0**	**0**	**795,501**
Total number of crediting years	7			
Annual average over the crediting period	**113,643**	**0**	**0**	**113,643**

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{facility,y}$
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data	The electricity supplied to the grid would be taken from the Joint Meter Reading Report / Energy Generation Statement issued by TNEB for each WTG. TNEB issues this report / statement based on the generation recorded by meters located near each WTG
Value(s) applied	Annual electricity supplied to the grid by the Project = 120,650 MWh
Measurement methods and procedures	The net electricity supplied to the grid is measured by the main meters and check meters (export and import values) installed by TNEB at the metering point near each WTG. The Total Net Electricity supplied to the grid by the project activity is the summation of Net Electricity supplied by individual 30 WTG of the project activity
Monitoring frequency	Continues monitoring and Monthly recording
QA/QC procedures	Accuracy of meters: 0.5s or higher Frequency of calibration: Once in five year The quantity of net electricity supplied will be cross-verified from the invoice raised to TNEB by the project proponent. Also refer Section B.7.3 below.
Purpose of data	Calculation of baseline emissions
Additional comment	The data will be archived for two years after the end of the last crediting period or till the last issuance of CERs for the project activity, whichever is later.

B.7.2. Sampling plan

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[20] Year 1 starts from start of crediting period and continues for 12 months

Not Applicable

B.7.3. Other elements of monitoring plan

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The approved large scale methodology ACM0002 (Version 20), stipulates the monitoring of the net electricity generation supplied by the project plant/unit to the grid.

Project proponent has renewed the and signed an 'Operation and Maintenance' contract with Renom Energy Services LLP for operation & maintenance of WTGs. The performance of the WTGs, safety in operation and scheduled /breakdown maintenances are organized and monitored by the Renom and their activities are supervised by CLP through their site staff. Vestas will also provide daily generation data to CLP through website.

A power purchase agreement has been signed with TNEB. The project proponent has installed two identical energy meters – main meter and check meters of 0.5s or higher accuracy class at each WTG's 33kV outgoing feeder (metering point). These main and check meters are duly approved, tested and sealed by TNEB. These comply with the requirements of the Electricity Rules. The meter readings at the Metering Point are undertaken every month jointly by the representatives of the State Grid/ TNEB and representative of CLP for the previous month. The meter readings are jointly certified by representatives of the State Grid/ TNEB and representative of CLP.

The TNEB carries out the calibration, periodical testing, sealing and maintenance of meters in the presence of representative of CLP. The frequency of meter testing is once in five year in line with para 18.1.b of the notification dated 17/03/2006 published by Central Electricity Board, Govt. of India (www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf). All meters are tested at the Metering Point.

Metering procedure

The metering is carried out at TNEB meter located near each WTG (30 TNEB main meters for 30 WTG of the project activity). This is the metering point wherein the Joint Meter Reading (JMR) is carried out every month in presence of the representatives of the project proponent & the state electricity utility (TNEB). This JMR is used for calculation of the amount of electricity supplied to the grid against which the utility makes the payment to the project proponent. The JMR document contains "export", "import" and "net export" of the electricity to/ from the Integrated Indian grid. In case of failure of main meter reading, check meter will be used for the purpose of JMR and billing.

The details of the metering equipment, metering, inspection, meter test checking etc are presented in the Appendix-5 – Monitoring Information.

Action Plan for Monitoring of 2% net CER Revenue Committed towards Sustainable Development

Introduction

CLP Wind Farms (India) Private Limited ("CLP") is a 100% subsidiary of Gujarat Paguthan Energy Corporation Private Limited owned by CLP Holdings, Hong Kong. CLP Holdings is listed in the Global Dow – a 150-stock index of the world's leading blue-chips, the Dow Jones Sustainability Asia Pacific Index (DJSI Asia Pacific), and the Dow Jones Sustainability Asia Pacific 40 Index (DJSI Asia Pacific 40). CLP is setting-up a 49.5 MW wind power Project in Theni District, Tamil Nadu state ("Project"). The Project comprises 30 turbines of 1.65 MW capacity each and involves a total investment of 300 Crores.

One of the most common definitions of sustainability is *"consumption today in a manner that one does not compromise the ability of future generations to consume the same".* To meet the growing energy needs of India, it is but inevitable that the country will continue to add generation capacity using conventional fossil fuel sources of energy. As one of the main stream power sector investors in India, CLP will continue to participate in this capacity addition endeavour. However, in the spirit of developing and operating a truly sustainable business from a climate and shareholders perspective, CLP has been pursuing investments in viable Renewable Energy Projects and has been on the forefront of adding capacity on the clean energy arena in India. The Project is a step in this direction and is at the outset a large scale investment on a sustainable electricity generation initiative.

Background

The National CDM Authority has mandated the Project to commit a minimum of 2% earning (net realization value) of proceeds from sale of Carbon Credits towards sustainable development activities including society and community development activities. In addition to investment in the subject Renewable Energy Project, which in itself is a significant contribution to the cause of Sustainable Development, the company proposes to enhance its contribution further by identifying and contributing towards suitable community initiatives in and around the wind farm and the state / country in general.

Approach

Contribution to community initiatives is a part of the fabric of the CLP Group of which the project company is a subsidiary. *"Economic & Social wellbeing of the community in which CLP operates"* is one of the mission statements of the CLP Group. The Company already has a Trust in operation in India, which leads the company's efforts on the community front. The company is also evaluating the prospects of enhancing the activities on this front at a pan India level through suitable structuring of the Trust.

In order to ensure that the contribution by the Project is deployed in a professional and optimal manner, it is envisaged that the Project will invest in community initiatives directly, through company's central Trust or such other centralized structure evolved by the company going forward. On a case to case basis depending on the potential positive impact on the target community, the company may also consider contributing to any other public trusts active in the target areas or carry out joint initiatives with the overall Developer and Operation & Maintenance Contractor at the site, Vestas Wind Technology India Private Limited, or such other means. The ultimate objective would be to ensure that the funds are deployed efficiently and the target community benefits in the ultimate analysis.

Target activities

Based on the preliminary understanding of issues plaguing societies in general, it is expected that healthcare, sanitation, education could be potential focus areas. The scope of activities could include but not be limited to organizing medical camps, providing amenities to village schools such as furniture, stationary, buildings, toilets, mid-day meal program, etc, assisting in construction of village roads and such other activities. However, as part of the company's assessment of prevailing local requirements, the nature and scope of work would be modified suitably and taken-up suitably going forward.

Demonstration

The Project will endeavor to spend a minimum of 2% of net proceeds from sale of carbon credits on community initiatives in and around the wind farm and the state / country in general after netting of share retained by the UNFCC, sharing prescribed by the electricity regulators as per the terms of the Power Purchase Agreement / regulations, any other statutory costs and applicable taxes.

