Project design document form

(Version 11.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the project activity	Wind Energy Project in Saundatti, Karnataka
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	06
Completion date of the PDD	03/08/2020
Project participants	CLP Wind Farms (India) Private Limited
Host Party	India
Applied methodologies and standardized baselines	ACM0002 "Grid-connected electricity generation from renewable sources - Version 20.0, EB 105"
Sectoral scopes	Sectoral Scope 1: Energy Industries (renewable/non-renewable sources)
Estimated amount of annual average GHG emission reductions	146,536 tCO_{2e} per annum

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Description and Purpose of the Project activity

CLP Wind Farms (India) Private Limited (CLPWFPL), the project proponent, is a subsidiary of CLP India Private Limited (CLPIPL) (formerly known as Gujarat Paguthan Energy Corporation Limited). The project activity is a wind energy project located at the Saundatti site, District Belgaum in the state of Karnataka. It was originally envisaged with the implementation of 82.4 MW consisting of 103 Wind World (India) Limited (formerly known as Enercon India Limited) make, E-53 Wind Energy Generators (WEGs) each of capacity 800 kW. However, due to delay in obtaining clearance from the state regulatory authorities, it was later decided that 13 WEGs of the project would be kept under abeyance. Therefore, the capacity that is being considered under this PDD refers to development of 72 MW, consisting of 90 WEGs, and this will be referred to as the Project activity in this PDD. The electricity generated from the wind farm will be exported to the Southern Region electricity grid which is now an integral part of Integrated Indian grid and sold to the state electricity utility thereby marginally contributing towards reduction in the energy demand supply gap in the state of Karnataka, diversification of grid supply and reduction of greenhouse gas emissions.

Since the proposed project activity is a Greenfield project, the approved consolidated methodology ACM0002 already prescribes the baseline scenario as being "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 wind power exported by the proposed project activity would displace an equivalent amount of electricity generated by the power plants already operational and proposed to be added in the Integrated Indian Grid which relies predominantly on fossil fuels (particularly coal), thus contributing towards reduction in the demand-supply gap during periods of electricity shortage and increasing the share of renewable energy in the grid mix.

In absence of the project activity, the grid could have procured power generated from fossil fuel based power projects. The estimation of GHG emission reductions by the project activity is limited to carbon dioxide (CO_2) only and its primary source is the fossil fuels consumed in the Integrated Indian grid. The proposed project activity would lead to an estimated emission reduction of 146,536 tCO_2 per annum over the chosen renewable crediting period.

View of the project participants on the contribution of the project activity to sustainable development

Ministry of Environment and Forests, Govt. of India has stipulated the following indicators for sustainable development in the guidelines for CDM projects:

Social well being

- The proposed project would lead to generation of business opportunities and employment in the region thereby contributing towards social upliftment through direct and indirect benefits.

- 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.

Economic well-being

- 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 Southern grid thereby improving the 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.

Environmental well being

- The project activity employs wind power for generation of electricity thereby displacing fossil fuels which are being rapidly consumed to meet the growing demand of electricity in the country thus contributing towards reduction in GHG emissions

- Wind power projects generate no end products in the form of solid waste (ash etc.) which are common to alternative modes of power generation (e.g. coal based on which the Indian grid is primarily dependent). Hence the project activity is a cleaner source of power generation and is encouraging greener practice of power generation.

- The wind power project indirectly is contributing towards conservation of non–renewable resources which are under the constant threat of depletion due to excessive and rapid growth of energy demand. The growing threat of global warming which is a key concern is also addressed due to renewable energy use thereby mitigating climate change.

Technological well being

- The project activity uses Wind Energy Generators (WEGs) 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 Southern Regional Grid), thus increasing energy availability under the service area of the substation. Hence the project leads to technological well being.

The National CDM Authority has mandated CLPWFPL to commit a minimum of 2% earning (net realization value) from sale of CER towards Sustainable Development Activities including society and community development activities. The Project is expected to generate 146,536 CERs per annum upon registration. The net realization that is likely to accrue to CLPWFPL from selling CERs would be based on prevailing market for CERs after meeting statutory tax requirements and CER revenue sharing requirements with the utility as per the provisions of the Power Purchase Agreement ('PPA').

CLPWFPL is a wholly owned subsidiary of the CLP Group, which is the largest and perhaps most environmentally conscious private power utility in Asia Pacific. CLP lays extensive emphasis on matters pertaining to climate change, safety, air quality and community development. CLP's ultimate objective is to supply electricity by striking a balance between the commercial economics of a project on one side and social and environmental needs of the communities on the other. This commitment of CLP runs through its entire system and within all the businesses across various countries.

It is envisaged that CLPWFPL may work with local communities and villages through Non-Government Organisations ('NGOs') that are better placed to consolidate such corporate efforts at a more meaningful and larger scale to identify specific local needs and ensure effective spending of funds allocated out of CER revenues.

The CLP Group reports its performance on the Sustainability front through the Annual Sustainability Report, which is issued jointly with the Company's Annual Report. CLP's Sustainability Report includes elements and indicators recommended in the Global Reporting Initiative - G3 Sustainability Reporting Guidelines, which is an international framework on sustainability reporting. Being a subsidiary of the CLP Group, the standards also apply to CLPWFPL. Along with this reporting, CLPWFPL will also monitor the impact of its contributions through the reporting of the NGOs that it works with for this purpose.

A.2. Location of project activity

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The project activity is located at Saundatti which is approximately 550 kms from the major metropolitan city of Mumbai, India. The site is well accessible by road from the cities of Belgaum and Hubli in Karnataka, which are at a distance of approximately 80 kms and 67 kms respectively.

State: Karnataka

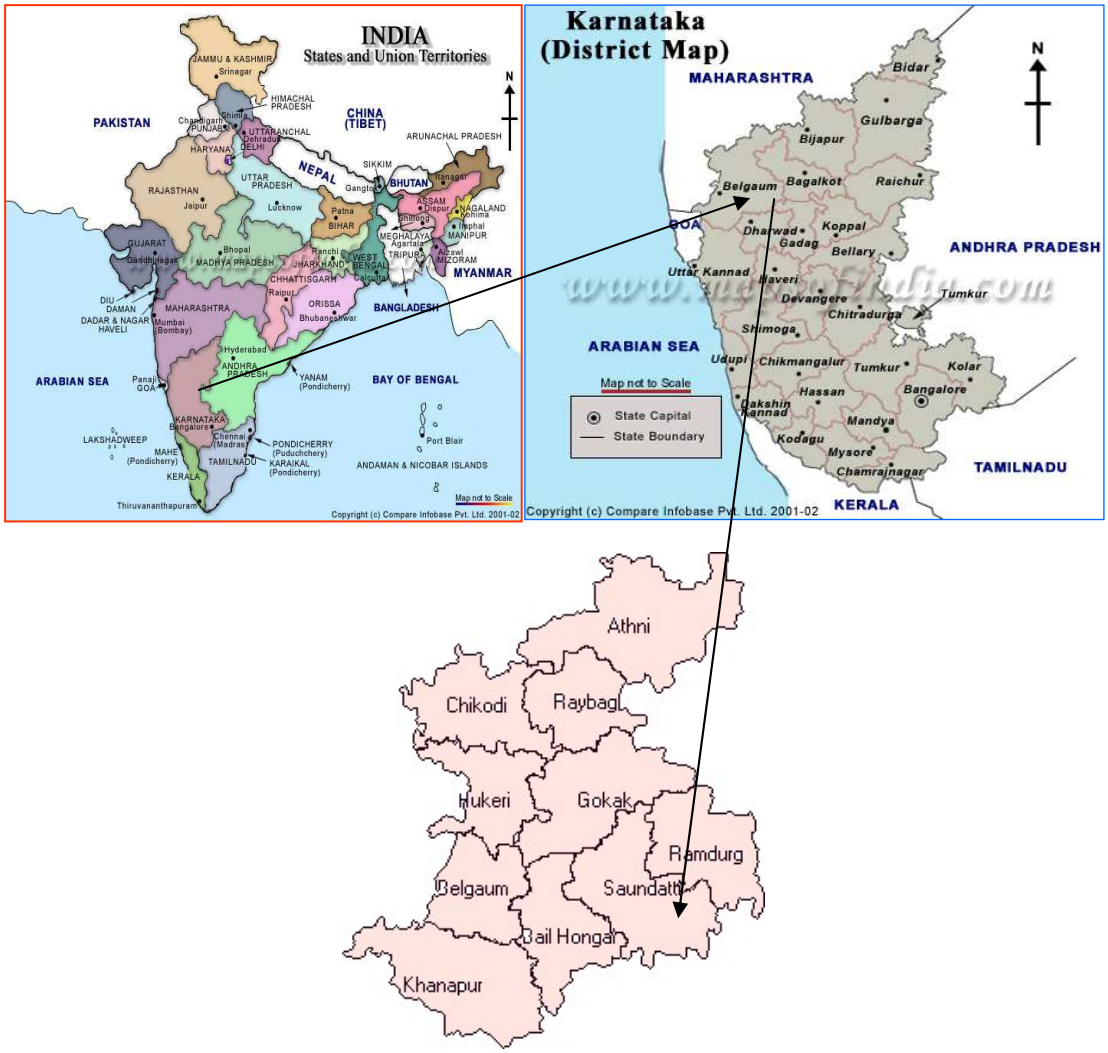
District – Belgaum

Site – Saundatti

Villages – Katamalli, Hooli, Vatnal, Gorbala, Basidoni, Mallapur, Goravanakolla and Haletorgal.

Nearest Airport – Hubli;

Nearest Railway Station – Hubli



A.3. Technologies/measures

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Wind turbines produce electricity by using the natural power of wind to drive a generator. Wind has a considerable amount of kinetic energy when blowing at high speeds. When this kinetic energy passes over the blades of the wind turbines, it is converted into mechanical energy and rotates the wind blades. When the wind blades rotate, the connected generator also rotates, thereby producing electricity. The electricity thus produced using wind leads to displacement of electricity produced by the grid which is primarily coal based and thus results in significant reduction of carbon dioxide emissions which is the main emission source being displaced by the implementation of the proposed project activity.

The Project activity envisages installation of 90 WEGs of E-53 WWIL make (formerly known as Enercon) (800 kW WEGs). Since the project activity is a Greenfield installation there was no electricity generation installation at the project site. The technical lifetime of the project activity would be 20 years based on manufacturer specifications. The PLF for the project activity location based on the wind availability assessment provided by WWIL and further used to estimate the net generation is 24.80%.

As per the applied methodology ACM0002, Version 20.0, since the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the "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".

The list and arrangement of the main manufacturing / production technologies, systems, equipment included has been included in section A.2.

The technical details of individual WEGs are tabulated below:

WWIL (formerly ENERCON)- E53 TECHNICAL DATA

WEG

General

Model	: E53
Rated Output	: 800 kW
Rotor diameter	: 53 m
Hub height	: 75 m

Generator

Type	: Synchronous
Voltage	: 2 x 460 V (Variable)
Frequency	: Variable
Manufacturer	: Wind World (India) Limited (formerly known as Enercon India Limited)

Rotor with Pitch Control

Manufacturer	: WWIL (formerly known as EIL)
Type	: Continuous variable pitch mechanism
Number of blades	: 3
Swept area	: 2196.75 m²
Blade material	: Fibre glass epoxy reinforced with integral lightning arresters
Rotor speed	: 12-29 rpm
Tip speed	: 80 m/s (max)
Pitch control	: Continuous variable pitching mechanism

Hub	: Casted Steel
Bearings	: Tapered roller bearings
Braking System	: 3 independent Brakes with power back up supply.
Yaw Control	: Active yawning with 4 electric yaw drives
Cut-in Wind Speed	: 3 m/s
Cut out wind Speed	: 24 m/s
Wind Speed at rated output	: 12.6 m/s
Tower	: 75 m height
Controller	: WWIL (formerly known as EIL)
Type	: AC-DC-AC through convertor invertor

These turbines are supplied by Wind World India Limited (formerly Enercon India Ltd.) and are designed for Indian wind conditions. The technology for the same is environmentally safe and sound. Further, there is no technology transfer involved in the project activity.

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)	CLP Wind Farms (India) Private Limited (Private entity)	No

A.5. Public funding of project activity

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There is no recourse to any public funding by CLPWFPL in the proposed project activity. The project proponent hereby confirms that there is no divergence of Official Development Assistance (ODA) to the proposed project activity.

A.6. History of project activity

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CLPWFPL confirms that:

- The proposed CDM project activity is a registered CDM project activity with registration number 6794 and Registration Dated 01/08/2012; please refer the below weblink https://cdm.unfccc.int/Projects/DB/BVQI1343049611.03/view

- The proposed CDM project activity is not a project activity that has been deregistered.

CLPWFPL declares that:

- The proposed CDM project activity was not a CPA that has been excluded from a registered CDM PoA;

The proposed CDM project was not a registered CDM project activity of a CPA under a registered CDM PoA whose crediting period has not expired exists in the same geographical location as the proposed CDM project activity.

A.7. Debundling

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Not applicable

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

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Title of the baseline methodology: “Grid-connected electricity generation from renewable sources”.
Reference: ACM0002, Version 20 (Sectoral Scope: 01)

It has been referred from the list of approved methodologies for CDM project activities in the UNFCCC CDM website (https://cdm.unfccc.int/methodologies/PAmethodologies/approved)

The approved methodology also draws upon Version 6.0.0 of the “Tool for demonstration and assessment of additionality”. The baseline for the said Project activity is determined using the “Tool to calculate the Emission Factor of an electricity system” (Version 7.0).

