CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

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SECTION A. General description of project activity

A.1. Title of the project activity:

Title: 21 MW Wind energy farm at Palladam, TamilNadu by HZL
Version: Version 03.1
Date: 28th September 2012

A.2. Description of the project activity:

Hindustan Zinc Ltd. (HZL), a vertically integrated natural resources enterprise, headquartered at Udaipur, Rajasthan having broad operations ranging from exploration, mining, ore processing to smelting of non-ferrous metals is the owner and project proponent of the proposed project activity.

Purpose of the Project Activity

The project activity primarily aims at reducing Green House Gas (GHG) emissions through utilization of renewable energy technology for generation of electrical energy. The electricity generated from the project site will displace equivalent electricity generation in grid connected power plants. The project activity will reduce the anthropogenic GHG emissions associated with the equivalent amount of electricity generation from the fossil fuel based grid connected power plants.

Measures Implemented within the Proposed Project Activity

The project activity involves installation and operation of fourteen Suzlon make 1.5 MW Wind Turbine Generators (WTGs) by Hindustan Zinc Limited (HZL) in the state of Tamil Nadu. The cumulative capacity of the project activity is 21 MW. The electricity generated from the wind farm will be exported to regional Grid.

Baseline Scenario

The project activity is a Greenfield wind power project, supplying electricity to the fossil fuel dominated Southern Grid of India. In the absence of the project activity equivalent amount of electricity would have been generated in the Southern Grid. Since the wind power project is a Greenfield project, there is no difference between the pre-project scenario and the baseline scenario.

Project's contribution to Sustainable Development

The Designated National Authority (DNA) for the Government of India (GoI) in the Ministry of Environment and Forests (MoEF), called the National CDM Authority (NCDMA), has stipulated four indicators for sustainable development in the interim approval guidelines for CDM projects[1]:

- **Social well being**

  The CDM project activity should lead to alleviation of poverty by generating additional employment, removal of social disparities and contribution to provision of basic amenities to people leading to improvement in quality of life of people.

[1] http://www.envfor.nic.in/cc/cdm/criteria.htm

- The project activity would generate employment in the region during construction as well as operation of the project activity.
- It would lead to generation of employment and development of the region.
- It would augment power generation in the region that would aid the local population.

- **Economic well-being**

  The CDM project activity should bring in additional investment consistent with the needs of the people.

  - The project activity would lead to additional business for equipment suppliers , O&M contractors , civil work contractors etc .
  - It would also lead to additional investment for the development of infrastructure in the region like roads, communication facilities etc and the same could be utilized by the local population.

- **Environmental well being**

  This should include a discussion of impact of the project activity on resource sustainability and resource degradation, if any, due to proposed activity; bio-diversity friendliness; impact on human health; reduction of levels of pollution in general.

  - The proposed project activity will reduce the GHG emissions associated with the combustion of fossil fuels in grid connected power plants.
  - The project activity utilizes wind power as the source of kinetic energy used to generate renewable power. Wind power generation does not consume any fuels or water for power generation.
  - Wind is a clean form of energy and electrical power generation using wind does not produce any solid waste products (such as ash from combustion), emissions of carbon dioxide, SOx, or NOx.

- **Technological well being**

  The CDM project activity should lead to transfer of environmentally safe and sound technologies with a priority to the renewable sector or energy efficiency projects that are comparable to best practices in order to assist in up-gradation of technological base.

  - The proposed project activity will demonstrate the use of wind based electricity generation, which would serve as an example for other industries to replicate.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host party)	Private and/or public entity (ies) Project participants (*) (as applicable)	Kindly indicate if the party involved wishes to be considered as project participant (Yes/No)
Government of India (Host Country)	Hindustan Zinc Limited (Private Entity)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

India

A.4.1.2. Region/State/Province etc.:

Tamil Nadu

A.4.1.3. City/Town/Community etc.:

District: Tiruppur
Villages:

Sr. No.	WTG. No.	Village
1	KD176	Suriyanallur
2	KDE80	Suriyanallur
3	TAY52	Kurukkapalayam
4	TAY54	Nelali
5	KDE84	Nelali
6	TAY29	Kozhumankuli
7	Q165	Kundadam
8	Q132	Kundadam
9	Q133	Kundadam
10	KDE92	Uthiyur
11	TAY46	Nelali
12	TAY48	Nelali
13	TAY47	Nelali
14	KD 112	Nandanvanapalayam