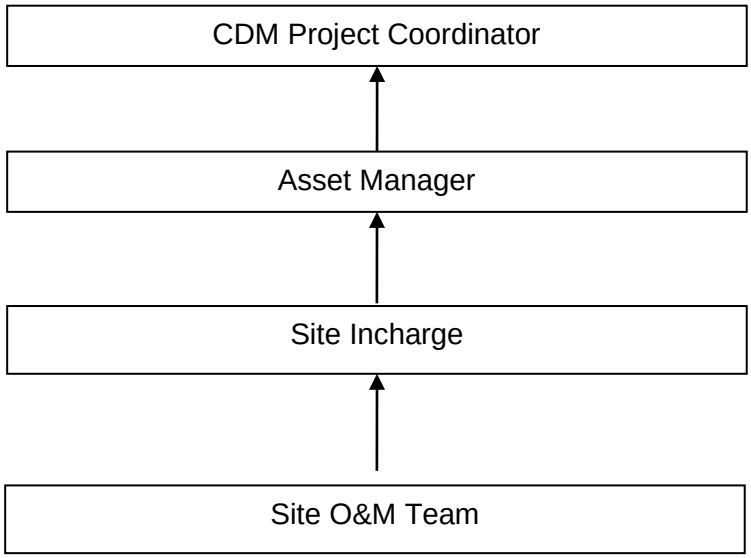
The Project proposes to tabulate this expenditure over the entire crediting period and not on a year on year basis suggesting that it is possible that in some years the expenditure would be more than 2% and in some years less than 2% but on a net basis by the end of the crediting period, the project would have incurred 2% of the total net proceeds on community initiatives. This option of demonstrating expenditure to the DOE is proposed as against a year or year approach to take care of issues such as non-sale of credits in a given year due to poor global demand for carbon credits, poor market prices, accrual of substantially large proceeds in a given year owing to a market upswing or sale of aggregated credits stifling the ability to spend a large amount efficiently in one year, etc.

This apart, given the nature of the Company's Mission statement, it is possible that the Project may voluntarily choose to spend money on community initiatives pending sale of CERs or registration, which would be demonstrated to the DOE during the verification process to enable the DOE keep track of the cumulative expenditure as a percentage of the net sale proceeds over the entire crediting period.

The expenditure incurred by the Project would be demonstrated to the DOE either through a CA certificate and/or receipts received or such other means.

Project management structure

The operation and maintenance team consists of representatives of technology supplier, Renom, who will record the readings and prepare daily generation reports of all the WTGs. The primary recording of the electricity fed to the electricity grid will be carried out jointly at the TNEB meter located near each WTG. The organizational and management structure for the monitoring of the project activity is as follows:

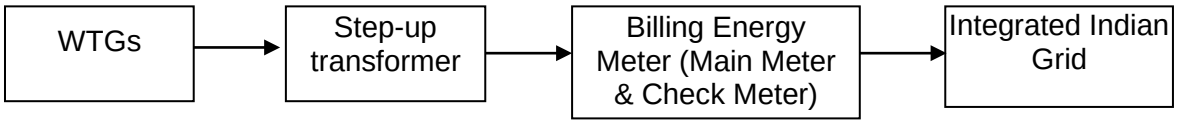


The project team is delegated with the responsibility to monitor and document the electricity generated and also safe keeping of the recorded data. The project team is also responsible for

calculation of emission reduction in the most transparent and relevant manner. All the monitoring data is stored/will be recorded and kept under safe custody. The organizational structure for the monitoring plan with responsibilities is provided below:

Designation	Responsibilities
CDM Project Coordinator	• Overall CDM project management • Ensures adherence to monitoring plan • Estimation of Emission Reductions • Holds complete control over monitoring aspects pertaining to the project
Asset Manager	• Verification of Data (Consistency & Completeness) • Storage of Data (Archiving) • Review / Corrective and preventive Actions • QA/QC procedures
Site Incharge	• Verification of Data (Consistency & Completeness) • Storage of Data (Archiving) • Operation & Maintenance
Site O&M team	• Recording of monitored data • Storage of Data (Archiving) • Operation & Maintenance

The schematic representation of metering arrangement is demonstrated below:



SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

>>
31/08/2009

C.2. Expected operational lifetime of project activity

>>
The project activity is expected to be operational for a period of 20 Years 00 months

C.3. Crediting period of project activity

C.3.1. Type of crediting period

>>
Renewable Crediting Period. It is the second crediting period of the project activity.

C.3.2. Start date of crediting period

>>

04/10/2019

C.3.3. Duration of crediting period

>>
7 years 00 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
As per the Schedule 1 of the EIA notification 2006, given by the Ministry of Environment and Forests under the Environment (Protection) Act 1986, the proposed project does not fall under the list of activities requiring EIA

D.2. Environmental impact assessment

>>
The project activity involves implementation and operation of wind energy generators to generate electrical energy. The implementation of project activity does not result in burning of fossil fuel and will thus not contribute towards environmental degradation or any other such adverse impact on environment.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

>>
CLP invited the local stakeholder for the local stakeholder meeting by inviting local stakeholders through notices 15 days in advance to the date of the meeting. The notices were sent to the stakeholders on 03 February 2010. The stakeholder meeting was organised on 18 February 2010 from 4:30 pm onwards at Middle school in the village nearby to the project site, in presence of representatives of Vestas and project proponent CLP as per the requirements of the CDM modalities.

E.2. Summary of comments received

>>
Around 35 stakeholders from nearby villages were present for the meeting. No adverse comment was received from the local stakeholders. The queries raised by stakeholders during the meeting and the response given by project proponent in the following table:

S.N.	*Questions raised*	*Name of stakeholder / Village*	*Answer by CLP and Vestas*
1.	What are the factors affecting Global warming and the bad effects thereon?	Mr. S. Suresh Kumar, Poomalaikundu Village	The major factors causing global warning is increase in CO_2 and other greenhouse gases level in the atmosphere. The major ill effects of the global warming are the increase in the average ambient temperature level, increase in the sea water level, changes in the weather conditions etc.
2.	Will the project help in	Mr.Karuppiah,	The electricity generated by the project

S.N.	Questions raised	Name of stakeholder / Village	Answer by CLP and Vestas
	improving the electricity supply to the villagers/ village school?	Poomalaikundu Village	activity is fed into the Tamil Nadu State Electricity grid which is then distributed across the state.
3	Do the wind turbines cause any sound pollution	Mrs. Thavamani, Poomalaikundu Village	The intensity of sound generated by the wind turbines is maximum at the hub height but it is not threatening to humans or other living beings, as the noise generated is within permissible limits. There are also adequate sound dampeners provided in each wind turbine.
4	Will other projects like this also be erected in this region	Mr.Velusamy, Poomalaikundu Village	The project site at Theni district in Tamil Nadu is a very good site for development of wind power projects, Vestas would be developing similar wind projects for other companies apart from CLP.
5	Will the installation of wind farm affect the rainfall in the region?	Mrs. P. Vasuki, Poomalaikundu Village	It has been scientifically proven that wind turbines have no impact on rainfall pattern. Wind turbines only extract energy from running wind and cause no other side effect.
6	Does the installation of wind farm affect the ground water level in the nearby villages?	Bhaskar, Kandamannur Village	No, the wind farm installed in the region does not affect either ground water level or drinking water quality of area nearby to the project site.
7	Why & who buys the wind turbine generators?	Mrs. T. Anitha, Teacher, NPV School	The representative of Vestas explained that Wind Turbine are bought by investors for the reason that they are inclined towards their commitment to produce green / pollution free energy.
8	Does the project affect the grazing of cattle?		It does not affect the cattle grazing as, wind farms are located which is far away from Village. There was no prohibition by the project officials in allowing villagers for taking their domestic animals for grazing.

E.3. Consideration of comments received

>>

Please refer section E.2 above, for project proponent response to local stakeholder queries. The detailed minutes of meeting are attached as Appendix 2 to this PDD.