B.2. Applicability of methodologies and standardized baselines

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The project activity is Grid connected renewable power generation and meets the applicability conditions of the chosen methodology as follows:

Sr. No	Applicability criterion	Justification
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 Involve a replacement of (an) existing plant(s)/unit(s)	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 start of this minimum historical reference period and the implementation of the project activity.	The proposed project activity is the installation of a greenfield wind power plant/unit. Therefore, the project activity is satisfying the said criteria.
3	In case of hydro power plants, one of the following conditions shall apply: • The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or • 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 (3), is greater than 4 W/m2; or • The project activity results in new single or multiple reservoirs and the power density,	The proposed project activity involves installation of a wind power plant/unit. As the criteria are related to hydro power project, therefore, the said criteria are not applicable.

Sr. No	Applicability criterion	Justification
	calculated using equation (3), is greater than 4 W/m2; or • The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m2, all of the following conditions shall apply: I. The power density calculated using the total installed capacity of the integrated project, as per equation (4), 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/m2 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.	
4	In the case of integrated hydro power projects, project proponent shall: • 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 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 five years prior to implementation of CDM project activity.	The proposed project activity involves installation of a wind power plant. As the criteria are related to hydro power project, therefore, the said criteria are not applicable.
5	The methodology is not applicable to: • 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; Biomass fired power plants/units.	The proposed project activity is the installation of wind power plant/unit. Therefore, the said criteria is not applicable.

Sr. No	Applicability criterion	Justification
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 maintenance.	The proposed project activity is a Greenfield project, thus this criteria is not applicable.
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 3.1 of the PD 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 bio fuels.

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

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According to the methodology ACM0002 (Version 20), the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

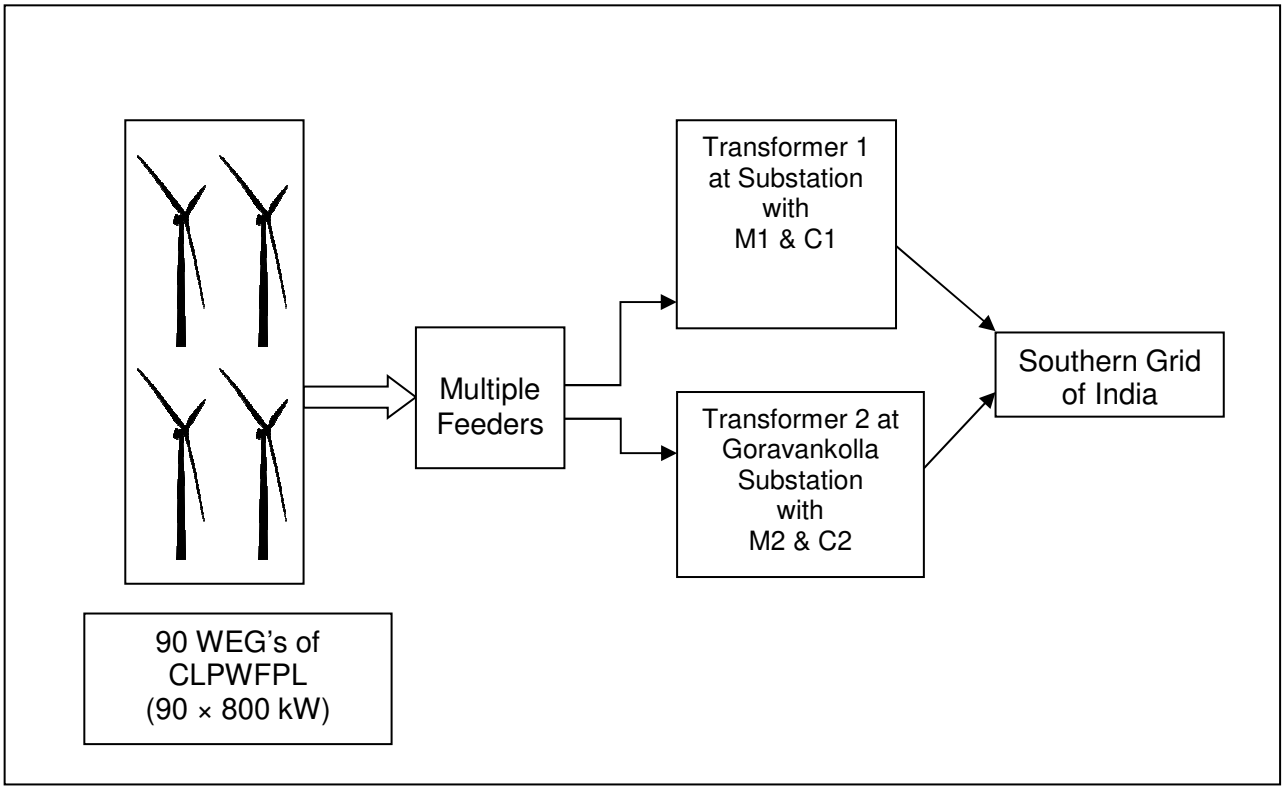
The proposed project activity would be feeding the electricity to Integrated Indian Grid . Thus, in accordance with the methodology all the power generation facilities connected to the Integrated Indian grid form the project boundary for the purpose of baseline estimation.

The greenhouse gases and emission sources included in or excluded from the project boundary are discussed in the following table:

	Source	GHG	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil 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 CO_2 emissions resulting from the power generation.
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam.	CO_2	No	Not applicable for wind projects
		CH_4	No	Not applicable for wind projects
		N_2O	No	Not applicable for wind projects
	For geothermal and solar power plants, CO_2 emissions from combustion of fossil fuels required to operate the power plants.	CO_2	No	Not applicable for wind projects
	For geothermal and solar power plants, CO_2 emissions from combustion of fossil fuels required to operate the power plants.	CH_4	No	Not applicable for wind projects
		CO_2	No	Not applicable for wind projects
	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	Not applicable for wind projects
		CH_4	No	Not applicable for wind projects
		N_2O	No	Not applicable for wind projects
	For all renewable energy plants, CO_2 emissions from backup power generation.	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 CO_2 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:



Project Boundary

T1 & T2: Transformers
M1 & M2: Main Meters at T1 & T2 respectively
C1 & C2: Check Meters at T1 & T2 respectively

B.4. Establishment and description of baseline scenario

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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 14.0)[1].

In accordance 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

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

the emissions which would have 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.

As such and in accordance with Tool and 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 as mentioned in section 1.11 of this document, 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 solar 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

The project is in compliance with laws and regulations required. There is no any 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 existing at the time of requesting renewal of the crediting period on the current baseline emissions, 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 14, 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.

This step is not applicable for the project activity as the life time of the project is for 20 years and it covers the current crediting period under renewal.

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 14, 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 first crediting period and not monitored during the crediting period are updated according to relevant data sources listed in table below. 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[2] (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:

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

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

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 Joint Meter Reading sheets

2) CO_2 Baseline Database (Version- 14) published by Central Electricity Authority (CEA), Government of India under Baseline Carbon Dioxide Emissions from Power Sector

Sr. No.	Parameters	Unit	Value	Reference
1.	$EF_{grid,OM,y}$	tCO_2/MWh	0.9610	Operating margin CO_2 emission factor for the project electricity system. The value is calculated for year 2015-16, 2016-17 and 2017-18
2.	$EF_{grid,BM,y}$	tCO_2/MWh	0.8644	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	0.9368	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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In accordance with the "Guidance on the demonstration and assessment of prior consideration of the CDM" (EB49, Annex 22), for project activities with a start date before 2nd August 2008, for which the start date is prior to the date of publication of the PDD for global stakeholder consultation, the serious consideration of CDM in the decision to proceed with the implementation of the project activity is demonstrated below:

a) The project proponent has taken the decision to undertake the said project activity for the purpose of promoting renewable energy in view of the revenues from CDM accruing to it, which make the investment worthwhile. CLP India Private Limited (CLPIPL) (formerly known as Gujarat Paguthan Energy Corporation Limited) which has already undertaken wind power projects and is taking these projects through CDM. Thus, CLPWFPL was aware of CDM prior to the project start date and revenues from CER sales as a part of returns from the project were decisive in the decision to

implement the project. In the minutes of the meeting of the Board of Directors the importance of CER revenue for the proposed project activity was discussed in detail and it was resolved to implement the proposed project activity in the state of Karnataka after due consideration of CDM revenues.

b) The evidences to demonstrate this awareness and actions to secure CDM status are available in the form of various documentary evidences. An account of the same is documented below:

- The project proponent, CLPWFPL is a wholly owned subsidiary of CLP India Private Limited (CLPIPL) (formerly known as Gujarat Paguthan Energy Corporation Ltd.) which in-turn is a subsidiary of the CLP Group, one of the largest investor-owned power businesses in Asia. The CLP Group operates a vertically integrated electricity generation, transmission and distribution business in Hong Kong.

- The CLP group recognizes climate change as a global challenge and the impact of this phenomenon must be mitigated as far as possible. The group had identified an action plan to reduce emissions from power generation in a document "Our Manifesto on Air Quality & Climate Change"[3] released in 2004, where it has defined its objective of increasing capacity through renewable modes of power generation.

- Expanding on the objectives mentioned in the above document, the goals were elaborated in the document "A Future Power from Nature" released in March 2006 which outlines the specific activities planned to be implemented. This document also documents the sort of projects (including the possibility of CDM funding) the CLP group will undertake as a part of this initiative[4].

- A further reiteration of the group's commitment to contribute to the reduction of GHG emissions and minimize the impact of its carbon-intensive operations, the group has established a target of producing a part of its total generation through renewable sources. For this purpose, it issued an action plan and manifesto "CLP's Climate Vision 2050"[5] in December 2007.

- Further, the group also acknowledges the fact that "substantial and sustainable investment in renewable energy depends on proper returns"[6] to entail viability. In order to ensure this, CLP has duly considered carbon funding for all its renewable energy projects and has specifically stated in the referred document that "CLP hopes to develop projects with high potential of CDM credits"[7]. The said project activity is a part of the planned investment of CLP in renewable energy projects worldwide supported by CDM revenues as also mentioned in the document.

- In line with this global objective, CLP Group sought to invest in a large scale wind power project effectively supported by CDM revenues in India through its wholly owned subsidiary GPEC.

- The communications with the CDM consultants started on 22nd June 2007 and appointment of the CDM consultant after general negotiations happened on 18th August 2007. Subsequently, the PDD development started and further actions to secure CDM for the proposed project activity were undertaken.

- CLP management then decided to create the Special Purpose Vehicle (SPV) in June 2008 and was incorporated with the name CLP Wind Farms (India) Private Limited (CLPWPL). The SPV remained under the management of CLP and hence the CDM benefits considered were applicable to the project even under the SPV. The assets pertaining to the project activity were

[3] https://www.clpgroup.com/Abt/Res/Pub/CLPGroup/Pages/default.aspx
[4] https://www.clpgroup.com/Abt/Res/Pub/CLPGroup/Pages/default.aspx
[5] https://www.clpgroup.com/Abt/Res/Pub/CLPGroup/Pages/default.aspx
[6] Page 4 "A Future Power from Nature" CLP Renewables https://www.clpgroup.com/Abt/Res/Pub/CLPGroup/Pages/default.aspx
[7] Page 9 "A Future Power from Nature" CLP Renewables https://www.clpgroup.com/Abt/Res/Pub/CLPGroup/Pages/default.aspx

then transferred to the name of CLPWPL through a novation at a board meeting of CLP held on 26th September 2008.

The chronology of events related to the project activity and the efforts of the project proponent to secure CDM funding for the project activity are summarized below:

S. No	Date	Timeline of Events		Reference
		Project Related	CDM related	
1	18/08/2007	--	Finalization and appointment of the CDM consultant for a number of CLP Wind Farms (India) Private Ltd projects to be implemented in the near future	Engagement letter for CDM Advisory Services dated 18/08/2007.
2	24/09/2007	The decision to proceed with the implementation of the proposed project activity at Saundatti in Karnataka with CDM.	The decision to proceed with the implementation of the proposed project activity at Saundatti in Karnataka with CDM.	Minutes of meeting of the Board of Directors of CLP dated 24/09/2007. Annex 1
3	19/11/2007	Signing of Facilitation Agreement (FA) for supply of WEG equipment	--	Copy of facilitation agreement between CLP and WWIL dated 19/11/2007. Annex-2
4	11/12/2007	--	Purchase Order issued to WWIL (formerly Enercon (India) Limited) for Supply of WEGs for the 82.4 MW project	Copy of the Purchase Order issued by CLP India (formerly GPEC) dated 11/12/2007
5	11/02/2008	Approval of transfer of capacity of 82.4 MW to CLP India (formerly GPEC) from WWIL	--	KREDL letter KRED/08/GPECPL – EIL/2008/116 dtd. 11/02/ 2008
6	29/07/2008	Incorporation of CLP Wind Farms (India) Private Ltd. to implement wind power projects in India	Incorporation of CLP Wind Farms (India) Private Ltd. to implement wind power projects in India	Incorporation of CLPWFPL. Annex 11
7	13/08/2008	Signing of Power Purchase Agreement (PPA) between GPEC and Bangalore Electricity Supply Company (BESCOM)	--	Copy of PPA between GPEC and BESCOM dated 13/08/2008 Annex 4

S. No	Date	Timeline of Events		Reference
		Project Related	CDM related	
8	28/08/2008	Approval of PPA for the project activity to BESCOM by KERC	--	KERC Approval dated 28/08/2008. Annex 5
9	03/09/2008	--	Amendment to CDM Engagement Letter dated 18/08/2007. This is date of appointment of CDM consultant for the project activity.	Amendment letter dated 03/09/2007
10	26/09/2008	Meeting of the Board of Directors of CLPWFPL relating to transfer of rights and obligations related to consents and approvals along with acceptance of novation of FA and WOM of Saundatti wind farm.	Meeting of the Board of Directors of CLPWFPL relating to transfer of rights and obligations related to consents and approvals along with acceptance of novation of FA and WOM of Saundatti wind farm.	Minutes of meeting of the Board of Directors of CLPWFPL dated 26/09/2008. Annex 7
11	30/09/2008	Approval of evacuation scheme for the project by KPTCL	--	KPTCL letter dated 30/09/2008
12	12/03/2009	--	CDM Stakeholder Consultation meeting at Hubli, Karnataka.	Minutes of the meeting of stakeholders held on 12/03/2009. Annex 6
13	13/03/2009	Order of Government of Karnataka transferring capacity of 82.4 MW from GPEC to CLPWFPL	PDD preparation	Order Number EN 65 NCE 2009, Bangalore dated 13/03/2009
14	28/07/2009	--	Presentation to National CDM Authority for award of Host Country Approval (HCA) to the project activity	Email communication from MoEF dated 20/08/2009.
15	30/07/2009	--	Published on UNFCCC portal for Global Stakeholders Comments for a period of one month as part of CDM cycle	http://cdm.unfccc.int/Projects/Validation/DB/UTY2YY69RTQ04NJW0ZRHKU5VSCZAGV/view.html
16	09/09/2009		Validation site visit conducted by the DOE	

S. No	Date	Timeline of Events		Reference
		Project Related	CDM related	
17	03/02/2011	Decision to place 13 WEGs under abeyance		Internal Memo dated 03/02/2011
18	13/04/2011		Receipt of Host Country Approval (HCA) to the project activity from the Designated National Authority	

This chronology provides the dates related to investment decision, commissioning and events related to the actions which have been taken to achieve CDM registration. The above account clearly demonstrates the seriousness of the project proponent in terms of implementing project activities to mitigate climate change duly supported by incentives from CDM which thence make the project investments worthwhile.