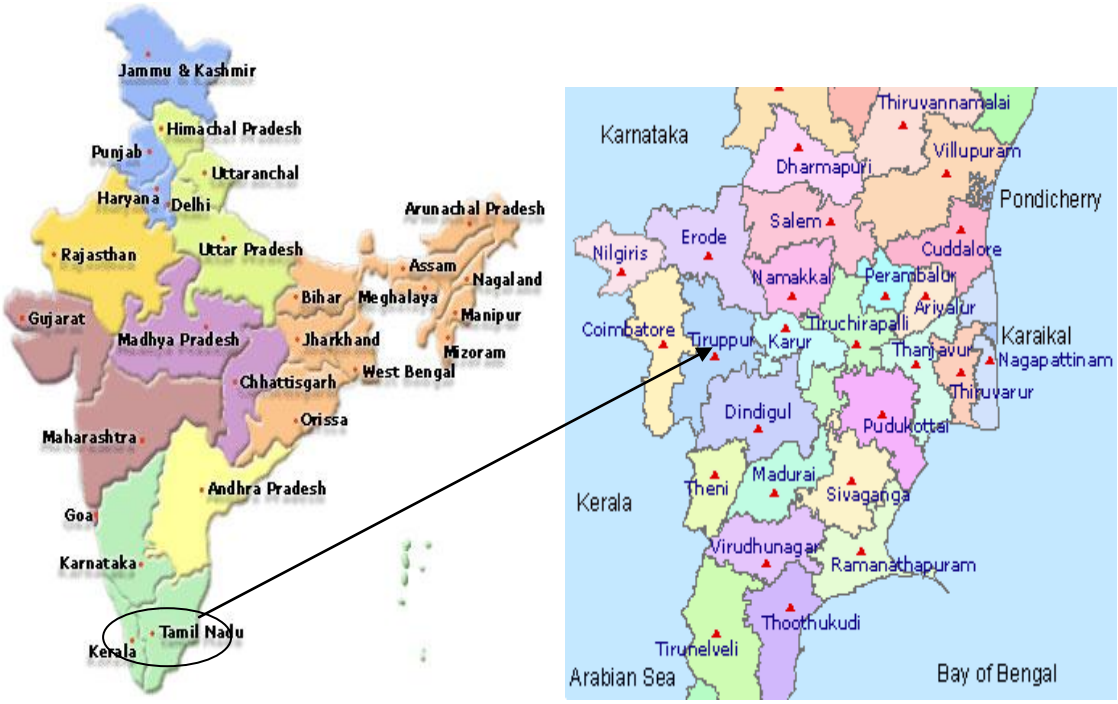
A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

The project activity consists of Fourteen 1.5 MW wind turbines in the district of Tiruppur in the state of Tamil Nadu, India.

The specific geographical coordinates of the individual WEGs are as follows:

Sr. No.	WTG. No.	Latitude	Longitude
1	KD176	N 10 52 02.9	E 77 27 31.8
2	KDE80	N 10 54 07.8	E 77 29 11.2
3	TAY52	N 10 56 12.0	E 77 29 07.2
4	TAY54	N 10 55 34.0	E 77 28 46.5
5	KDE84	N 10 54 35.0	E 77 29 27.6
6	TAY29	N 10 52 26.0	E 77 29 30.2
7	Q165	N 10 51 43.3	E 77 25 52.6
8	Q132	N 10 52 57.4	E 77 24 51.9
9	Q133	N 10 52 58.2	E 77 25 11.3
10	KDE92	N 10 54 21.7	E 77 30 22.5
11	TAY46	N 10 55 38.7	E 77 29 38.1
12	TAY48	N 10 55 38.5	E 77 29 59.3
13	TAY47	N 10 51 9.5	E 77 23 57.6
14	KD 112	N 10 55 18.7	E 77 30 2.1

The project activity location is delineated in the maps given below:



A.4.2. Category(ies) of project activity:

The project activity is considered under "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", having a capacity of more than 15 MW. Therefore as per the scope of the project activity enlisted in the 'list of sectoral scopes and related approved baseline and monitoring methodologies', the project activity may principally be categorized in:

Scope Number – 1
Sectoral Scope – Energy Industries (renewable/non-renewable sources).
Methodology – ACM0002 Version 12.3.0 (EB 66) "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

A.4.3. Technology to be employed by the project activity:

The technology employed by the project activity converts kinetic energy in wind to mechanical energy and mechanical energy to electrical energy using wind turbine generators (WTGs). In this process, there are no greenhouse gas emissions or burning of any fossil fuels. The electricity is generated through sustainable means without causing any negative effect to the environment and therefore the technology is environmentally safe and sound.