SECTION F. Approval and authorization

>>

Host country approval has been received dated 15/12/2011

Appendix 1. Contact information of project participants

Organization name	M/s CLP Wind Farms (India) Private Limited
Country	India
Address	7th Floor, FULCRUM, Sahar Road, Andheri (East), Mumbai – 400 099
Telephone	+91 22 67588888
Fax	+91 22 67588811
E-mail	carbon@clpindia.in
Website	www.clpindia.in
Contact person	Sandip Saha

Appendix 2. Affirmation regarding public funding

No ODA is involved in the project activity

Appendix 3. Applicability of methodologies and standardized baselines

Please refer above section B.2 for Applicability of selected methodology

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

Grid Emission Factors[21]:

The Operating Margin data for the most recent three years and the Build Margin data for the Southern Regional Electricity Grid as published in the CEA database are as follows:

Simple Operating Margin

Year	Simple Operating Margin of Integrated Indian Grid (tCO_2e/MWh)	Net electricity generation in the year (GWh)	Total Emission (tCO2)
2016-17	0.9636	916,278	882,950,683
2017-18	0.9543	960,693	916,827,432
2018-19	0.9685	995,957	964,616,872
Generation weighted Average Operating Margin of last three years	0.9622 tCO2e/MWh		

[21] "CO_2 Baseline Database for the Indian Power Sector" version 15 published by the Central Electricity Authority, Ministry of Power, Government of India on http://cea.nic.in/tpeandce.html

Build Margin

	Integrated Indian Grid (tCO_2e/MWh)
Build Margin	0.8811

Combined Margin Calculations

	Weights	Integrated Indian Grid (tCO_2e/MWh)
Operating Margin	0.75	0.9622
Build Margin	0.25	0.8811
Combined Margin		0.9419

Appendix 5. Further background information on monitoring plan

The points given below detail the monitoring plan and are for the TNEB meter:

The general conditions set out for metering, recording, meter readings, meter inspections, Test & Checking and communication are as per the PPA (power purchase agreement) with TNEB.

Metering: The electricity supplied to the state grid is metered through the two way export meter installed by TNEB at the high voltage side of the step up transformer installed at the project Site.

Metering Equipment: The metering equipment is electronic trivector meter of accuracy class 0.5s or higher required for the project. The meters are owned and operated by TNEB. The metering equipment is maintained in accordance with the electricity standards prevalent in Tamil Nadu.

Meter Readings: The monthly meter reading will be taken jointly by the TNEB and representative of CLP for the last month. At the conclusion of each meter reading an appointed representative of the TNEB and representative of CLP sign a document indicating the number of kWh indicated by the main meter. The project participant has also installed the check meter. The check meter reading shall be considered when main meter is found to be defective or stopped.

Apart from the main meter and the check meter, every WEG is equipped with an inbuilt meter which continuously records the electricity generated by each WEG.

Inspection of Energy Meters: The two-way export meter and all associated instruments, transformers at the project site are of 0.5s or higher accuracy class. The meter is jointly inspected and sealed on behalf of the parties and is not to be interfered with by either party except in the presence of the other party or its accredited representative.

Meter Test Checking: The meter is tested for accuracy with reference to a portable standard meter owned by TNEB. The meter is deemed to be working satisfactorily if the errors are within specifications for meters of 0.5s or higher accuracy class. The consumption registered by the main meter alone holds good for the purpose of metering electricity supplied to the grid as long as the error in the meter is within the permissible limits.

Readings of both Main and Check meters shall be taken every month and shall be compared with each other. Following QA-QC scenarios are planned to demonstrate accuracy of the metering equipment,

1. If the difference between the readings of both meters is lower than total permissible error of both the meters, reading of Main meter is considered for emission reduction calculation

2. If the difference between the readings of both meters is higher than total permissible error of both the meters, both the meters shall be tested.

    a. During such test, if Main meter is found working with in the permissible limits then, reading of Main meter will be considered for emission reduction calculation and Check meter will be calibrated

    b. During such test, if Check meter is found working with in the permissible limits then, reading of Check meter will be considered for emission reduction calculation and Main meter will be calibrated

During such test, if error of both the meters are found to be more than their individual permissible error limits, then error of Main meter will be applied in a conservative manner to its reading in emission reduction calculation. Such correction will be applied to entire generation record starting from the last calibration due date to the date of testing. Both the Main and Check meters shall be calibrated.

Appendix 6. Summary report of comments received from local stakeholders

Local Stakeholders' Consultation Meeting Minutes

Clean Development Mechanism (CDM) Project by CLP

Venue	**:**	Sri Narasingha Permal Vidyalaya Middle School Poomalaikundu Village, Theni District, Tamil Nadu
Date	**:**	18 February 2010, Thursday
Time	**:**	4:30pm onwards

CLP India is setting up wind farms for power generation at Theni district in the state of Tamil Nadu. These farms will generate 99 MW power and the electricity generated from this wind farm is used for supplying the power to the state grid. The project installs the 1.65 MW capacity, V-82 type of Wind Turbine Generators (WTGs) manufactured by Vestas Wind Technology India Private Limited (Vestas). The Vestas V-82 class of wind turbines is the latest in the megawatt series. The project activity comprises of supply, erection, commissioning & operation of 60 numbers of these turbines.
The local stakeholder's from the nearby villagers, state electricity board officials were invited for the local stakeholders meetings through the individual letters. The stakeholder meeting was conducted on 18 February 2010, Thursday and was arranged at the Middle school in the village nearby to the project site. The meeting was attended by the local villagers, representatives of village, teachers of

the nearby school and representatives of state electricity boards. The list of participants has been attached with this minute of meeting.

Agenda for the meeting:

The agenda for the meeting is as follow:

1. Welcome Speech
2. Election of the chair of the meeting and approval of the proposed agenda
3. Presentation about the project undertaken by CLP
4. Introduction to Kyoto protocol and CDM and the role of stakeholders
5. Discussion and articulation of concerns
6. Vote of thanks

Election of Chair of Meeting and approval of proposed agenda

Mr. Ashwin Kumar David, Senior Executive, Vestas India proposed Mr. R. K. Ashokan, Headmaster - Sri Narasingha Permal Vidyalaya Middle School to chair the meeting. Mr.Karuppiah, Local Panchayat Head, Poomalaikundu Village supported the proposal. Mr. Ashokan welcomed the participants and adopted the proposed agenda for the meeting.

Welcome Speech:

Mr. B. Ramaswamy Pillai, Senior Engineer, Vestas India started with the brief introduction about the Vestas and welcomed all the attendees. He explained that meeting has been convened for discussing the opinions, concerns and benefits from the wind power project established in this region by CLP. He informed the local stakeholders about the functioning of the wind turbines. He also explained in brief about the various components of the wind turbine to the local stakeholders.

Introduction about CLP and the project undertaken by CLP:

Mr. Sanjay Pawar, Manager - Commercial (Renewables), introduced about the CLP and explained about its initiatives in development of the wind farms in the country. He explained that CLP is committed to protect the environment and to be part of this process; the organization has developed the wind farm in the region which generates pollution free power. It also adds to national resources and above all it generated employment to the local villagers and helps in increasing the standard of living of the society. He also said that wind farm helps in economic well being of the society through various job opportunities i.e. civil construction, drivers, security personnel, technicians and casual labors etc. He also informed about the purpose of organizing the meeting.

Introduction to Kyoto Protocol and CDM:

Mr. Nashib Kafle, Consultant representative to the project proponent, explained about the Kyoto protocol and CDM to all the stakeholders and in his speech. He explained the modalities and procedures of the Clean Development Mechanism. He further added how carbon levels and greenhouse gases in the atmosphere is increasing and its impact to the global warming. He further explained how wind farm project generated pollution free energy and helps in creating employment opportunities to the villagers. He explained wind power projects also helps in catering the power shortage faced by the nation.