Sectoral circumstances:

In September 2007, when the decision to go ahead with the project activity was taken the installed capacity in India stood at 135781.63[8] MW and that of the Southern grid stood at 39343.79. The proposed project activity is going to feed power to the Southern regional grid which despite the significant installed capacity, has a shortfall in power[9]. In 2007-08, the shortfall of power in the Southern regional grid varied from 0.8% to 10%[10] with the maximum gross energy consumption of 599 MU/day[11]. The state wise installed generation capacity as on 31/03/2008[12] in the Southern regional grid was as follows:

	Thermal	Hydro	Gas	Diesel	Nuclear	Others	Total
Andhra Pradesh	3533.93	3342.50	1875.70	36.80	0.00	66.90	9452.02
Karnataka	3288.20	2230.00	220.00	234.42	0.00	1640.73	7613.35
Kerala	1769.10	0.00	174.00	256.44	0.00	100.14	2299.68
Tamil Nadu	2093.95	3220.00	934.10	411.66	0.00	3956.50	10606.21
Puducherry	0.00	0.00	32.50	0.00	0.00	0.03	32.53
Central Sector	0.00	7890.00	350.00	0.00	1100.00	0.00	9340.00
TOTAL	10685.18	16682.50	3586.30	939.20	1100.00	6350.49	39343.79

It is clear from the above table that thermal modes of power generation are the preferred mode of power generation in the Southern region. The project activity will export power to this southern regional grid and displace the addition of more thermal power generation stations.

The project activity is located in the state of Karnataka which was also short of power by and hence would be requiring additional capacity to meet the demand. The peak demand for power in the state of Karnataka and the shortages are presented in the table below[13]:

[8] http://cea.nic.in/power_sec_reports/executive_summary/2007_09/6.pdf
[9] http://cea.nic.in/power_sec_reports/executive_summary/2007_09/20.pdf
[10] http://www.srpc.kar.nic.in/reports/AR07-08.pdf
[11] http://www.srpc.kar.nic.in/reports/AR07-08.pdf
[12] http://www.srpc.kar.nic.in/reports/AR07-08.pdf

[13] http://www.srpc.kar.nic.in/reports/AR07-08.pdf

	Peak Demand in MW	Shortage in MW	Shortage %
April 2007	5644	1088	16.16
May 2007	5653	216	3.68
June 2007	5086	166	3.16
July 2007	4849	125	2.51
August 2007	5023	152	2.94
September 2007	4777	28	0.58
October 2007	5465	634	10.40
November 2007	5200	773	12.94
December 2007	5441	500	8.42
January 2008	5646	562	9.05
February 2008	5658	981	14.78
March 2008	5715	797	12.24

As can be seen from the data above, there is a significant shortage in capacity in the state of Karnataka going as high as 16.16%. Thus, the power exported from the project activity will contribute to reducing this shortfall and prevent further addition of fossil fuel based generation stations.

The additionality of the project is ascertained in line with the applicable guidance from the UNFCCC. Accordingly, the decision 17/cp.7, paragraph 43 is consulted; which states a CDM project activity is additional if anthropogenic emissions of green house gases by sources are reduced below those that would have occurred in the absence of registered CDM project activity.

The demonstration of the additionality of the said project activity is being carried out in accordance with the additionality tool provided by the UNFCCC i.e. "*Tool for demonstration and assessment of Additionality, Version 6.0, EB 65"* This tool provides a step-wise approach to demonstrate additionality, which is dealt with below:

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

Sub-step 1a: Define alternatives to the project activity:
Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity.

The proposed project activity envisages the new installation of a wind farm consisting of 90 WEGs of WWIL E-53 make, with each WEG having an individual capacity of 800 kW making the total installed capacity of the project activity as 72 MW. In view of the purpose of the project activity being to generate electrical power to be fed to the grid, the alternatives have been identified as per ACM0002 which states:

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".

Hence, the baseline alternative has been identified as the expansion of the existing grid through the use of a suitable grid mix consisting of currently running power plants and by new capacity addition to the grid i.e. *operation of grid-connected power plants and by the addition of new generation sources*

Outcome of Sub-step 1a:
As stated in the VVM, the baseline has already been identified in the applied methodology ACM 0002 as *operation of grid-connected power plants and by the addition of new generation sources* i.e. existing grid mix and thus only this alternative to be considered has been described above.

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

The alternative(s) shall be in compliance with all applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution. (This sub-step does not consider national and local policies that do not have legally-binding status.).

The Indian power sector was primarily dominated by the public sector and was regulated by the Electricity (Supply) Act, 1948 until the amendment of the act in 1991 to create the provision for private generating companies to setup projects. These were both replaced by the Electricity Act 2003 which is the applicable regulation for the project activity. However, the Electricity Act 2003 did not provide any incentive to less GHG-intensive technologies. Even considering this act both the above alternatives are in compliance with all applicable legal and regulatory requirements as follows:

The implementation of project activity is a voluntary initiative and it is not mandatory or a legal requirement. For power generation, the Electricity Act 2003[14] does not restrict or empower any authority to restrict the fuel choice, the applicable environmental regulations do not restrict the use of wind energy and there is no legal requirement on the choice of a particular technology.

Outcome of Sub-step 1b:
Hence, the alternative above has been identified as per ACM 0002 and is found to comply with the applicable legislation and regulations. The baseline alternative selected is the existing grid mix considering both the operating power plants and the capacity addition from newly built generating stations.

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). To conduct the investment analysis, use the following sub-steps:

Sub-step 2a: Determine appropriate analysis method

The CLPWFPL project activity envisages the export of the power generated by the WEGs to the grid and the revenues from the sale would be generated in accordance to the terms and tariffs established in the PPA. Thus, simple cost analysis cannot be used as the analysis method as the sale of the units of generated electricity shall result in a revenue stream during the operation of the project.

After eliminating Option I, the use of Benchmark analysis (Option III) has been selected as the most suitable method of investment analysis out of the two remaining methods. This method determines the attractiveness of the project activity for the investors to assess the project. It also provides a measure of the viability of the investment to generate revenues during its operation, as compared with other avenues and investment options available to the project proponent. Hence, the Benchmark analysis method is to be employed for analysis of the said project.

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

The investment analysis using Benchmark analysis (Option III) is determined to be the most accurate indicator of the financial attractiveness of the project. Further, this method illustrates the evaluation of the project by the project proponent before the decision to undertake the project was taken and management approval granted.

IRR is one of the known financial indicators used by banks, financial institutions and project developers for making investment decisions. The project proponents have hence identified IRR (Internal Rate of Return) as the most appropriate financial indicator for the project and carried out an investment analysis of the project activity.

[14] http://www.ippai.org/theElectricityAct2003.pdf

The tool for the demonstration and assessment of additionality provides that *"the financial indicator can be based either on (1) project IRR or (2) equity IRR. There is no general preference between the approaches (1) or (2). The benchmark chosen for analysis shall be fully consistent with the choice of approach."* In line with the guidance the project proponent has assessed Equity IRR against the corresponding appropriate benchmark.

As per sub-step 2b of additionality tool, the benchmark value should represent *standard returns in the market*, considering the *specific risk of the project type*, but *not* linked to the subjective profitability expectation or risk profile of a particular project developer.

Since there is more than one potential developer in case of this project activity, internal benchmark of the company has not been used as a relevant benchmark value. The identified benchmark value does not represent company internal benchmark but instead the benchmark has been determined in accordance with para 6(a) sub step 2b of the Additionality tool i.e. *Government bond rates increased by a suitable risk premium to reflect private investment and / or project type*.

The required rate of return on equity for the project has been calculated using the Capital Asset Pricing Model (CAPM). As per CAPM, the required return on equity investment is the return of a risk-free security plus beta times the difference between the market return and the risk-free return. The Government Securities have been taken to represent the risk free return. Stock index has been used to represent the market return.

While considering a new project, CAPM can provide the required rate of return that the project needs to yield, taking into account the volatility (risk) of the stock relative to the market (Beta). This required return on equity represents the cost of equity benchmark for the project.

The formula of CAPM is as follows:

$Ri = Rf + \beta (Rm-Rf)$

Where:

Ri	=	Rate of return on equity;
Rf	=	Risk-free rate of return;
β	=	Beta or systematic risk for this type of equity investment coefficient reflecting the volatility (risk) of the stock relative to the market,;
Rm	=	Expected market returns
Rm – Rf	=	Market risk premium;

The cost of equity for the project has been calculated using the Capital Asset Pricing Model (CAPM). As per CAPM, the cost of equity of investment is the return of a risk-free security plus beta times the difference between the market return and the risk-free return. The Government Securities have been taken to represent the risk free return. Stock index has been used to represent the market return.

Risk free rate (Rf):

Risk free rate of return is 8.3698%. It is taken from Yield To Maturity (YTM) of Statutory General Ledger (SGL) transactions in Central govt dated securities for 20 Yr Maturity at end of June 2007 available at the time of decision making (August 2007).[15]

Market Rate of Return (Rm):

It represents the standard return of the market and has been calculated as the compounded rate of return of the Sensex index of the Bombay Stock Exchange (BSE). The returns have been calculated for a 10 year

[15] http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/79299.pdf

period from September 1997 using monthly closing values till the date of investment decision for the project in August 2007. The calculations for the same are:

Market rate of return = 19.37[16] %

Market Risk Premium (Rm – Rf):

The market risk premium is the return that an investor expects over and above the risk free return available in the market. The market risk premium has been estimated using historical approach. This can be defined as the historical differential return of the market and the risk-free rate. The most common method of calculating this is the difference between historical return of the stock market index and the historical return of the risk free rate. This would give the incremental returns expected by the project proponent over and above the risk free rate. The calculations for the same are as below:

Market risk premium = 19.3711%- 8.3689%[17]
= 11.0013%

Beta (β):

The β in the CAPM equation helps to account for the systematic risk by quantifying the sensitivity of the stocks of the companies representing a particular project type/sector with the market returns. Thus, it incorporates the risk of a specific sector in the calculation of the cost of equity. The Beta value taken for this analysis is based on the beta values of the listed power companies engaged in similar business as the project activity at the time of investment decision estimated by regressing weekly returns on stock against local index, using 5 years of data if available otherwise using the data since incorporation of the company. The raw beta values have been taken from Bloomberg[18] and are presented below:

Company Name	Raw beta
CESC Ltd	1.343
Neyveli Lignite Corporation	1.262
BF Utilities	3.486
Reliance Infrastructure Ltd.	0.954
Tata Power Co Ltd	1.084

The guidance on investment analysis states "*It is not considered reasonable to apply the rate general stock market returns as a risk premium for project activities that face a different risk profile than an investment in such indices*." Thus the returns are assumed to reflect the risk free rate of return plus a market premium. The capital asset pricing model requires the adjustment of the market premium with the factor 'beta' which represents the volatility of a stock relative to a well diversified market portfolio.

In order to understand the standard market returns, it is essential to consider a wide range of companies. Hence an attempt to study the beta values of companies with relatively significant investment in power sector. BF Utilities was the only one company identified with mainstream wind power business, listed on the Indian bourses and actively traded with a historic beta value of 3.48 since the incorporation of the company in August 2001. Hence, the portfolio of the companies considered for the study was widened to include the companies with significant investment in the power sector including in renewable and non renewable energy.

Conventional (Thermal and Large Hydro) power projects are a more attractive investment option as compared to non conventional (renewable energy power projects) projects, primarily because of the lower risks that such project activities face as compared to renewable energy projects and in particular wind power projects. Conventional power plants supply firm power, operate on higher Plant Load Factor (PLF) and are

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

[17] http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/79299.pdf

[18] Screenshots from Bloomberg terminal are being submitted as Annexure

not subject to the vagaries of nature as wind power plants. Wind power projects on the other hand operate at much lower PLF and have much higher capital costs. Thus, from the perspective of a private investor, investments in thermal power plants are a safer option.