The technical specifications of the WTGs are as below:

WTG (S82 , 1.5 MW, 50 Hz) TECHNICAL DATA

Rated capacity :	1500 kW
Rotor diameter :	82 m
Hub height :	78.5 m

Rotor with Pitch Control

Type :	Upwind rotor with active pitch control
Number of blades :	3
Swept area:	5281 m²
Blade material :	The rotor blades are made epoxy bonded fibre glass
Rotor speed :	16.30 rpm
Tip speed :	70 m/s

Generator :

Type: Single fed Induction Generator with slip-rings, variable rotor resistance with SUZLON-FLEXI-SLIP control system.

Hub :	Cast spherical hub
Bearings :	Spherical roller bearing
Tower :	Steel Tubular, 76 m height

Technology Transfer

No technology transfer from other countries is involved in the project.

Plant Load Factor

The expected plant load factor for the project activity as determined by Power & Energy Consultants, a third party engineering and consultancy firm, is **25%**. The plant load factor is applied in accordance with paragraph 3(b) of the "Guidelines for the reporting and validation of plant load factors" for ex-ante estimation of emission reductions.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

Years	Estimation of annual emission reductions in tonnes of CO_2 e
2012*	42,131
2013	42,131
2014	42,131
2015	42,131
2016	42,131
2017	42,131
2018	42,131
Total estimated reductions (tonnes of CO_2 e)	2,94,917
Total number of crediting years	**7**
Annual average of the estimated reductions over the crediting period (tonnes of CO_2 e)	42,131

*1 December 2012 to 30 November 2013

A.4.5. Public funding of the project activity:

No public funding from parties included in Annex – I is involved in the project activity. The project proponent hereby confirms that there is no divergence of Official Development Assistance (ODA) to the project activity.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

Title of the approved baseline and monitoring methodology: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

Reference: ACM0002, Version 12.3.0 (EB 66), Sectoral Scope: 01

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

The following tools and guidance's have been followed (References):

1. Tool to calculate the emission factor for an electricity system (Version 02.2.1)
2. Tool for the demonstration and assessment of additionality (Version 06.0.0)

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

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

S. No.	Applicability Conditions in the ACM0002 Version 12.3.0	Position of the project activity vis-à-vis applicability conditions
1.	*The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit*	The project activity is the installation of a wind power project for renewable electricity generation. Thus, it meets the applicability condition.
2.	*In the case of capacity additions, retrofits or replacements (except for capacity addition projects for which the electricity generation of the existing power plant(s) or unit(s) is not affected): the existing plant 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 addition or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;*	This condition is not applicable to the project activity as it is a wind power project and does not involve capacity addition, retrofit or replacement of an existing power plant.

3.	*In case of hydro power plants:*
	• *At least one of the following conditions must apply:*
	  ○ *The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or*
	  ○ *The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity; or*
	  ○ *The project activity results in new single or multiple reservoirs and the*
		The project is not a hydro power project. Hence, this applicability criterion is not applicable.

	power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2 after the implementation of the project activity.	
4.	*The methodology is not applicable to the following:* • *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;* • *A hydro power plant[2] that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the reservoir is less than 4 W/m^2.* •	This is a greenfield project activity and does not involve switching from fossil fuels to renewable energy at the project site. Further, the project activity is a neither a biomass fired project and nor a hydro power project. Hence, this applicability condition is also satisfied.
5.	*In the case of retrofits, 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, i.e. 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..	This condition is not applicable to the project activity as it is a wind power project and does not involve capacity addition, retrofit or replacement of an existing power plant.

The project activity meets the applicability conditions of tools refereed in the methodology as follows:

S. No.	Relevant Applicability Criteria of "Tool for the demonstration and assessment of additionality"	Position of the project activity vis-à-vis applicability conditions
1.	Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory.	The tool is referenced in ACM0002. Application of the additionality tool is mandatory.

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

2.	Project activities with a start date before the date of validation shall specifically take into account the guidance provided in Chapter B "Specific guidelines for completing the Project Design Document (CDM-PDD)" section B, sub-section B-5. The start date of a project activity. is as defined in paragraph 76 of thirty-third report of the Board.	The project start date is prior to the date of validation. The guidelines are taken into account in section B.5.
3.	Project activities that apply this tool in context of approved consolidated methodology ACM0002, only need to identify that there is at least one credible and feasible alternative that would be more attractive than the proposed project activity.	Only one alternative more attractive than the proposed project activity (no investment) has been identified.