Discussion and Articulation of Concerns:

After the presentation by CLP and their consultant representative the interactive session with the stakeholders was held. The detail of the interactive session is presented below:

S.N.	*Questions raised*	*Name of stakeholder / Village*	*Answer by CLP and Vestas*
1.	What are the factors affecting Global warming and the bad effects thereon?	Mr. S. Suresh Kumar, Poomalaikundu Village	The major factors causing global warming is increase in CO_2 and other greenhouse gases level in the atmosphere. The major ill effects of the global warming are the increase in the average ambient temperature level, increase in the sea water level, changes in the weather conditions etc.
2.	Will the project help in improving the electricity supply to the villagers/ village school?	Mr.Karuppiah, Poomalaikundu Village	The electricity generated by the project activity is fed into the Tamil Nadu State Electricity grid which is then distributed across the state.
3	Do the wind turbines cause any sound pollution	Mrs. Thavamani, Poomalaikundu Village	The intensity of sound generated by the wind turbines is maximum at the hub height but it is not threatening to humans or other living beings, as the noise generated is within permissible limits. There are also adequate sound dampeners provided in each wind turbine.
4	Will other projects like this also be erected in this region	Mr.Velusamy, Poomalaikundu Village	The project site at Theni district in Tamil Nadu is a very good site for development of wind power projects, Vestas would be developing similar wind projects for other companies apart from CLP.
5	Will the installation of wind farm affect the rainfall in the region?	Mrs. P. Vasuki, Poomalaikundu Village	It has been scientifically proven that wind turbines have no impact on rainfall pattern. Wind turbines only extract energy from running wind and cause no other side effect.
6	Does the installation of wind farm affect the ground water level in the nearby villages?	Bhaskar, Kandamannur Village	No, the wind farm installed in the region does not affect either ground water level or drinking water quality of area nearby to the project site.
7	Why & who buys the wind turbine generators?	Mrs. T. Anitha, Teacher, NPV School	The representative of Vestas explained that Wind Turbine are bought by investors for the reason that they are inclined towards their commitment to produce green / pollution free

S.N.	Questions raised	Name of stakeholder / Village	Answer by CLP and Vestas
			energy.
8	Does the project affect the grazing of cattle?		It does not affect the cattle grazing as, wind farms are located which is far away from Village. There was no prohibition by the project officials in allowing villagers for taking their domestic animals for grazing.

Vote of thanks:

The representative of CLP and their consultant along with the people from Vestas India at the project site thanked the local villagers, school teachers and state electricity board representatives who participated in the meeting. They thanked the villagers for their time and effort taken to come to the venue of the meeting and for sharing the opinion about the project. The meeting concluded at 6:00pm with light refreshment.

Appendix 7. Summary of post-registration changes

CLP had requested below mentioned Post Registration Changes for this project activity and same have been approved by Secretariat on 18/01/2018 (ref. PRC-7415-001) (https://cdm.unfccc.int/PRCContainer/DB/prcp362700508/view). Details of the changes are mentioned below:

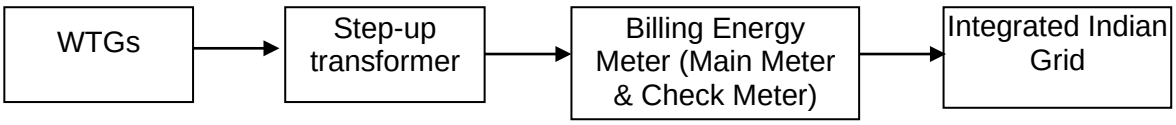
- In this project activity, project WTGs are generating electricity at 690 V which is then stepped up to 33 kV through 3 phase transformers located near to the WTG and dedicated energy meters are also connected to these transformers to monitor the electricity export and import by the WTGs.

  In accordance with Standards on Installation and Operation of Meters (pg no 15 of 20) of the notification dated 17/03/2006 published by Central Electricity Board, Govt. of India (www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf), interface meters with 0.5s or better accuracy class needs to be installed if energy meter is connected to above 650 volts and up to 33 kV. Thus, during project commissioning state utility has installed energy meters with 0.5s accuracy class as energy meters are connected to grid at 33 kV. However, TNEB (state utility) has decided to upgrade accuracy class of all energy meters from 0.5s to 0.2s. Thus, being a project developer under TNEB jurisdiction, CLP has to replace all interface energy meters at site and same is beyond the control of CLP. The meter replacement process is still ongoing and expected to be completed by March-2018. Thus, this project activity is now using energy meters with higher accuracy class to monitor export and import of electricity which is more conservative in nature. Due to upgradation of interface energy meters, project baseline and additionality would be remain unaltered and accuracy of monitored data would be more accurate.

- During registration, calibration frequency has been considered once in a year. However, in actual practice, state utility conducted the accuracy check of all interface meters once in five years. These meters also tested whenever the energy and other quantities recorded by the meter are abnormal or inconsistent with electrically adjacent meters. Same is in line

with para 18.1.b of the notification dated 17/03/2006 published by Central Electricity Board, Govt. of India (www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf). Testing and calibration has been done by state utility which is beyond the control of Project Participant.

- During project registration, PDD had been developed in line with prevailing Project design document form i.e. version 03. Further, version of Project design document form has been revised now. In line with guideline for Project design document form and paragraph 259 of Project Standard Version 01.0, line diagram of monitoring system showing all relevant monitoring points has now been incorporated in section B.7.1 of PDD. The schematic representation of metering arrangement is demonstrated below:



ANNEX-1: WEIGHTED AVERAGE COST OF CAPITAL

Weighted Average Cost of Capital:

WACC = [D/ (D+E)]*[Cost of Debt] + [E/ (D+E)]*[Cost of Equity]

Cost of Debt:
In order to reflect the standard rate in the market the bank prime lending rate prevailing at the time of project start date has been considered as the cost of debt. The Prime Lending Rate (PLR) at the time of investment was in the range of 11.00% – 12.00%[22]. The average PLR of 11.50% has been considered as the cost of debt.

Interest costs are tax deductible, therefore in order to arrive at the post tax cost of debt, the cost of debt is multiplied with marginal tax rate. The loan tenure of the project is 10 years, it may be noted that for the first 10 years, all power projects in India are required to pay tax @ 16.995% (as per section 80 IA of Income Tax Act). Accordingly the marginal tax rate has been considered as 16.995%. The post tax cost of debt therefore works out to: 11.5% * (1-16.995%) = 9.55%

Calculation of Cost of Equity:
The expected return on equity has been determined using the Capital Asset Pricing Model (CAPM)[23]. The CAPM economic model is used worldwide to determine the required/expected return on equity based on potential risk of an investment. The CAPM framework is the Nobel award winning work of financial economist Dr. William Sharpe.

Ke = Rf + B x (Rm - Rf)
where:
Ke = Rate of return on equity capital;
Rf = Risk-free rate of return;
B = Beta;
Rm – Rf = Market risk premium;

Risk free rate:
The risk free rate is understood as the rate of return on an asset that is theoretically free of any risks, therefore the rate of interest on government bonds are considered as risk free rates. Page 191 of text book on "Corporate Finance Theory and Practice" by Dr. Aswath Damodaran[24] of Stern School of Business, New York University describes that the long term government bond rates are suitable indicators of risk free rates since the time horizon for this investment is long term.

Accordingly the risk free rate has been taken from long dated Indian government bond rates prior to the project investment decision. The data on government bond rates is published by Reserve Bank of India[25].

[22] http://www.rbi.org.in/scripts/WSSView.aspx?Id=13930

[23] The Capital Asset Pricing Model (CAPM) was published in 1964 by William Sharpe, for his work on CAPM Sharpe received the Nobel Prize in 1990. http://www.investopedia.com/articles/06/CAPM.asp

[24] Dr. Damodaran is one of the foremost authorities in the world in the field of Investment Analysis

[25] (Web-link: http://rbi.org.in/scripts/AnnualReportPublications.aspx?Id=817)

The applicable risk free rate is 8.12 %.