Hence it is assumed that such companies with significant investments in non renewable energy projects face lower risk as compared to the wind power developers. Thus, as the use of the beta value for companies with significant investment in non renewable power projects is representative of the returns generated in the baseline scenario and is also conservative, the same has been considered appropriate for the analysis.

The raw beta has been unlevered using the Hamada's Equation [19] and the benchmark has been calculated taking an average figure of all the unlevered individual company betas. In the unlevering process, the various parameters like Debt to Equity ratio, Profit Before Tax etc which are a part of Hamada equation have been sourced from Capitaline.[20] Based on the calculations, it comes out to be 1.0600.

The YTM of SGL transactions in central government dated securities for 20 Yr Maturity at the end of June 2007 (viz. 8.3698%) has been considered as the risk free rate of return (R_f).

This beta (β), return on market (R_m) and risk free rate of return (R_f) has been used in the standard Capital Asset Pricing Model (CAPM) formula to arrive at a benchmark for comparing the EIRR i.e Return on Equity (ROE).

The unlevered beta for companies considered for analysis is tabulated below.

Company Name	Unlevered beta
CESC Ltd	0.6280
Neyveli Lignite Corpn.	1.1367
BF Utilities	2.2103
Reliance Infrastructure Ltd.	0.6456
Tata Power Co Ltd	0.6796
Average	**1.0600**

The average beta has been estimated as 1.0600 and the same has been chosen for further analysis.

Rate of return on equity or cost of equity benchmark is

Ri = Rf + β (Rm-Rf)
= %
= 8.3698%+ 1.0600*11.0013%
=20.03%

Hence the benchmark for equity IRR of the project is the return on equity of companies engaged in similar business as that of the project which is calculated as 20.03%.

Sub-step 2c: Calculation and comparison of financial indicators (only applicable to options II and III):
The equity internal rate of return for the proposed project activity without CDM revenues was computed for a period of 20 years, corresponding to the lifetime of the wind farm based on the following assumptions.[21]

[19] http://www.investopedia.com/terms/h/hamadaequation.asp

[20] http://www.capitaline.com

[21] The Investment analysis includes various benefits available to the project activity from the national and sectoral policies for promoting renewable energy generation in India such as accelerated depreciation, tax holidays etc.

including various benefits available to the project activity from the National and Sectoral policies for promoting renewable energy generation in India.

It was originally envisaged with the implementation of 82.4 MW consisting of 103 WWIL make, E-53 Wind Energy Generators (WEGs) each of capacity 800 KW. However, due to delay in obtaining clearance from the state regulatory authorities, it was later decided that 13 WEGs of the project would be kept under abeyance. Therefore the capacity that is being considered under this PDD refers to development of 72 MW, consisting of 90 WEGs, and this has been referred to as the Project activity in this PDD.

In order to enhance the transparency of this PDD, the set of input parameters and assumptions used for the investment decision considering a project capacity of 82.4 MW have also been provided below:

For the original 82.4 MW capacity:

Revenue Related			
Parameter	**Unit**	**Value**	**Source**
Capacity of the WEG	MW	0.80	WWIL offer_June 2007
Number of WEGs	No	103	
Net saleable power	Million kWh	1.738	IDFC letter_PLF_Jan 2011
Net PLF	%	24.80%	Calculated
Tariff from the Wind Farm	Rs/kWh	3.40	KERC order _Jan 2005

Financial Assumptions			
Parameter	**Unit**	**Value**	**Source**
Debt (% of total project cost)	%	70.00%	Page 8 of KERC RE order 2005
Loan repayment (years)	Years	10	Page 10 of KERC RE order 2005
Interest rate (% pa)	%	12.75%	Page 9 of KERC RE order 2005
Tax depreciation (% pa)	%	80%	Indian Income Tax Act
Book depreciation (% pa)	%	5.28%	Indian Companies Act
Corporate tax rate (%)	%	33.99%	Indian Income Tax Act
MAT rate (%)	%	11.33%	Indian Income Tax Act
Service tax (%) on O & M	%	12.36%	As per prevalent service tax rates

Project Cost Details			
Parameter	**Unit**	**Value**	**Source**
Cost per wind turbine	Rs Mn	43.00	WWIL offer_June 2007
Cost of Wind Turbines	Rs Mn	4,429.00	Calculated
Total Project Cost	Rs Mn	**4,429.00**	
Equity	Rs Mn	1,328.70	Calculated
Debt	Rs Mn	3,100.30	Calculated

O & M Expenses			
Parameter	**Unit**	**Value**	**Source**
O & M charges per WEG	Rs Mn	0.60	WWIL offer_June 2007

Escalation in O & M charges	%	6%	WWIL offer_June 2007
Land lease charges	Rs. per WEG	6000	WWIL offer_June 2007

Insurance Expenses			
Parameter	**Unit**	**Value**	**Source**
Fire & Perils Policy	Rs per WEG	41,199	Apportioned based on Bajaj Allianz policy for Khandke wind farm project from 27 June 2007
Insurance Premium Fire & Perils	Rs	4,243,463	Calculated
Commercial General Insurance Policy	Rs per project	674,160	As per the TATA AIG policy for Khandke wind farm project from 15 June 2007
Total Insurance Premium	**Rs**	**4,917,623**	**Calculated**

The assumptions used to calculate the equity IRR for the downsized capacity of 72 MW (Project activity under consideration in this PDD) are listed below:

For 72 MW capacity (Project activity):

Revenue Related Assumptions			
Parameter	**Unit**	**Value**	**Source**
Capacity of the WEG	MW	0.80	WWIL offer_June 2007
Number of WEGs	No	90	
Net saleable power	Million kWh	1.738	Apportioned for 72 MW from IDFC letter_PLF_Jan 2011 viz. for 82.4 MW
Net PLF	%	24.80%	Calculated
Tariff from the Wind Farm	Rs/kWh	3.40	KERC order _Jan 2005

Financial assumptions			
Parameter	**Unit**	**Value**	**Source**
Debt (% of total project cost)	%	70.00%	Page 8 of KERC RE order 2005
Loan repayment (years)	Years	10	Page 10 of KERC RE order 2005
Interest rate (% pa)	%	12.75%	Page 9 of KERC RE order 2005
Tax depreciation (% pa)	%	80%	Indian Income Tax Act
Book depreciation (% pa)	%	5.28%	Indian Companies Act
Corporate tax rate (%)	%	33.99%	Indian Income Tax Act
MAT rate (%)	%	11.33%	Indian Income Tax Act
Service tax (%) on O & M	%	12.36%	As per prevalent service tax rates

Project Cost Details			
Parameter	**Unit**	**Value**	**Source**
Cost per wind turbine	Rs Mn	43.00	WWIL offer_June 2007
Cost of Wind Turbines	Rs Mn	3,870.00	Calculated
Total Project Cost	Rs Mn	**3,870.00**	
Equity	Rs Mn	1,161.00	Calculated

Debt	Rs Mn	2,709.00	Calculated

O & M Expenses			
Parameter	**Unit**	**Value**	**Source**
O & M charges per WEG	Rs Mn	0.60	WWIL offer_June 2007
Escalation in O & M charges	%	6%	WWIL offer_June 2007
Land lease charges	Rs. per WEG	6,000	WWIL offer_June 2007

Insurance Expenses			
Parameter	**Unit**	**Value**	**Source**
Fire & Perils Policy	Rs per WEG	41,199	Apportioned based on Bajaj Allianz policy for Khandke wind farm project from 27 June 2007
Insurance Premium Fire & Perils for Saundatti	Rs.	3,707,880	Calculated
Commercial General Insurance Policy	Rs per project	674,160	As per the TATA AIG policy for Khandke wind farm project from 15 June 2007
Total Insurance Premium	Rs.	**4,382,040**	**Calculated**

As per the "Guidelines for the reporting and validation of plant load factors"[22], the Plant Load Factor (PLF) was considered as the value provided to banks while applying the project activity for project financing.

Using the assumptions stated above, the calculated equity IRR for the original envisaged capacity of 82.4 MW (103 WEGs) is 5.88% without considering CDM funds and the same rises to 9.42% after considering revenue from sale of carbon credits. This clearly demonstrates the fact that the project activity was not financially attractive as an investment option since the returns are much below the selected benchmark.

Similarly, using the assumptions sated above, the calculated equity IRR for 72 MW (90 WEGs) is 5.88% without considering CDM funds and the same rises to 9.41% after considering revenue from sale of carbon credits. This clearly demonstrates the fact that the project activity is not financially attractive as an investment option since the returns are much below the selected benchmark.

Therefore, from the analysis above, it is clear that the project activity does not meet the stipulated benchmark without CDM revenues and is hence additional.

Sub-step 2d: Sensitivity analysis

In order to ascertain the magnitude of risk associated with the project activity a sensitivity analysis has to be carried out, by varying the parameters of the project activity. This sensitivity is carried out by varying the parameters which have the most impact on the returns from the project. The parameters selected for the purpose of sensitivity analysis have been selected based on paragraph 15 of "Guidance on the Assessment of Investment Analysis", EB 39, Annex 35 which states that "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". Based on the above guidance the following parameters have been subjected to sensitivity analysis to determine if the project activity meets the benchmark in different scenarios.

[22] http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid35.pdf

- PLF- The total generation and corresponding inflow of revenue from sale of generated power is primarily governed by PLF.
- Capital Investment- The major outflow of funds involved with the implementation of the project activity is reflected in the capital cost.
- O&M costs- The implementation stage is followed by operation of the project and the costs indicative of it are O&M costs which are critical in determining the returns.

Accordingly, the sensitivity analysis corresponding to the critical parameters for the original 82.4 MW capacity is tabulated below:

Change in generation	**+10.00%**	**0.00%**	**-10.00%**
Equity IRR	8.40%	5.88%	3.35%
Change in Capital Cost	**+10.00%**	**0.00%**	**-10.00%**
Equity IRR	3.97%	5.88%	8.19%
Change in O & M Cost	**+25.00%**	**0.00%**	**-25.00%**[23]
Equity IRR	4.69%	5.88%	7.02%
Change in tariff	**+10.00%**	**0.00%**	**-10.00%**
Equity IRR	8.40%	5.88%	3.35%

The sensitivity analysis corresponding to the critical parameters for the revised/downsized 72 MW capacity is tabulated below:

Change in generation	**+10.00%**	**0.00%**	**-10.00%**
Equity IRR	8.40%	5.88%	3.35%
Change in Capital Cost	**+10.00%**	**0.00%**	**-10.00%**
Equity IRR	3.97%	5.88%	8.18%
Change in O & M Cost	**+25.00%**	**0.00%**	**-25.00%**[24]
Equity IRR	4.68%	5.88%	7.02%
Change in tariff	**+10.00%**	**0.00%**	**-10.00%**
Equity IRR	8.40%	5.88%	3.35%

The purpose of the sensitivity analysis is to demonstrate the sensitivity of the returns from the project activity due to uncertainty in plant load factor, capital cost and O&M costs for the project. This is an assessment of the impact of variations in above parameters from the assumed/design values and represents magnitude of the sort of effects these variations may have on the returns from the project.

- PLF is the parameter on which the project proponent has very little control since it is contingent upon the wind patterns. Even with the 10% increase in PLF, the equity IRR of the project activity remains much below the benchmark for the project activity.

- The O&M cost is expected to increase in the future, which will further lower the returns from the project. However the sensitivity analysis with a 25% reduction in O&M costs shows that the equity IRR of the project remains lesser than the benchmark.

[23] As the actual O&M cost is less than that mentioned in the Enercon proposal available at the time of taking investment decision, the sensitivity analysis has been carried out up to +/- 25% in order to cover this range.

[24] As the actual O&M cost is less than that mentioned in the Enercon proposal available at the time of taking investment decision, the sensitivity analysis has been carried out up to +/- 25% in order to cover this range.

- The Capital cost of the project is unlikely to decrease and is more or less fixed based on the purchase orders/invoices, however under any unforeseen circumstances if the project cost increases/decreases, the equity IRR of the project still remains lower than the benchmark.

The above sensitivity analysis shows the IRR for the project does not exceed the benchmark even after variation of generation, O&M costs and project cost hence establishing that the financial analysis presented above is robust to variations in critical parameters.

As discussed earlier, an IRR analysis was also conducted for the downsized 72 MW capacity project. This was done because 13 WEGs of the project have been placed under abeyance after the original investment decision due to delay in obtaining clearance from the state regulatory authorities. Therefore, the equity IRR was analyzed for the situation where the number of WEGs gets reduced from 103 to 90 and was found to be 5.88% which is well below the benchmark.

Thus, the sensitivity analysis further illustrates the significant amount of risks associated with the implementation of the project activity having the potential to result in additional financial burden. The above discussion is designed to highlight the risks associated with the project and the fact that the project activity being undertaken was not the most attractive investment option available to the project proponent. The above results confirm that the post tax equity IRR for the project activity remains lower than the benchmark even under circumstances which could bring about favourable or adverse variations in some of the critical factors of the project activity.

Using the set of assumptions listed earlier in this section, the Equity IRR has been calculated to be the 5.88% for both 82.4 MW and 72 MW cases. Also, the sensitivity analysis has been demonstrated for the key parameters for both 72 MW and 82.4 MW cases. Hence it can be concluded from the sensitivity analysis performed that the project is additional while considering both the initial planned (82.4 MW) and final implemented capacities (72 MW).

Therefore, it can be justifiably concluded that the CDM revenue that the project activity would obtain through sale of the emission reductions, is very crucial to sustaining the operations of the project activity and the project proponent would not have implemented the project without consideration of CDM funds.