S. No.	Relevant Applicability Criteria of "Tool to calculate the emission factor for an electricity system"	Position of the project activity vis-à-vis applicability conditions
1.	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, i.e. 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 activity supplies electricity to the grid. Therefore the tool may be applied.
2.	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 Activity is located in India, which is not an Annex I Country. Therefore, the tool may be applied.

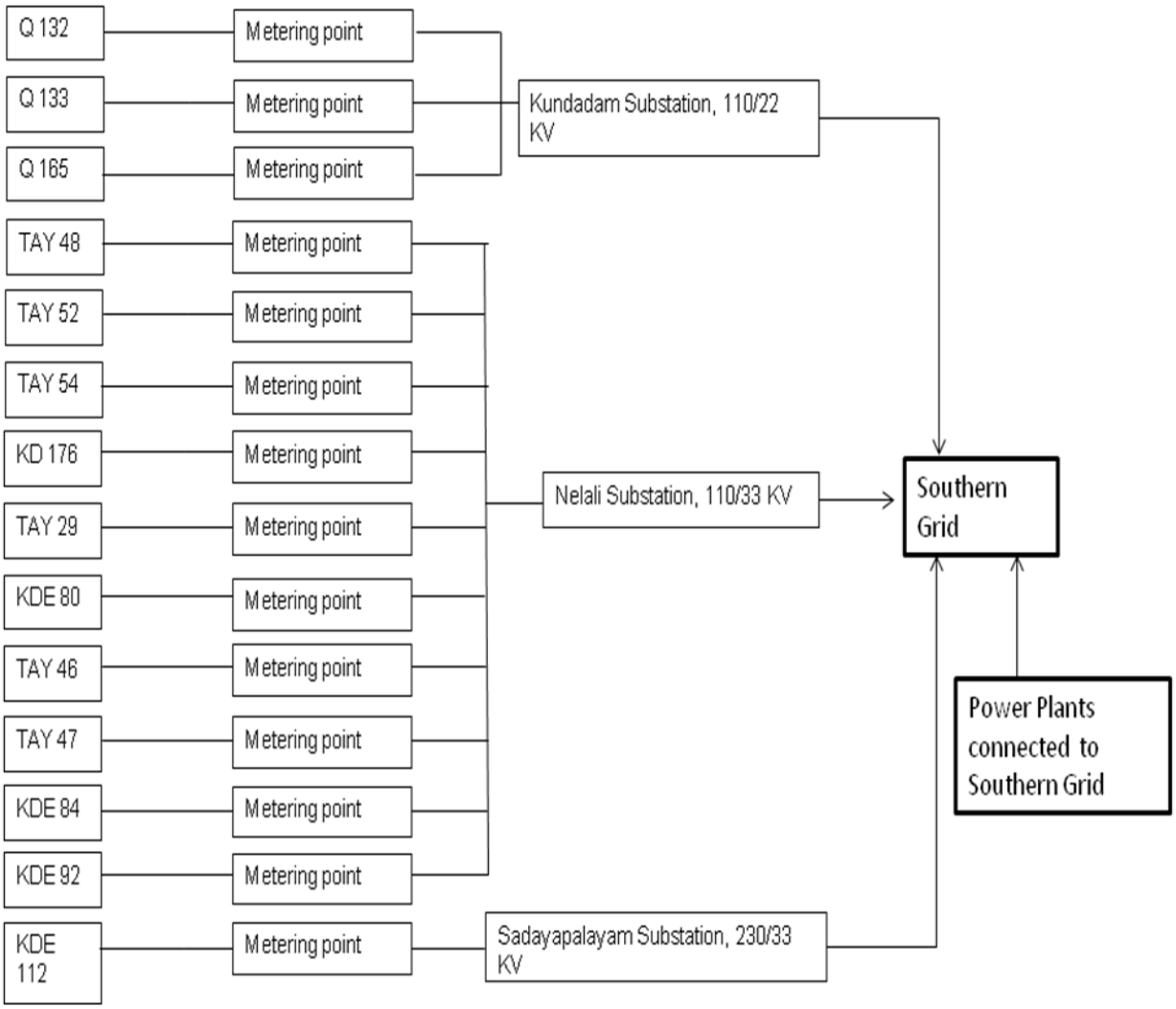
B.3. Description of the sources and gases included in the project boundary:

ACM0002 version 12.3.0 (EB 66) specifies that the project boundary will be:

*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 would be feeding the electricity in the Southern regional grid which constitutes several states and Union territories including Tamil Nadu. The proposed project would have marginal impact on all the generation facilities in the Southern grid. Thus all the power generation facilities connected to this grid form the project boundary for the purpose of baseline estimation. For conservative and accurate estimation, the imports of electricity from other regional grids have been included in the baseline calculation.