Risk Premium:

The most common approach for estimating the risk premium is to base it on historical data, in the CAPM, the premium is estimated by looking at the difference between average return on stocks and average return on government securities over an extended period of history [page 190, Corporate Finance Theory and Practice, Dr. Aswath Damodaran.[26]]. It is preferred to use long term premiums, i.e. over a period of 25 years, since considering shorter time periods can lead to large standard errors because volatility in stock returns [page 191, Corporate Finance Theory and Practice, Dr. Aswath Damodaran.]

.Therefore the market risk premium has been calculated as the difference in compounded annual return between the BSE Sensex since the year of inception of BSE Sensex, i.e. 1979 -80 and the risk free rate applicable at the time of investment decision. The detailed calculations are presented in the attached excel sheet.

The applicable risk premium is 18.08% - 8.12% = 9.96%

Beta:

Beta (B) indicates the sensitivity of the company to market risk factors. For companies that are not publicly listed, the beta is determined by referring beta values of publicly listed companies that are engaged in similar types of business. The project activity type is wind power generation; the approach therefore should be to base the beta for the project on the beta values of listed wind power generation companies in India. However, there was only one wind energy or renewable energy power generation company (BF Utility) listed on any stock exchange in India (both BSE-Bombay Stock Exchange and NSE-National Stock Exchange) in year 2007[27]. Therefore, in the absence of adequate data on companies which are exclusively into the exactly same type of business (i.e wind power projects), the next best option for assessing the risk of these projects is to consider the data available on companies which are involved in similar businesses.

Therefore, we have considered beta values of all electricity generating companies in India. The group of companies considered includes renewable as well as conventional power generating companies.

The applicable Beta value has been determined on the basis of the Beta values of all power generating companies in India which were listed on the stock exchange at the time of this investment. Beta values of individual companies have been sourced from Bloomberg and screenshots are available in appendix - 4. The table below summarises the beta values:

Company	Bloomberg Symbol	Beta
BF Utilities Ltd.	BFUT IN Equity	0.998
CESC Ltd.	CESC IN Equity	1.061
Neyveli Lignite Corpn.	NLC IN Equity	1.241

[26] All such related sources would be submitted to the DOE during validation.

[27]This can be verified from the database available at the web-link www.securities.com (This website is owned by a Euromoney Institutional Investor Company and It delivers hard-to-get information on more than 80 emerging markets through its award-winning online Emerging Markets Information Service.)

Tata Power Co. Ltd.	TPWR IN Equity	1.048
NTPC Ltd.	NTPC IN Equity	0.683
Gujarat Industries Power Co. Ltd.	GIP IS Equity	0.953
Jaiprakash Power Ventures Limited	JPVL IN Equity	1.34
Reliance Infrastructure Ltd.	RELI IN Equity	1.735
Average		**1.132**

Source: Bloomberg

$$WACC = [D/(D+E)]*[\text{Cost of Debt}] + [E/(D+E)]*[\text{Cost of Equity}]$$

For calculation of WACC, a debt : equity ratio of 70:30 has been considered, as typical for the project Type[28].

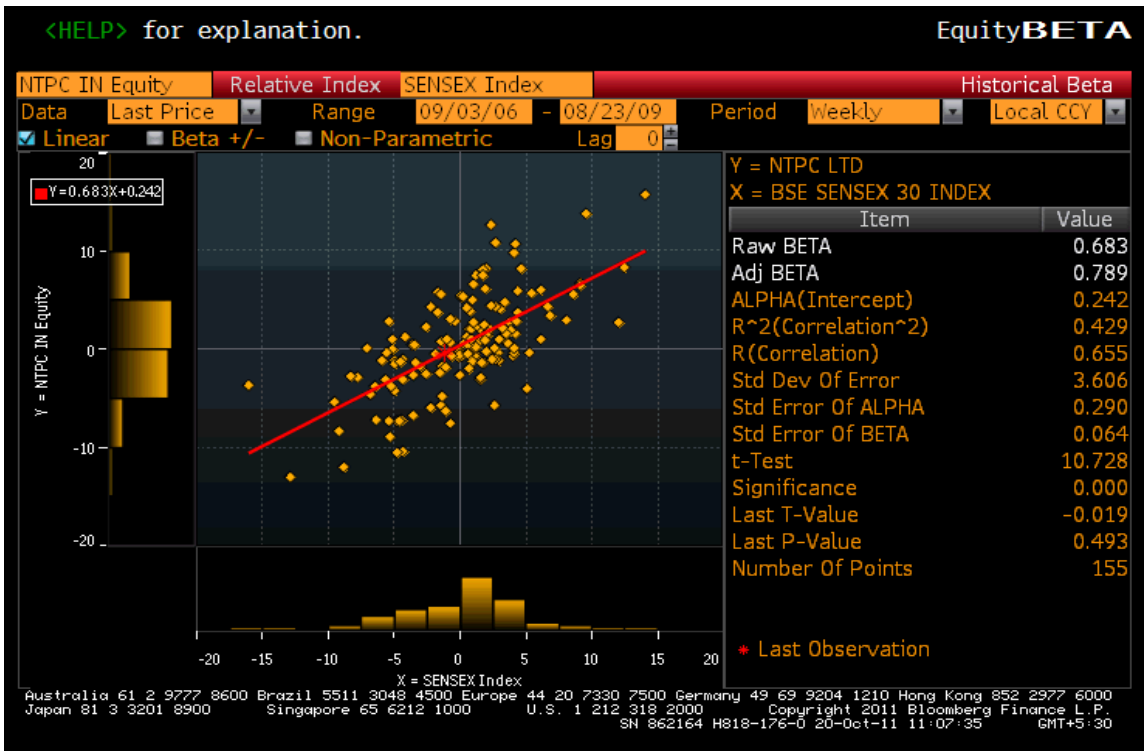
WACC = 70%* 11.50%*(1-16.995%) + 30%*(8.12 % +1.132 * 9.96%)