Step 4: Common practice analysis

In the context of the present project activity, the following parameters are defined in line with paragraphs 5 – 10 of this approved methodological tool:

Measure: As per paragraph 6, the project activity falls under the following measure:
"*(b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies);*"

Output: As per paragraph 7, "power generation" may be considered to be the output in the context of the project activity. Further as per Step 1 of paragraph 47 of the same tool, the applicable output range will be 36 MW to 108 MW, i.e. ±50% of installed capacity of the project activity (72 MW)

As per paragraph 47 of the approved methodological tool , the following Stepwise approach has been followed by the project activity to demonstrate that it is not a Common Practice in the applicable geographical area:

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 72 MW. The project capacity has been subject to the variation in the range of +/- 50%, the following table depicts the outcome of the variation applied. Hence, the applicable output range will be 36 MW to 108 MW, i.e. ±50% of installed capacity of the project activity

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 shall not be included in this step.*

India has been considered applicable geographical area as a default, for the common practice analysis of project activity. All power plants generating electricity within the capacity range of 36 MW to 108 MW and having commercial operations date before project activity start date (19/11/2007) have been considered in this analysis. The power generation plants identified in this step are hydro, thermal, nuclear, biomass based, solar and wind power projects. The total number of power plants in the applicable output range = 362

Category of Power plants	No. of Projects
Thermal	147
Hydro	206
Wind	2
Nuclear	1
Solar	0
Biomass	6
Total (N_{all})	**362**

Therefore N_{all} =362.

Note: Registered CDM project activities have been excluded in this step .The spreadsheet containing the list of the plants identified has been provided separately to the DOE.

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}.*

In accordance with Guidelines on Common practice following criterion has been used to arrive at the number of different technology power plants;
Different technologies *in the context of the project activity*:

Energy Source / Fuel
The project activity involves electricity generation from wind. The other project activities using water (Hydro, Biomass, Solar), conventional fuels (Coal, Lignite, Natural Gas & Liquid Fuel based – i.e. Thermal) as energy sources for the generation of electricity respectively are considered as plants with different technologies and included under N_{diff}.

The N_{diff} value is thus arrived at as tabulated below:

Category of Power plants	No. of Projects
Thermal	147
Hydro	206
Wind	0
Nuclear	1
Solar	0
Biomass	6
Total (N_{diff})	**360**

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*

N_{all}	362
N_{diff}	360
N_{all} - N_{diff}	2
$F = 1-N_{diff}/N_{all}$	0.0055

The factor F and $N_{all}-N_{diff}$ is calculated and following values are arrived at;
F = 0.0055;
$N_{all}-N_{diff}$ = 2

As value of F is not greater than 0.2 and $N_{all}-N_{diff}$ is not greater than 3 so it can be concluded that the project activity is not a common practice in the applicable geographical area.

The above discussions show that wind power development is not a common practice in the applicable geographical area and the Project activity is not financially attractive; hence the Project activity is additional.

In view of the above, the PP had considered CDM as a source of additional revenue to improve financial viability of the project while deciding to make invest in the Project activity.

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)
$EG_{PJ,y}$	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)
$EF_{grid,CM,y}$	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

As all the three projects included in 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:

$EG_{PJ,y} = EG_{facility,y}$ *(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 14.0[25] (December 2018). 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 Gujarat which come under Integrated Indian grid system. Since the project supplies electricity to the

[25] http://cea.nic.in/tpeandce.html. Post signing of agreement with DoE, CO2 database has been revised. At the signing of agreement with DoE, prevailing version of CO2 emission database was version 14. However, in Dec-19, CEA has revised the version of CO2 database for India i.e. version 15. Thus, combined emission factor has been calculated for both the versions and conservative emission factor has been considered for renewal of PDD.

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.

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 different grids in India in the last five years is as follows:

Grid	2013-14	2014-15	2015-16	2016-17	2017-18
Integrated Indian Grid	18.6%	16.8%	15.1%	14.6%	14.3%

Source: CEA Baseline Carbon Dioxide Emission Database Version 14

Ref: CO_2 Baseline Database for the Indian Power Sector – CEA, Version 14[26]

In Indian Grid, the low-cost/must run resources vary from 18.6% to 14.3% of the total net grid generation (From Year 2013-14 to Year 2017-18). The calculation above shows that the generation from low-cost/must-run resources 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:

- 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,

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

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or

- 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 14, Dec'18) 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 only 14.3% which 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 has also been endorsed by the DNA and 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 (MWh) (incl. imports)		
2015-16	**2016-17**	**2017-18**
871,753	916,278	960,693

Simple Operating Margin Emission Factors (tCO2/MWh) (incl. Imports)		
2015-16	**2016-17**	**2017-18**
0.9655	0.9636	0.9543

Therefore, weighted OM average for Indian grid comes out to be 0.9610 tCO_2/MWh

i.e. $EF_{grid,OM,y}$ = 0.9610 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 2017-18 is 0.8644 tCO2/MWh

$EF_{grid, BM, y}$ = 0.8644 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 0.8644 (tCO_2e/MWh)

Therefore, $EF_{grid,BM,y}$ = 0.8644 (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* 0.9610 + 0.25* 0.8644 (tCO_2/MWh)

$EF_{grid,CM,y}$ = 0.9368 tCO_2/MWh

Thus, as per the equation 11 of the methodology ACM 0002 (Version 20.0),

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

Where:

BE_y : Baseline emissions in year y (tCO_2e/yr)

$EG_{PJ,y}$: 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)

$EF_{grid, CM, y}$: 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)

This project activity is expected to generate 156,416 MWh of energy to the Indian Grid each year.

Thus, BE_y = 156,416 MWh * 0.9368 tCO_2/MWh

= 146,536 tCO_2

Project emissions (PEy)

According to the chosen baseline methodology ACM0002, ver 20, renewable energy project activities, PE_y = 0.

Leakage

According to ACM0002, the main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects). Project participants do not need to consider these emission sources as leakage in applying this methodology. Project activities using ACM0002 shall not claim any credit for the project on account of reducing these emissions below the level of the baseline scenario. Thus the leakage emissions are nil.

B.6.2. Data and parameters fixed ex ante

Data/Parameter	**$EF_{OM,y}$**
Data unit	tCO_2/MWh
Description	Operating Margin emission factor for Integrated Indian grid
Source of data	Referred from CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority, Version 14.0.
Value(s) applied	0.9610
Choice of data or measurement methods and procedures	This value is calculated using OM 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	For the calculation of Emission Factor of the grid
Additional comment	The data will be archived for two years beyond the crediting period.

Data/Parameter	**$EF_{BM,y}$**
Data unit	tCO_2/MWh
Description	Build Margin emission factor for Integrated Indian grid
Source of data	Referred from CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority, Version 14.0.
Value(s) applied	0.8644
Choice of data or measurement methods and procedures	This value is calculated in this database as the by taking weighted average emissions intensity of the 20% most Simple Operating Margin of recent capacity additions in the three years for Indian grid based on net generation and option of ex ante calculation.as per the "Tool to calculate the emission factor for an electricity system", version 07.0.0. Computed once during PDD finalization.
Purpose of data	For the calculation of Emission Factor of the grid
Additional comment	The data will be archived for two years beyond the crediting period.

Data/Parameter	EFy
Data unit	tCO_2/MWh
Description	Combined Margin CO_2 emission factor for Integrated Indian grid
Source of data	Estimated figure based on 75% of OM and 25% of BM values, Version 7.0.
Value(s) applied	0.9368
Choice of data or measurement methods and procedures	This value is calculated by taking weighted average of Simple Operating Margin of recent three years for Indian grid as per the "Tool to calculate the emission factor for an electricity system", version 07.0.0. Computed once during PDD finalization.
Purpose of data	For the calculation of Emission Factor of the grid
Additional comment	This data will be archived for 2 years beyond the crediting period.

B.6.3. Ex ante calculation of emission reductions

>>
Illustrated below are the ex-ante calculations for the estimation of annual emission reductions:

Installed Capacity (MW)	72	MW
Number of WEGs	90	
Capacity of individual WEG (MW)	0.8	MW
Net Generation of one WEG in a year (MWh)	1737.96	MWh
PLF	24.80	%
Number of days of operation	365	Days
Number of hours	8760	
Net Generation from 90 WEGs in a year (MWh) ($EG_{PJ,y}$)	156,416[27]	MWh
Baseline emission factor of Integrated Indian grid (tCO_2/MWh)	0.9368	tCO_2/MWh
Baseline emissions (tCO_2) $BE_y = EF_y \times EG_y$ $BE_y = 0.9368 \times 156,416$	146,536.00	
Emission reductions (tCO_2) $ER_y = BE_y - PE_y - L_y$	**146,536**	**tCO_2**

[27] Calculated as 1.73796 Million kWh per WTG x 90 WTGs = 156,416

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	146,536	0	0	146,536
Year 2	146,536	0	0	146,536
Year 3	146,536	0	0	146,536
Year 4	146,536	0	0	146,536
Year 5	146,536	0	0	146,536
Year 6	146,536	0	0	146,536
Year 7	146,536	0	0	146,536
Total	**1,025,752**	0	0	**1,025,752**
Total number of crediting years	7			
Annual average over the crediting period	**146,536**	**0**	**0**	**146,536**

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

(Copy this table for each piece of data or parameter.)

Data/Parameter	$EG_{PJ,y}$[28]
Data unit	MWh/yr
Description	Net Electricity supplied to the Distribution Licensee
Source of data	Monthly Joint Meter Reading Sheets
Value(s) applied	156,416 MWh/yr
Measurement methods and procedures	Net electricity supplied to the Distribution Licensee will be calculated as the sum of the net electricity supplied through Transformer 1 and Transformer 2. The net electricity supplied is monitored through bi-directional main and check meters installed at the high voltage side of each step up transformers installed at the sub-station. This data would be recorded a monthly basis by the ESCOM and Representatives of WWIL (O & M Contractor). $EG_{PJ,y} = EG_{PJ,y,T1} + EG_{PJ,y,T2}$
Monitoring frequency	This is calculated parameter based on parameters which are measured continuously. Frequency of recording data: Monthly **Recording:** The values of Net Electricity Exported to the grid by the project are sourced from monthly billing records given by Electricity Board. This record provides data for entire project WECs.
QA/QC procedures	This is a calculated parameter. The monthly readings can be cross checked with the invoices/bills raised by the project proponent and the corresponding payments made by the ESCOM.
Purpose of data	To calculate baseline emission

[28] Also referred to as $EG_{facility,y}$

Additional comment	The data will be electronically archived for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	$EG_{PJ,y,T1}$
Data unit	MWh/yr
Description	Net Electricity supplied to the Distribution Licensee at Transformer 1
Source of data	Monthly Joint Meter Reading Sheets
Value(s) applied	Would be monitored ex-post
Measurement methods and procedures	The WEGs of CLPWFPL at the project location are connected to several Vacuum Circuit Breakers through step-up transformers (400V to 33KV) which in-turn connect to six feeders that ultimately lead to two step up transformers (33KV to 110 KV) (which may be increased depending on current carrying capacity and connected load of windfarm). Net electricity supplied to the Distribution Licensee at Transformer 1 will be calculated from the difference of the electricity exported to the grid and electricity imported from the grid. Bi-directional main and check meters with an accuracy class of 0.2% would be installed at the high voltage side of the step up transformer at the sub-station. This data would be recorded a monthly basis by the ESCOM and Representatives of WWIL (O & M Contractor). $EG_{PJ,y,T1} = EG_{PJ,y,T1,export} - EG_{PJ,y,T1,import}$
Monitoring frequency	This is calculated parameter based on parameters which are measured continuously. Frequency of recording data: Monthly **Recording:** The values of Net Electricity Exported to the grid by the project are sourced from monthly billing records given by Electricity Board. This record provides data for entire project WECs.
QA/QC procedures	This is a calculated parameter. The monthly readings can be cross checked with the invoices/bills raised by the project proponent and the corresponding payments made by the ESCOM.
Purpose of data	To calculate baseline emission.
Additional comment	The data will be electronically archived for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	$EG_{PJ,y,T2}$
Data unit	MWh/yr
Description	Net Electricity supplied to the Distribution Licensee at Transformer 2
Source of data	Monthly Joint Meter Reading Sheets
Value(s) applied	Would be monitored ex-post

Measurement methods and procedures	The WEGs of CLPWFPL at the project location are connected to several Vacuum Circuit Breakers through step-up transformers (400V to 33KV) which in-turn connect to six feeders that ultimately lead to two step up transformers (33KV to 110 KV) (which may be increased depending on current carrying capacity and connected load of windfarm). Net electricity supplied to the Distribution Licensee at Transformer 2 has been calculated from the difference of the electricity exported to the grid and electricity imported from the grid. Bi-directional main and check meters with an accuracy class of 0.2% would be installed at the high voltage side of the step up transformer at the sub-station. This data would be recorded a monthly basis by the ESCOM and Representatives of WWIL (O & M Contractor). $EG_{PJ,y,T2} = EG_{PJ,y,T2,export} - EG_{PJ,y,T2,import}$
Monitoring frequency	This is calculated parameter based on parameters which are measured continuously. Frequency of recording data: Monthly **Recording:** The values of Net Electricity Exported to the grid by the project are sourced from monthly billing records given by Electricity Board. This record provides data for entire project WECs.
QA/QC procedures	This is a calculated parameter. The monthly readings can be cross checked with the invoices/bills raised by the project proponent and the corresponding payments made by the ESCOM.
Purpose of data	To calculate baseline emission.
Additional comment	The data will be electronically archived for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	$EG_{PJ,y,T1,export}$
Data unit	MWh/yr
Description	Electricity exported to the Distribution Licensee at Transformer 1
Source of data	Monthly Joint Meter Reading Sheets
Value(s) applied	Would be monitored ex-post
Measurement methods and procedures	The WEGs of CLPWFPL at the project location are connected to several Vacuum Circuit Breakers through step-up transformers (400V to 33 kV) which in-turn connect to six feeders that ultimately lead to two step up transformers (33KV to 110 KV) (which may be increased depending on current carrying capacity and connected load of windfarm). The electricity exported to the Distribution Licensee at Transformer 1 has been measured using bi-directional main and check meters of accuracy class 0.2% installed at the high voltage side of the step up transformer at the sub-station. This data would be recorded a monthly basis by the ESCOM and Representatives of Enercon (O & M Contractor).
Monitoring frequency	This parameter is directly and continuously monitored. Frequency of recording data: Monthly
QA/QC procedures	Energy meters are tested annually and faulty meters will be duly calibrated or replaced immediately if found to be outside the permissible limits of error. The responsibility of testing/calibration of the meters at the substation lies with KPTCL/ESCOM. The monthly readings can be cross checked with the invoices/bills raised by the project proponent and the corresponding payments made by the ESCOM.