The project activity has a distinctive physical demarcated boundary.



The details of metering points relevant to the project activity are tabulated below. Main meter and check meter serial numbers may change during the crediting period in case of replacement of metering equipment.

WTG Location	HTSC No.	Main Meter No.	Check Meter No.
TAY29	TZA 11	TN 901795	TN 902631
KDE80	TZA 12	TN 901793	TN 902632
KD176	TZA 20	HT 2110564	TN 902633
TAY52	TZA 18	TN 901794	TN 902630
TAY54	TZA 19	TN 901802	TN 902641
KDE84	TZA 13	TN 901798	TN 902634
KDE92	TZA 14	TN 901797	TN 902629
TAY46	TZA 17	TN 902614	TN 902615
TAY48	TZA 16	TN 901801	TN 902616
TAY47	TZA 15	TN 901803	TN 902611
Q132	U2178	Wallaby-HT 2110435	Yet to be installed
Q133	U2177	Wallaby-HT 2110438	
Q165	U2176	Wallaby-HT 2110427	
KD 112	2180	Wallaby-HT 2110426	

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in Table below:

Overview on emission sources included in or excluded from the project boundary				
	Source	**Gas**	**Included ?**	**Justification / Explanation**
Baseline	CO_2 emissions from electricity	CO_2	Yes	This is the main emission source because the combustion of fossil fuels for electricity generation leads to emission of CO_2.

	generation in fossil fuel fired power plants that are displaced due to the project activity.	CH_4	No	This is a minor emission source because the emission of CH_4 from the combustion of fossil fuels is low.
		N_2O	No	This is a minor emission source because the emission of N_2O from the combustion of fossil fuels is low.
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	The project activity is a wind power project and not a geothermal project. Thus these emission sources are not applicable to the proposed project.
		CH_4	No	
		N_2O	No	
	For geothermal power plants, CO_2 emissions from combustion of fossil fuels required to operate the geothermal power plant.	CO_2	No	The project activity is a wind power project and not a geothermal project. Thus these emission sources are not applicable to the proposed project.
		CH_4	No	
		N_2O	No	
	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	The project activity is a wind power project and not a hydro project. Thus these emission sources are not applicable to the proposed project.
		CH_4	No	
		N_2O	No	

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

As the project activity is the installation of a new grid-connected wind power plant/unit, according to ACM0002 Version 12.3.0, 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" described step wise under section B.6.

Step 1: Identify the relevant electricity systems

For determining electricity emission factors, a **project electricity system** is defined by the spatial extent of power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

The Indian power system is divided into two regional grids, namely NEWNE and Southern grid. Each grid covers several states. Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid.

Each state in a regional grid meets their demand with their own generation facilities and also with allocation from power plants owned by the central sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the central sector power plants. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid. There are also electricity transfers between regional grids, and small exchanges in the form of cross-border imports and exports (e.g. from Bhutan). Recently, the Indian regional grids have started to work in synchronous mode, i.e. at same frequency.

States connected to different regional grids

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

The Southern grid constitutes several states and union territories including Tamil Nadu[3]. These states under the regional grid have their own power generating stations as well as centrally shared power-generating stations. While the power generated by own generating stations is fully owned and consumed through the respective state's grid systems, the power generated by central generating stations is shared by more than one state depending on their allocated share. Presently the share from central generating stations is a small portion of their own generation.

For the purpose of determining the emission reductions achieved by the Project the "Tool to calculate the emission factor for an electricity systems" (Version 02.2.1, EB 63) states that the "*project electricity system is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints*". On this basis the Central Electricity Authority, *CO_2 Baseline Database for the*

[3] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf

Indian Power Sector - Version 6.0[4] defines the project electricity systems within India in two regional grids. This is justified "*as electricity continues to be produced and consumed largely within the same region, as is evidenced by the relatively small volume of net transfers between the regions, and consequently it is appropriate to assume that the impacts of CDM project will be confined to the regional grid in which it is located*". The project is located in Tamil Nadu and is therefore as per the CEA's grid definitions it is within the Southern regional grid. Also, it is preferable to take the regional grid as project boundary than the state boundary as it minimizes effect of interstate power transactions, which are dynamic and vary widely. Considering free flow of electricity among member states and the union territory the entire NEWNE grid is considered as a single entity for estimation of baseline.