Therefore, WACC = 70% * 9.55% + 30% * 19.4% = 12.50**%**

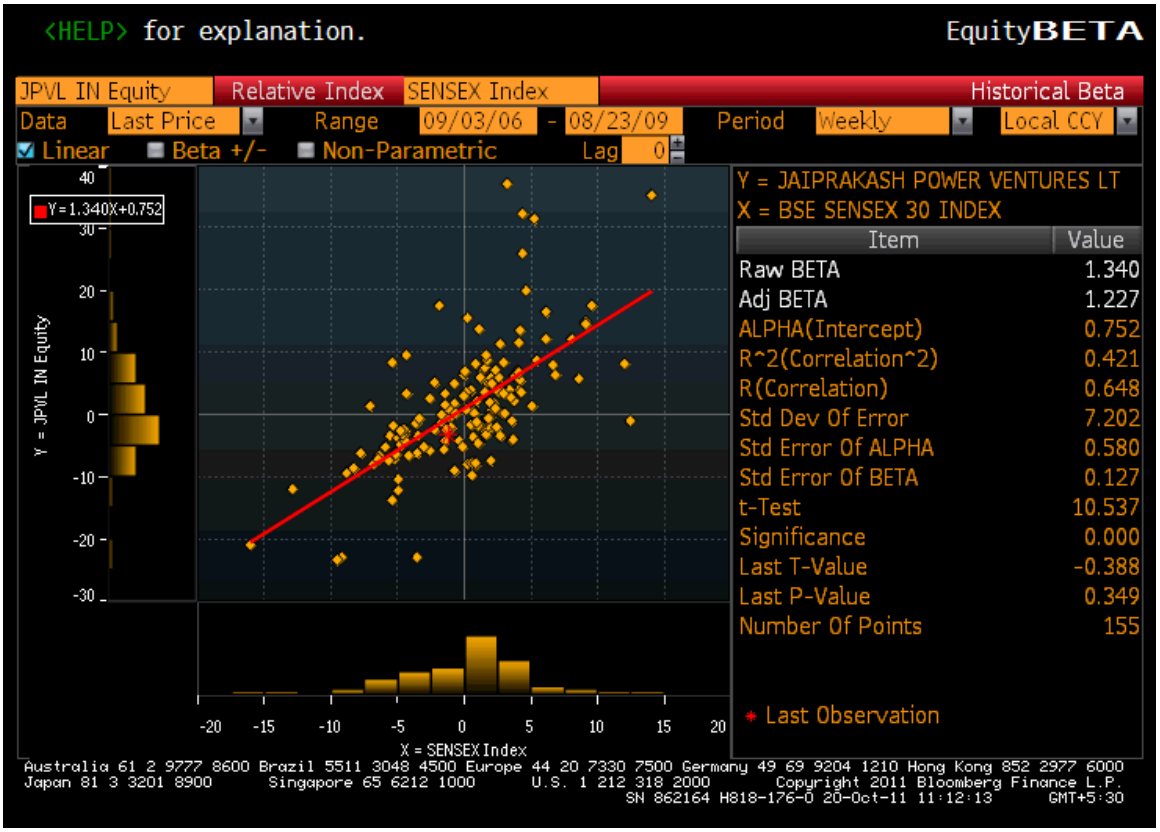
[28] Several regulations and orders refer this as the normative debt equity ratio for wind power projects.