Purpose of data	To calculate baseline emission.
Additional comment	The data will be electronically archived for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	$EG_{PJ,y,T2,export}$
Data unit	MWh/yr
Description	Electricity exported to the Distribution Licensee at Transformer 2
Source of data	Monthly Joint Meter Reading Sheets
Value(s) applied	Would be monitored ex-post
Measurement methods and procedures	The WEGs of CLPWFPL at the project location are connected to several Vacuum Circuit Breakers through step-up transformers (400V to 33 kV) which in-turn connect to six feeders that ultimately lead to two step up transformers (33KV to 110 KV) (which may be increased depending on current carrying capacity and connected load of windfarm). The electricity exported to the Distribution Licensee at Transformer 2 has been measured using bi-directional main and check meters of accuracy class 0.2% installed at the high voltage side of the step up transformer at the sub-station. This data would be recorded a monthly basis by the ESCOM and Representatives of WWIL (O & M Contractor).
Monitoring frequency	This parameter is directly and continuously monitored. Frequency of recording data: Monthly
QA/QC procedures	Annual meter testing will be undertaken and faulty meters will be duly calibrated or replaced immediately if found to be outside the permissible limits of error. The responsibility of testing/calibration of the meters at the substation lies with KPTCL/ESCOM. The monthly readings can be cross checked with the invoices/bills raised by the project proponent and the corresponding payments made by the ESCOM.
Purpose of data	To calculate baseline emission.
Additional comment	The data will be electronically archived for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	$EG_{PJ,y,T1,import}$
Data unit	MWh/yr
Description	Electricity imported from the Distribution Licensee at Transformer 1
Source of data	Monthly Joint Meter Reading Sheets
Value(s) applied	Would be monitored ex-post
Measurement methods and procedures	The WEGs of CLPWFPL at the project location are connected to several Vacuum Circuit Breakers through step-up transformers (400V to 33 kV) which in-turn connect to six feeders that ultimately lead to two step up transformers (33k V to 110 kV) (which may be increased depending on current carrying capacity and connected load of windfarm). The electricity imported from the Distribution Licensee at Transformer 1 would be measured using bi-directional main and check meters of accuracy class 0.2% installed at the high voltage side of the step up transformer at the sub-station. This data would be recorded a monthly basis by the ESCOM and

	Representatives of WWIL (O & M Contractor).
Monitoring frequency	This parameter is directly and continuously monitored. Frequency of recording data: Monthly
QA/QC procedures	Energy meters are tested annually and faulty meters will be duly calibrated or replaced immediately if found to be outside the permissible limits of error. The responsibility of testing/calibration of the meters at the substation lies with KPTCL/ESCOM. The monthly readings can be cross checked with the invoices/bills raised by the project proponent and the corresponding payments made by the ESCOM.
Purpose of data	To calculate baseline emission.
Additional comment	The data will be electronically archived for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Data/Parameter	$EG_{PJ,y,T2,import}$
Data unit	MWh/yr
Description	Electricity imported from the Distribution Licensee at Transformer 2
Source of data	Monthly Joint Meter Reading Sheets
Value(s) applied	Would be monitored ex-post
Measurement methods and procedures	The WEGs of CLPWFPL at the project location are connected to several Vacuum Circuit Breakers through step-up transformers (400V to 33 kV) which in-turn connect to six feeders that ultimately lead to two step up transformers (33 kV to 110 kV) (which may be increased depending on current carrying capacity and connected load of windfarm). The electricity imported from the Distribution Licensee at Transformer 2 has been measured using bi-directional main and check meters of accuracy class 0.2% installed at the high voltage side of the step up transformer at the sub-station. This data would be recorded a monthly basis by the ESCOM and Representatives of Enercon (O & M Contractor).
Monitoring frequency	This parameter is directly and continuously monitored. Frequency of recording data: Monthly
QA/QC procedures	Annual meter testing will be undertaken and faulty meters will be duly calibrated or replaced immediately if found to be outside the permissible limits of error. The responsibility of testing/calibration of the meters at the substation lies with KPTCL/ESCOM. The monthly readings can be cross checked with the invoices/bills raised by the project proponent and the corresponding payments made by the ESCOM.
Purpose of data	To calculate baseline emission
Additional comment	The data will be electronically archived for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

B.7.2. Sampling plan

>>
Not applicable

B.7.3. Other elements of monitoring plan

>>

The monitoring plan is being devised as per approved consolidated monitoring methodology ACM0002 Version 20 - "Grid-connected electricity generation from renewable sources"**.**

The methodology requires monitoring of the following parameters:

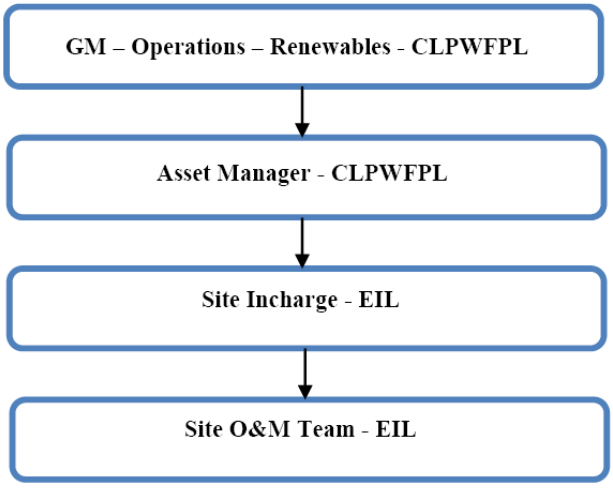
- Electricity exported to the Distribution Licensee from each transformer;
- Electricity imported from the Distribution Licensee from each transformer;
- Net Electricity exported to the Distribution Licensee from each transformer;

The electricity exported to and imported from the Distribution Licensee would be measured using bi-directional main and check meters of accuracy class 0.2% installed at the high voltage side of the step up transformer at the sub-station. The consumption registered by the main meter alone will hold good for the purpose of estimation of the emission reductions as long as the error in the main meter is within the permissible limits.

a) If during the annual tests, the main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the permissible limits, then estimation of the emission reductions will be as per the main meter as usual. The check meter shall, however, be calibrated immediately.
b) If during the annual tests, the main meter is found to be beyond permissible limits of error, but the corresponding check meter is found to be within permissible limits of error, then the estimation of the emission reductions for the month up-to the date and time of such test shall be as per the check meter. The main meter shall be calibrated immediately and estimation of the emission reductions for the period thereafter till the next monthly meter reading shall be as per the calibrated main meter.
c) If during the annual tests, both the main meters and the corresponding check meters are found to be beyond the permissible limits of error, both the meters shall be immediately calibrated and the correction applied to the reading registered by the main meter to arrive at the correct reading of energy supplied for the purpose of estimation of the emission reductions for the period from the last month's meter reading up to the current test. The estimation of the emission reductions for the period thereafter till the next monthly meter reading shall be as per the calibrated main meter.

To ensure trouble free operations and efficient generations through all the wind turbines, CLPWFPL has entered into a comprehensive Operation and Maintenance agreement with the manufactures of the turbines for a period of 10 years. The contractor EIL, under the O&M contract with CLPWFPL would be responsible for the operation and maintenance of the project activity for the entire crediting period.

The authority and responsibility of project management as well as registration, monitoring, measurement and reporting lies with CLPWFPL. CLPWFPL has envisaged a Project Team to ensure proper and continuous monitoring of the performance of turbines and generation of power. The same has been outlined as follows:



The O&M personnel are qualified engineers and are trained at the WEG manufacturing facility of WWIL at Daman for operating and ensuring best performance of the WEGs.

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

1. **Metering Equipment:** Metering equipment shall be bidirectional electronic tri-vector meters of accuracy class 0.2% required for the Project (both main and check meter).

2. **Meter Readings:** The monthly meter readings (both main and check meters) at the Receiving Station shall be taken jointly by the Parties.

3. **Meter Test Checking:** All the main and check meters shall be tested for accuracy every year. The meters shall be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2% accuracy class.

4. **Records:** O&M Contractor WWIL will maintain an accurate and up-to-date operating log at the wind farm. All the records will be preserved for 2 years beyond the crediting period.

Apportioning of electricity: In case dates of monitoring period do not match with the dates of Joint Meter Readings

The following apportioning formula would be used to estimate the electricity generation for calculating emission reductions:

X = No. of days between start/end date of monitoring period and date of BESCOM's billing cycle

Y = Total no. of days in a particular month for which Joint Meter Reading has been taken

Z = Net energy exported from project activity WTGs
Electricity Generation = (X/Y) * Z

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

>>
19/11/2007

The start date has thus been chosen to be the date on which the project proponent had committed to financial expenditures related to the project activity i.e. the date of signing of Facilitation Agreement for WEGs with the equipment supplier.

It is the second crediting period of the project activity.

C.2. Expected operational lifetime of project activity

>>
20 years, 0 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

>>
24/09/2019

C.3.3. Duration of crediting period

>>
7 years and 0 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
According to Indian regulation, the implementation of the wind park does not require an environmental impact assessment. The Ministry of Environment and Forests (MoEF), Government of India notification[29] S.O. 1533 (E) dated September 14, 2006 regarding the requirement of Environment Impact Assessment (EIA) studies as per the Environment Protection Rule, 1986 (Published in the Gazette of India, Extraordinary, Part-II, and Section 3, Sub-section (ii) MINISTRY OF ENVIRONMENT AND FORESTS) states that any project developer in India needs to file an application to the Ministry of Environment and Forests (including a public hearing and an EIA) in case the proposed industry or project is listed in a predefined list. Wind parks are not included in this list and thus an EIA is not required. The project activity has no significant impact on the environment.

D.2. Environmental impact assessment

>>
As discussed above, the project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. Hence EIA is not required to be undertaken by the host party.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

>>
The proposed project activity by CLPWFPL is located at Saundatti, District Belgaum in the state of Karnataka. The stakeholders are defined as the public, including individuals, groups or communities, affected, or likely to be affected, by the proposed CDM project activity. The local stakeholders identified for the proposed project activity are as follows:

1. Local villagers and representatives of village governing body
2. Ministry of new and renewable energy sources
3. Supplier of WEG
4. Karnataka Renewable Energy Development Limited
5. Bangalore Electricity Supply Company Limited (BESCOM)
6. Operation and Maintenance staff of WWIL
7. Representatives of Karnataka Power Transmission Corporation Limited (KPTCL)

Local villagers and representatives of village governing body
The varied sections of the local population, village panchayat local elected body of representatives administering the local area are a true representative of the local population. Hence, their consents / permissions to set the project are necessary. CLPWFPL organised a stakeholder consultation meeting with them on 12th March 2009 at Hotel Ananth Residency in order to inform them on the environmental and social impacts of the project activity and discuss their concerns regarding the proposed project activity.

Ministry of new and renewable energy sources
The government of India, through Ministry of new and renewable energy sources, has been promoting energy conservation, demand side management and renewable energy projects including wind, small hydro

[29] Reference : http://envfor.nic.in/legis/eia/so1533.pdf

and hydro / bio-mass power. CLPWFPL's effort in implementing the wind power project is in line with the goals and targets of the said Ministry and hence supported by them.

Karnataka Renewable Energy Development Limited
KREDL is the principal agency in Karnataka responsible for development of renewable energy sources in the state. CLPWFPL has obtained permission from KREDL for setting up the wind power project. KREDL is also responsible for transfer of wind farm from WWIL to CLPWFPL.

Supplier of WEGs
WWIL. is the supplier of WEGs and is also responsible for the operation and maintenance of the CLPWFPL's project activity.

Bangalore Electricity Supply Company Limited (BESCOM)
CLPWFPL has signed a Power Purchase Agreement (PPA) with BESCOM and will be supplying the generated electricity from the wind power project to various consumers through BESCOM at a price fixed in the PPA for a period of 10 years.

Identified stakeholders were invited more than 15 days prior to the meeting on 24th February 2009 using personal invitation letters by CLPWFPL and WWIL representatives.

E.2. Summary of comments received

>>
In accordance with the procedural requirements for the CDM process, the project proponent organized a stakeholder meeting for the entire project of 82.4 MW project. Besides being a requirement for the CDM process, the meeting provided the project proponent a forum to clarify any queries or misgivings the local inhabitants in the region may have about the project activity. The meeting for the wind power project at Saundatti site was held in Hubli on 12th March 2009. The meeting was well attended, with a turnout of around forty five stakeholders, including Representatives from Gram Panchayat (mostly village heads - Sarpanches), Local residents, representatives of KPTCL and equipment supplier. The list of stakeholders that attended the said meeting is included under Appendix 2. The meeting was initiated by a representative of the project proponent giving a brief on the project activity. This was followed by an introduction to climate change and its local as well as global effects. The relation of anthropogenic GHG emissions and climate change was also addressed and the contribution of the said project activity in mitigating these threats was explained.

In an open house session that followed the presentation, the Superintending Engineer of Karnataka Power Transmission Limited Mr. R.P. Chavate gave a detailed lecture on the power scenario in India (deficit status of Karnataka), subsidies, energy theft and contribution of renewables in capacity additions to the grid. Further, Mr. Chavate enlightened the audience on transmission losses, significance of CDM and benefits that would accrue, once the project activity is in place. All the stakeholders encouraged the upcoming of the project activity and provided their responses in writing in the questionnaires provided to them.

The issues and concerns raised by the stake holders and the clarifications provided by CLPWFPL and WWIL are summarized below:

Queries raised by Participants	Clarifications by CLPWFPL & WWIL
Mr. Basavaraj Sakri: How is the project useful for the local villagers?	The project proponent clarified that the implementation of the project activity would entail direct and indirect employment opportunities. Further small business opportunities would lead to overall development of the villages. Furthermore, the local grid would be strengthened thereby ensuring availability of reliable power in the

Queries raised by Participants	Clarifications by CLPWFPL & WWIL
	villages.
Mr. Dasharath Jambagi: Will there be employment opportunities for skilled labour available locally?	The project proponent clarified that Local villagers will be given preference for the manpower requirement of construction work as well as requirements during the operational life of the project. However, they would have to go through a proper selection procedure.
Mr. Santosh Hulikatti: Will the installation of machines create noise and disturb the surroundings?	The WWIL personnel clarified that they have already implemented WEGs in various villages in the neighbouring Gadag district Area and no such problem has been reported anywhere owing to advanced machine design that ensures minimal noise.
Mr. Mallik Khasa Reddy: Will the implementation of the project activity have any impact on grazing of animals 4-5 years down the line?	The project proponent clarified that there will be no impact of the wind farm on the grazing activity in the area.

The stakeholders present were satisfied with these responses and were appreciative of the efforts by the project proponent in undertaking the said project.

On the whole, the stakeholders were appreciative of the project being undertaken and were in agreement the beneficial effects of the said project activity. There were no adverse comments received and the above mentioned queries were addressed by the project participant.

E.3. Consideration of comments received

>>
There were no adverse comments received from the stakeholders and the net beneficial effects of the project activity were acknowledged by the stakeholders present.

SECTION F. Approval and authorization

>>
The letter of approval from the party involved in the project activity has been submitted.

Appendix 1. Contact information of project participants

Organization name	CLP Wind Farms India Private Limited
Country	India
Address	7th Floor,FULCRUM, Sahar Road, Andheri (East), Mumbai, Maharashtra, 400 099
Telephone	+ 91 22 6758 8888
Fax	+ 91 22 6758 8811
E-mail	carbon@clpindia.in
Website	www.clpindia.in
Contact person	Sandip Saha

Appendix 2. Affirmation regarding public funding

There is no public funding involved in the proposed project activity.

Appendix 3. Applicability of methodologies and standardized baselines

The details regarding applicability of selected methodology are provided in Section B.2

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

The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, has estimated the Combined Margin emission factor for the Western grid, the details of which are available on the following website.
http://cea.nic.in/tpeandce.html
The procedures and formulas used for estimation of the baseline factor and the assumptions made have also been detailed in there.

Appendix 5. Further background information on monitoring plan

The monitoring plan has been already explained in section B.7.3.

Appendix 6. Summary report of comments received from local stakeholders

The detailed stakeholder comments are provided in Section E.3.

Appendix 7. Summary of post-registration changes

Not Applicable

Annex - 1

Turbine wise geographical coordinates:

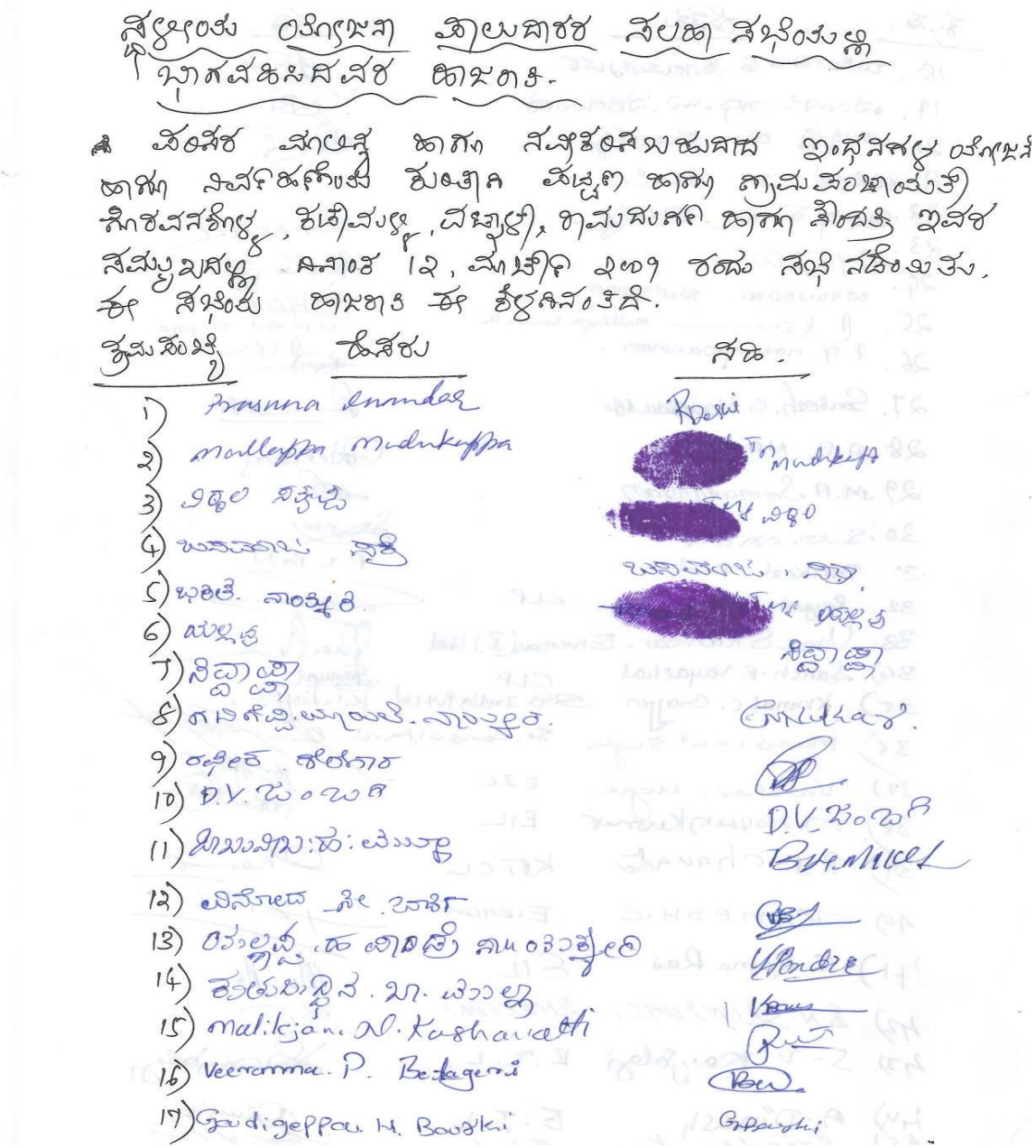
Turbine Identification Number	Longitude	Latitude
1	75° 6' 31.2" E	15° 49' 15.8" N
2	75° 6' 47.9" E	15° 49' 23.5" N
3	75° 6' 49" E	15° 49' 17.2" N
4	75° 6' 50" E	15° 49' 10.5" N
5	75° 7' 49.1" E	15° 48' 30.1" N
6	75° 7' 21.6" E	15° 49' 8.7" N
7	75° 6' 48.4" E	15° 48' 51" N
8	75° 7' 23" E	15° 49' 21.8" N
9	75° 7' 23.3" E	15° 49' 15.3" N
10	75° 6' 46.6" E	15° 48' 43.7" N
11	75° 6' 42.1" E	15° 48' 46.3" N
12	75° 7' 3.7" E	15° 48' 32.6" N
13	75° 7' 18.3" E	15° 48' 29" N
14	75° 7' 35.7" E	15° 48' 26.5" N
15	75° 7' 46.3" E	15° 48' 8.5" N
16	75° 7' 58.2" E	15° 48' 6.7" N
17	75° 8' 42.2" E	15° 48' 30.4" N
18	75° 8' 8.2" E	15° 48' 15.2" N
19	75° 8' 7.4" E	15° 48' 21.6" N
20	75° 8' 29.2" E	15° 47' 56" N
21	75° 8' 27.4" E	15° 48' 4.5" N
22	75° 8' 28.9" E	15° 48' 11" N
23	75° 8' 29.8" E	15° 48' 17.7" N
24	75° 8' 23.8" E	15° 48' 23.7" N
25	75° 8' 22.9" E	15° 48' 30.4" N
26	75° 8' 21.6" E	15° 48' 37.1" N
27	75° 8' 22.8" E	15° 48' 42.8" N
28	75° 8' 39" E	15° 48' 53.5" N
29	75° 8' 41.6" E	15° 48' 48.1" N
30	75° 8' 42.9" E	15° 48' 42.1" N
31	75° 8' 42.7" E	15° 48' 35.4" N
32	75° 8' 48.7" E	15° 48' 8.5" N
33	75° 8' 52" E	15° 47' 53" N
34	75° 9' 22.2" E	15° 47' 50" N
35	75° 9' 56.9" E	15° 47' 40.7" N
36	75° 9' 54.9" E	15° 47' 46.3" N

Turbine Identification Number	Longitude	Latitude
37	75° 9' 58.8" E	15° 47' 51.1" N
38	75° 9' 57.4" E	15° 48' 1.1" N
39	75° 10' 0.9" E	15° 48' 9.5" N
40	75° 10' 7.5" E	15° 48' 18.5" N
41	75° 10' 11.8" E	15° 48' 26.9" N
42	75° 10' 10.4" E	15° 48' 33.7" N
43	75° 10' 7.7" E	15° 48' 39.7" N
44	75° 10' 4.2" E	15° 48' 45.2" N
45	75° 9' 56.5" E	15° 48' 49.3" N
46	75° 11' 29.8" E	15° 49' 56.7" N
47	75° 11' 30.6" E	15° 50' 4.1" N
48	75° 11' 31.7" E	15° 50' 11.8" N
49	75° 11' 34.3" E	15° 50' 19.4" N
50	75° 11' 35.5" E	15° 50' 26.7" N
51	75° 11' 41" E	15° 50' 35.8" N
52	75° 11' 32.4" E	15° 50' 42.8" N
53	75° 11' 32.8" E	15° 50' 48.8" N
54	75° 11' 29.8" E	15° 50' 56.1" N
55	75° 11' 28.5" E	15° 51' 2.3" N
56	75° 11' 27.2" E	15° 51' 9" N
57	75° 11' 49.3" E	15° 50' 45.5" N
58	75° 11' 47.5" E	15° 50' 51.9" N
59	75° 11' 45.5" E	15° 50' 58.9" N
60	75° 11' 44" E	15° 51' 4.8" N
61	75° 11' 41.7" E	15° 51' 10" N
62	75° 11' 47.4" E	15° 51' 19.3" N
63	75° 11' 53" E	15° 51' 28" N
64	75° 11' 52" E	15° 51' 34.9" N
65	75° 12' 21.1" E	15° 51' 24.4" N
66	75° 12' 34.5" E	15° 51' 18.1" N
67	75° 12' 35.5" E	15° 51' 26" N
68	75° 12' 34.5" E	15° 51' 32.3" N
69	75° 12' 31.3" E	15° 51' 38.3" N
70	75° 12' 36.7" E	15° 51' 47.1" N
71	75° 12' 39.7" E	15° 51' 55.1" N
72	75° 12' 43" E	15° 52' 3.2" N
73	75° 13' 42.3" E	15° 51' 32.2" N
74	75° 13' 40.7" E	15° 51' 38.4" N
75	75° 13' 37.4" E	15° 51' 44.1" N

Turbine Identification Number	Longitude	Latitude
76	75° 13' 35.2" E	15° 51' 50.3" N
77	75° 13' 34.1" E	15° 51' 56.8" N
78	75° 13' 30.3" E	15° 52' 2.3" N
79	75° 13' 29.1" E	15° 52' 8.6" N
80	75° 13' 29.2" E	15° 52' 15.6" N
81	75° 13' 40" E	15° 52' 23.2" N
82	75° 13' 46.4" E	15° 52' 18.5" N
83	75° 13' 51.8" E	15° 52' 13.7" N
84	75° 13' 42.8" E	15° 52' 42.4" N
85	75° 13' 44.8" E	15° 52' 51.1" N
86	75° 13' 44.3" E	15° 52' 56.7" N
87	75° 13' 46" E	15° 53' 3.2" N
88	75° 13' 46.2" E	15° 53' 10.4" N
89	75° 14' 5" E	15° 53' 12.8" N
90	75° 14' 2.9" E	15° 53' 19.5" N