ANNEX-2 : Bloomberg's screenshots of individual companies for Beta Value

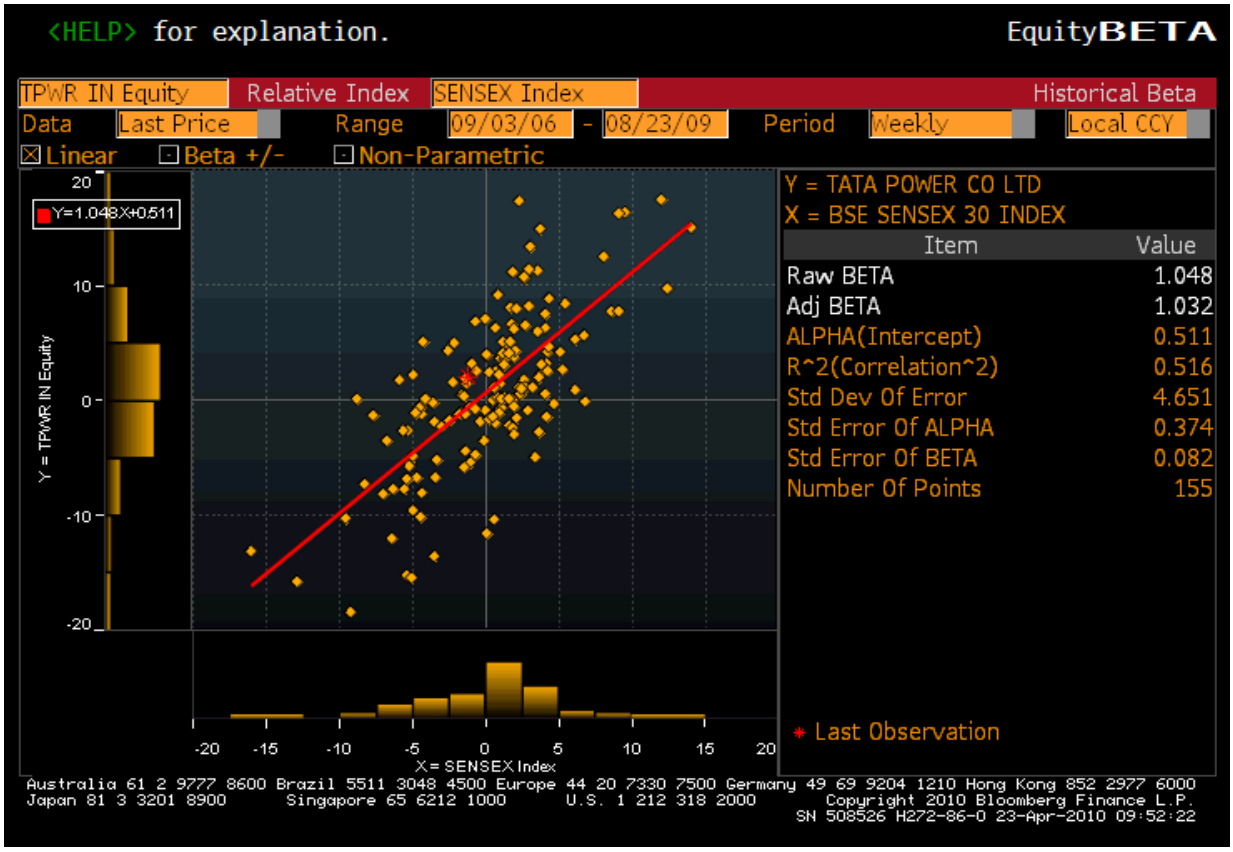
NTPC LTD



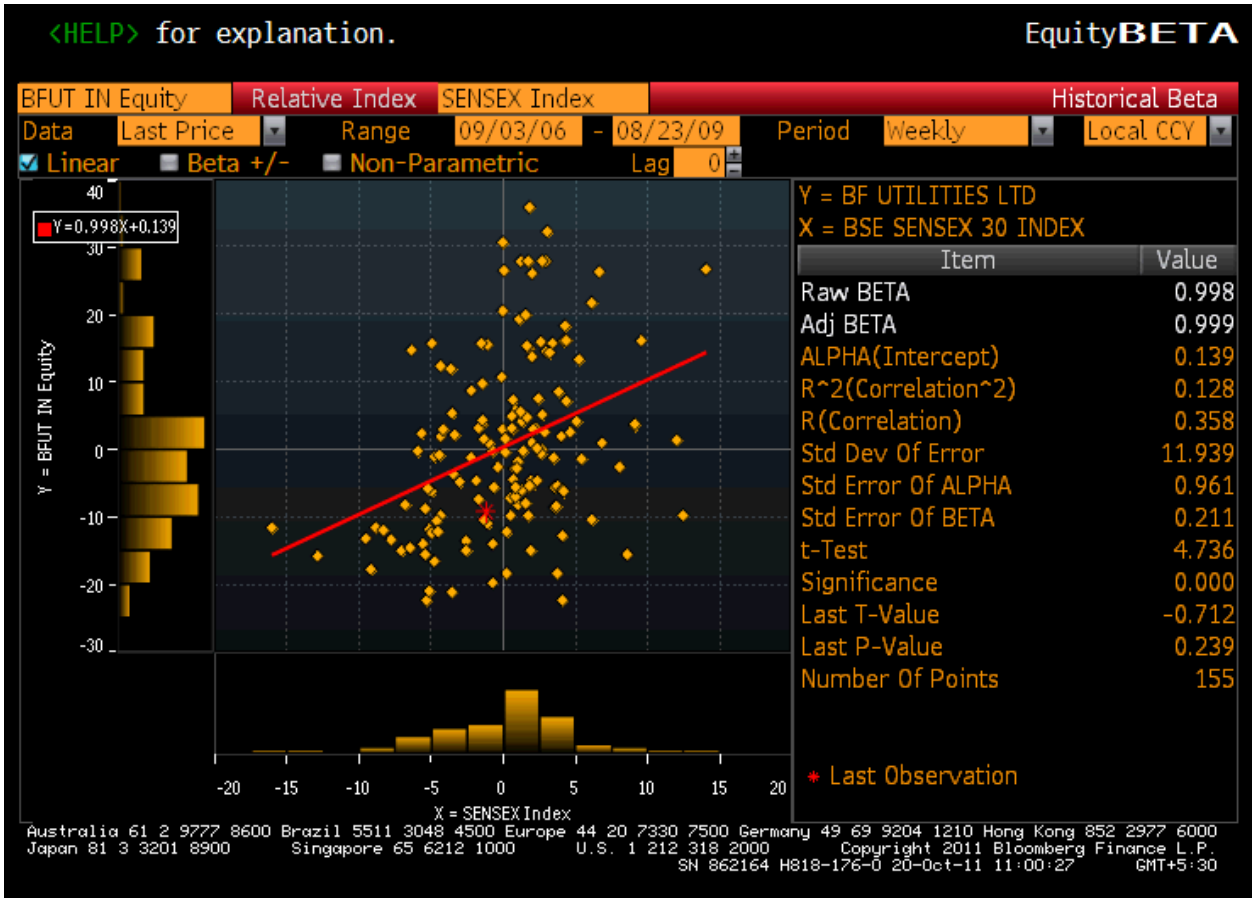
JAIPRAKSH POWER VENTURES LIMITED



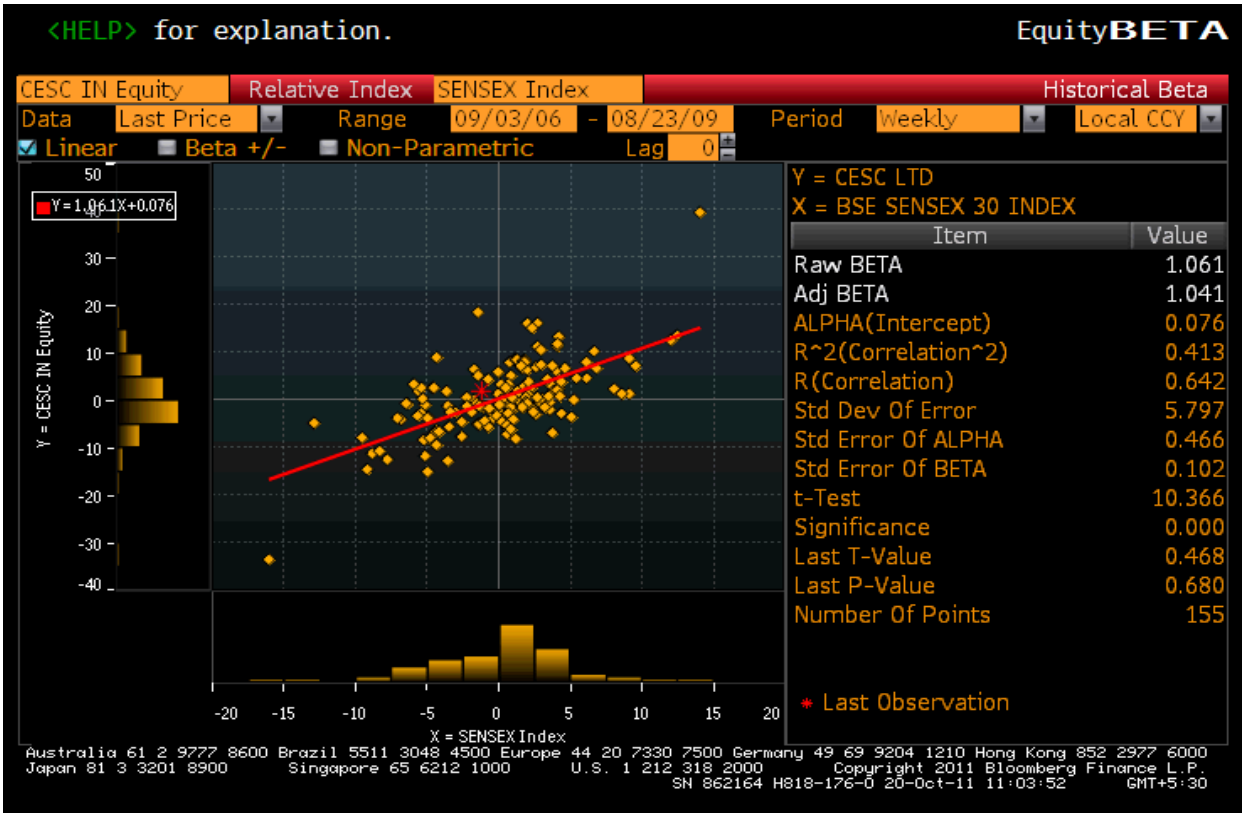
TATA POWER COMPANY LIMITED



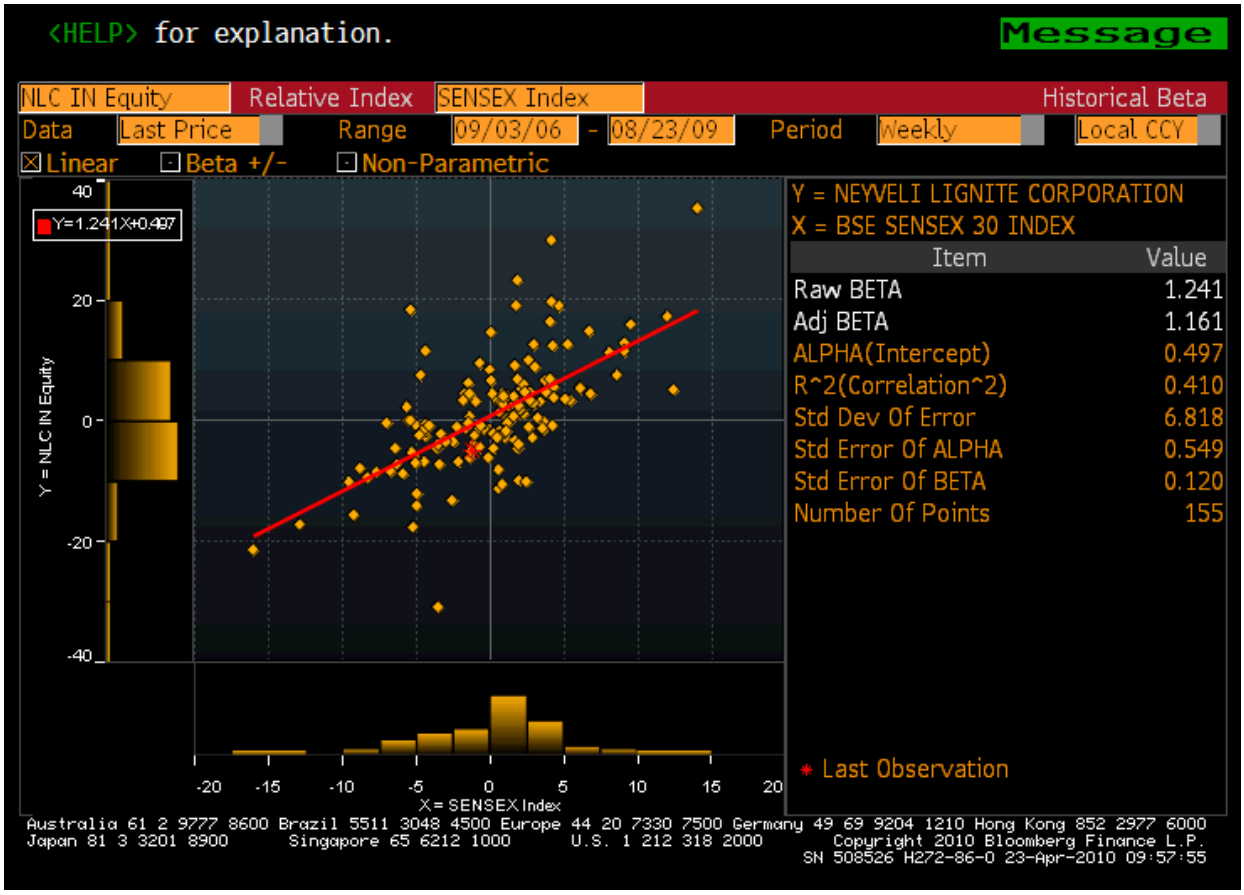
BF UTILITIES



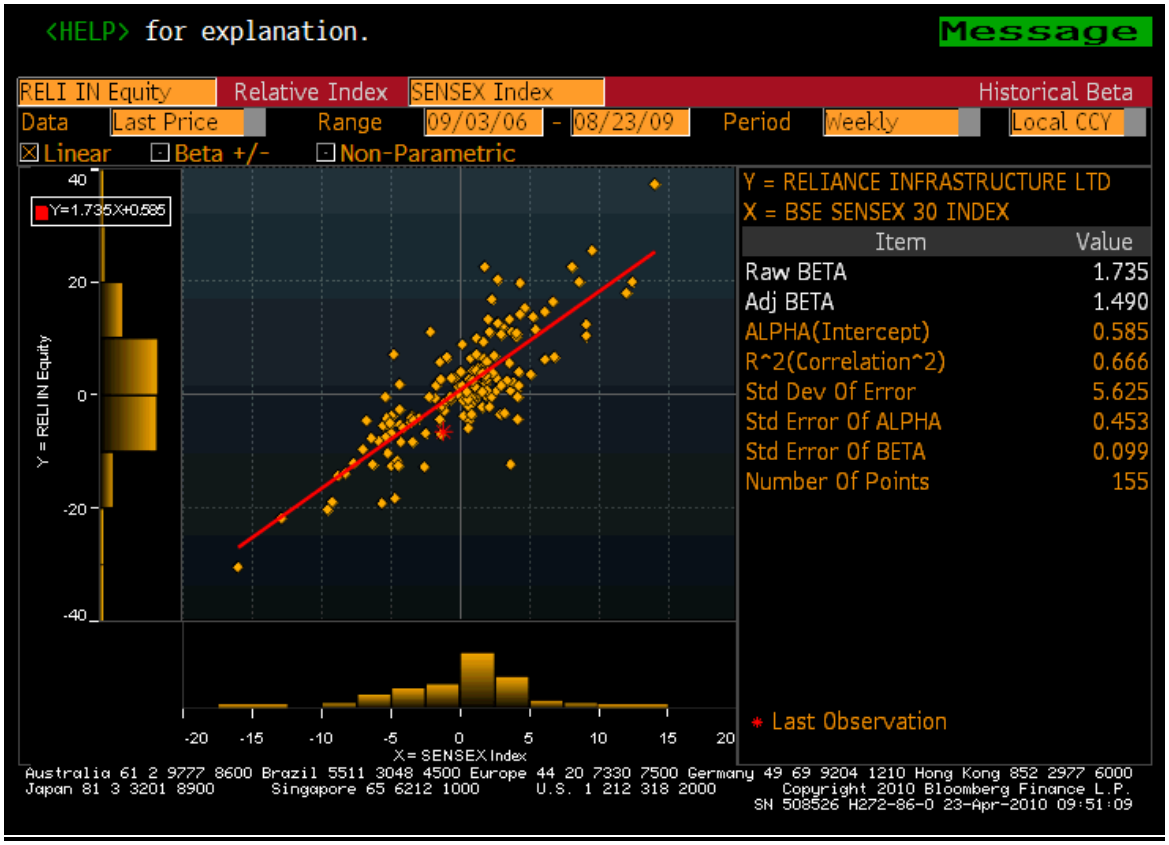
CESC LTD.



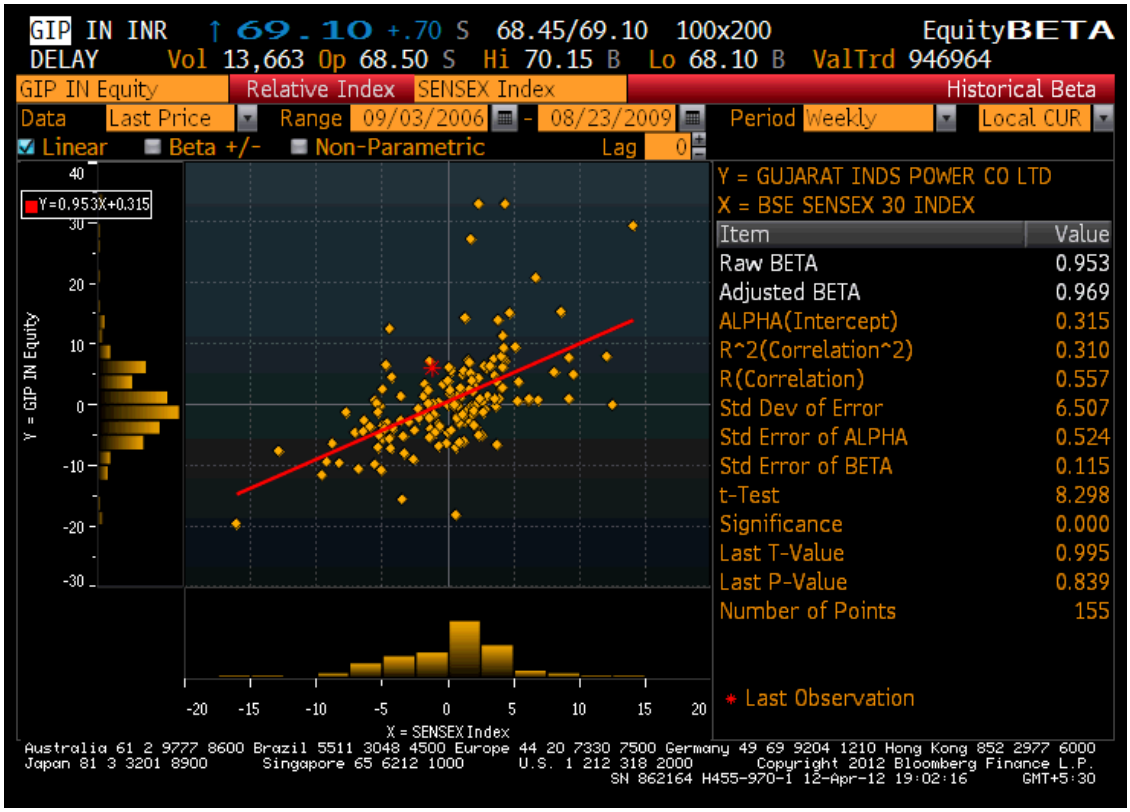
NEYVELLI LIGNITE



RELIANCE INFRASTRUCTURE



GUJARAT INDUSTRIES POWER COMPANY LTD



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Document information

Version	*Date*	*Description*
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.

Version	*Date*	*Description*
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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Document Type: Form
Business Function: Registration
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