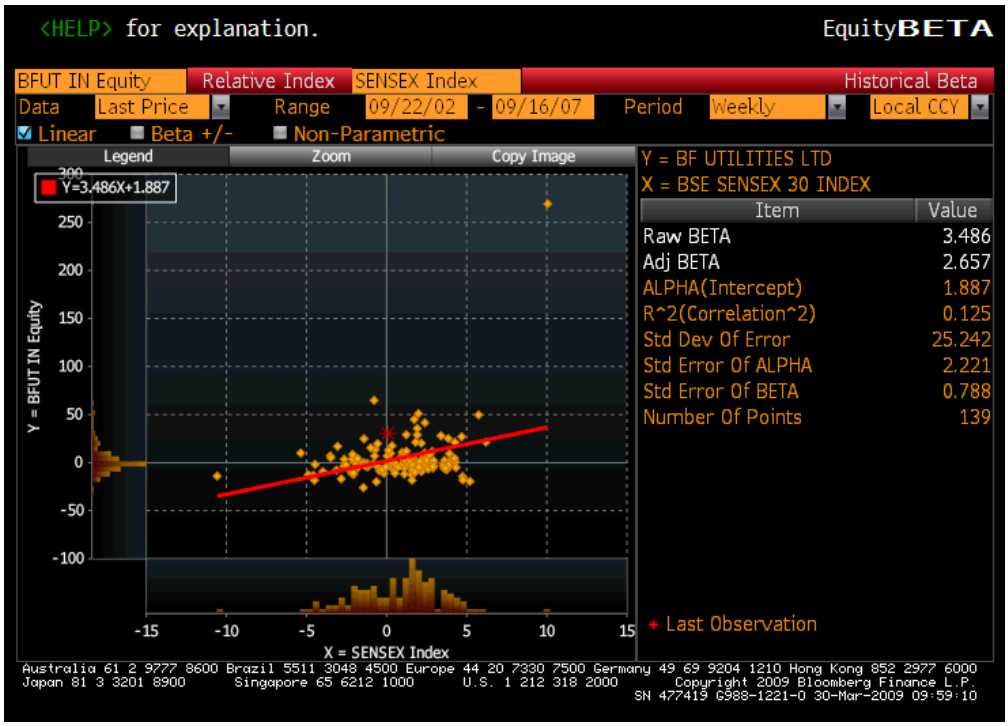
Annex-2

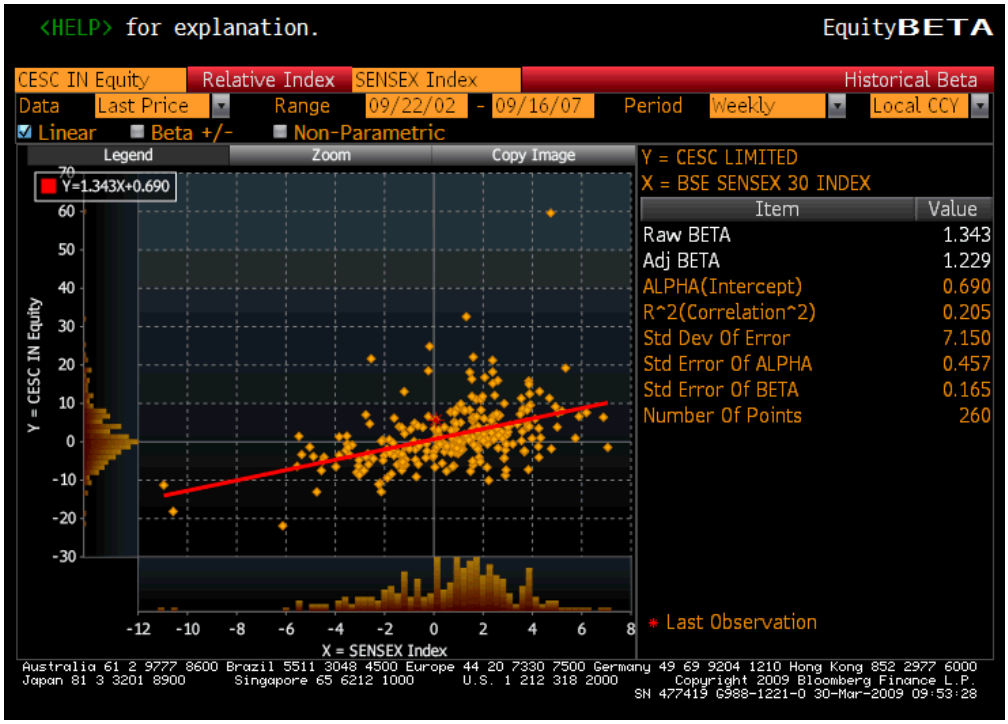
The list of stakeholders that attended the Stakeholder Meeting conducted by the project proponent on the wind energy project activity at Saundatti, Karnataka is provided below:

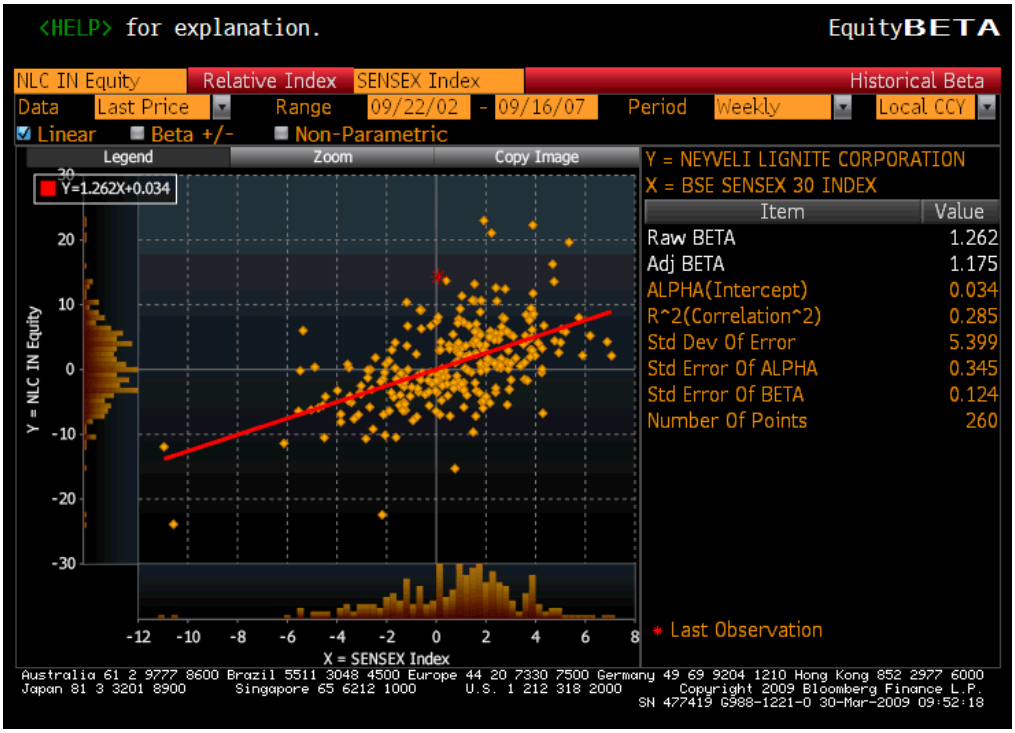


Annex - 3

Beta Screenshots from Bloomberg Terminal



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NLC IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
09/22/02
09/16/07
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Legend
Zoom
Copy Image
Y=1.262X+0.034
Y = NEYVELI LIGNITE CORPORATION
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA 1.262
Adj BETA 1.175
ALPHA(Intercept) 0.034
R^2(Correlation^2) 0.285
Std Dev Of Error 5.399
Std Error Of ALPHA 0.345
Std Error Of BETA 0.124
Number Of Points 260
Y = NLC IN Equity
X = SENSEX Index
* Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
Copyright 2009 Bloomberg Finance L.P.
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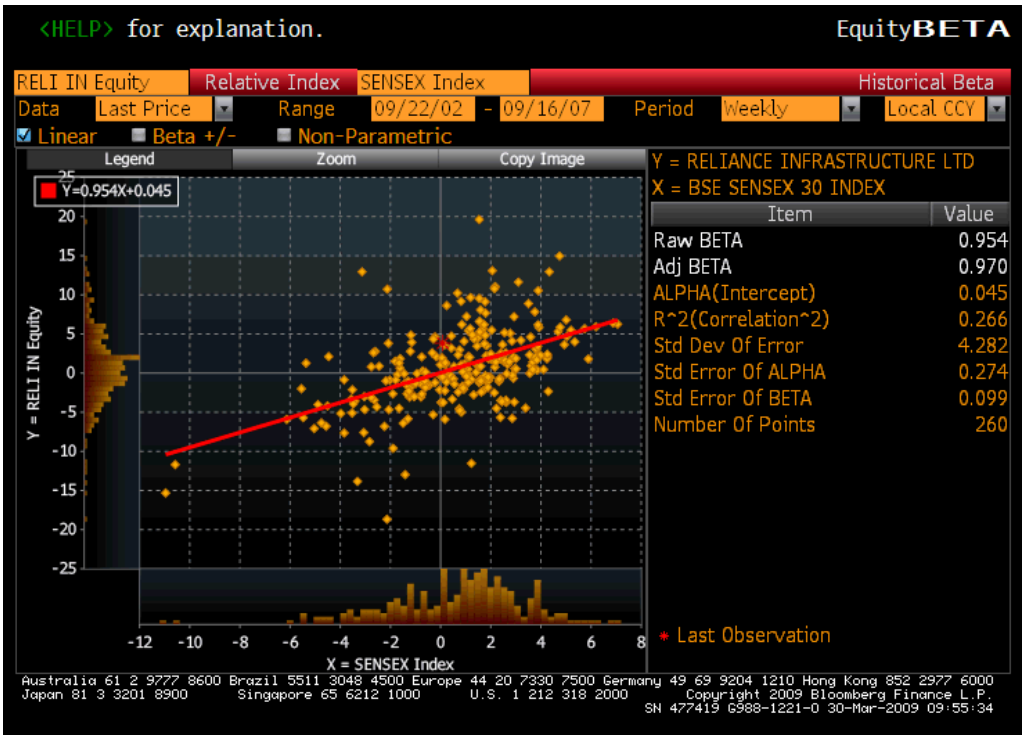
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EquityBETA
RELI IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
09/22/02
09/16/07
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Legend
Zoom
Copy Image
Y=0.954X+0.045
Y = RELIANCE INFRASTRUCTURE LTD
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA 0.954
Adj BETA 0.970
ALPHA(Intercept) 0.045
R^2(Correlation^2) 0.266
Std Dev Of Error 4.282
Std Error Of ALPHA 0.274
Std Error Of BETA 0.099
Number Of Points 260
Y = RELI IN Equity
X = SENSEX Index
* Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
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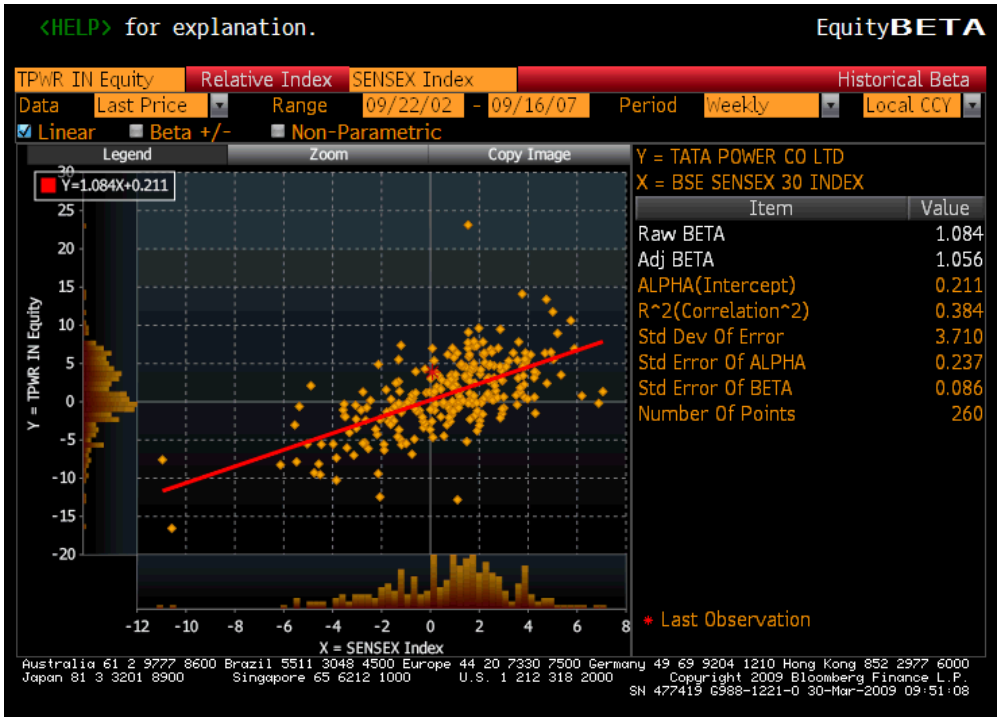
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EquityBETA
TPWR IN Equity
Relative Index
SENSEX Index
Historical Beta
Data
Last Price
Range
09/22/02
- 09/16/07
Period
Weekly
Local CCY
Linear
Beta +/-
Non-Parametric
Legend
Zoom
Copy Image
Y=1.084X+0.211
Y = TPWR IN Equity
X = SENSEX Index
Y = TATA POWER CO LTD
X = BSE SENSEX 30 INDEX
Item
Value
Raw BETA 1.084
Adj BETA 1.056
ALPHA(Intercept) 0.211
R^2(Correlation^2) 0.384
Std Dev Of Error 3.710
Std Error Of ALPHA 0.237
Std Error Of BETA 0.086
Number Of Points 260
* Last Observation
Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000
Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000
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SN 477419 G988-1221-0 30-Mar-2009 09:51:08

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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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