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:

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

For the proposed project activity, simple OM method (option a) has been chosen to calculate the operating margin emission factor ($EF_{grid, OM, y}$). However, the simple OM method 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.

Share of Low Cost / Must-Run (% of Net Generation)

Grid	2005-06	2006-07	2007-08	2008-09	2009-10
NEWNE	18.0%	18.5%	19.0%	17.4%	15.9%
South	27.0%	28.3%	27.1%	22.8%	20.6%
India	20.1%	20.9%	21.0%	18.7%	17.1%

Ref: CO_2 Baseline Database for the Indian Power Sector – CEA, Version 06.

Percentage of total grid generation by low cost/must run plants (on the basis of average of five most recent years) = 25.20 %

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.

[4] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf

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

- *Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.*

or

- *Ex post option: If the ex post option is chosen, the emission factor is determined for 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.*

The project proponent chooses 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: Calculate the operating margin emission factor according to the selected 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:

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

Where:

$EF_{grid,OMsimple,,y}$	=	Simple operating margin CO_2 emission factor of in year y (tCO_2/MWh)
$EG_{m,y}$	=	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	=	All power units serving the grid in year y except low-cost / must-run power units
y	=	The relevant year as per the data vintage chosen in step 3 i.e. 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)

Determination of $EF_{EL,m,y}$

The emission factor of each power unit m has been determined as follows:

$$EF_{EL,m,y} = \frac{\sum_m FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_{m,y}}$$

$EF_{EL,m,y}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,m,y}$	=	Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	=	Net electricity generated and delivered to the grid by power 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 fossil fuel types combusted in power plant / unit m in year y
y	=	The relevant year as per the data vintage chosen in step 3 i.e. 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)

Determination of $EG_{m,y}$

Since, the calculations consider only grid power plants, $EG_{m,y}$ should has been determined as per the data provided by the Central Electricity Authority (CEA) CO_2 Baseline Database for the Indian Power Sector.

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 the link below http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf.

Operating Margin Estimation for Southern Grid (tCO_2 / MWh)	
OM, 2007-08	0.9909
OM, 2008-09	0.9709
OM, 2009-10	0.9415
Net Electricity Generated (GWh), 2007-08	114634
Net Electricity Generated (GWh), 2008-09	121471
Net Electricity Generated (GWh), 2009-10	134717
Average OM ($EF_{grid, OM,y}$)	**0.9671**

Step 5: Identify the group of power units to be included in the build margin

The sample group of power units m used to calculate the build margin consists of either:

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

Project proponents should use the set of power units that comprises the larger annual generation.

Since in India, the installed capacity and corresponding annual generation from power plants is quite high, the sample group containing set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently comprise the sample group with the larger annual generation. Thus the sample group *m* consisting of option (b) is used for the estimation of build margin.

In terms of vintage of data, project proponents 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.

The project proponent wishes to choose option 1.

Step 6: Calculate the build margin emission factor

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

Build Margin Estimation for Southern Grid (tCO_2 / MWh)	
BM ($EF_{grid, BM, y}$), 2009-10	0.7634

Step 7: Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{CO_2} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

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 mentioned before, the CEA has calculated the baseline emission factors for various regional grids in India according to the formulas specified above. As this is the most authentic information available in the public domain. The baseline emission factor used in the calculation of baseline emissions for the proposed project activity is being referred from the same for transparency and conservativeness[5].

Combined Margin Estimation for Southern Grid (tCO_2 / MWh)	
Average OM ($EF_{grid, OM,y}$)	**0.9671**
Weight of OM (w_{OM})	**0.75**
BM, 2009-10 ($EF_{grid, BM, y}$)	**0.7634**
Weight of BM (w_{BM})	**0.25**
Combined Margin ($EF_{grid, CM,y}$)	**0.9161**

The Combined Margin has been calculated using the "Tool to calculate the emission factor for an electricity system" Version 02.2.1. The Operating Margin (OM) and Build Margin (BM) emission factors have been considered from the information (CO_2 Baseline Database for the Indian Power Sector -Version 6.0) published by the Central Electricity Authority (CEA), Ministry of Power, Govt. of India which has been computed according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system", version 02.2.1. Considering the individual weightings assigned to the OM and the BM emission factors respectively, as prescribed in the 'Tool to calculate the emission factor for an electricity system (Version 02.2.1)', the combined margin emission factor for the Southern Grid has been estimated at 0.9161 tCO_2e/MWh.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

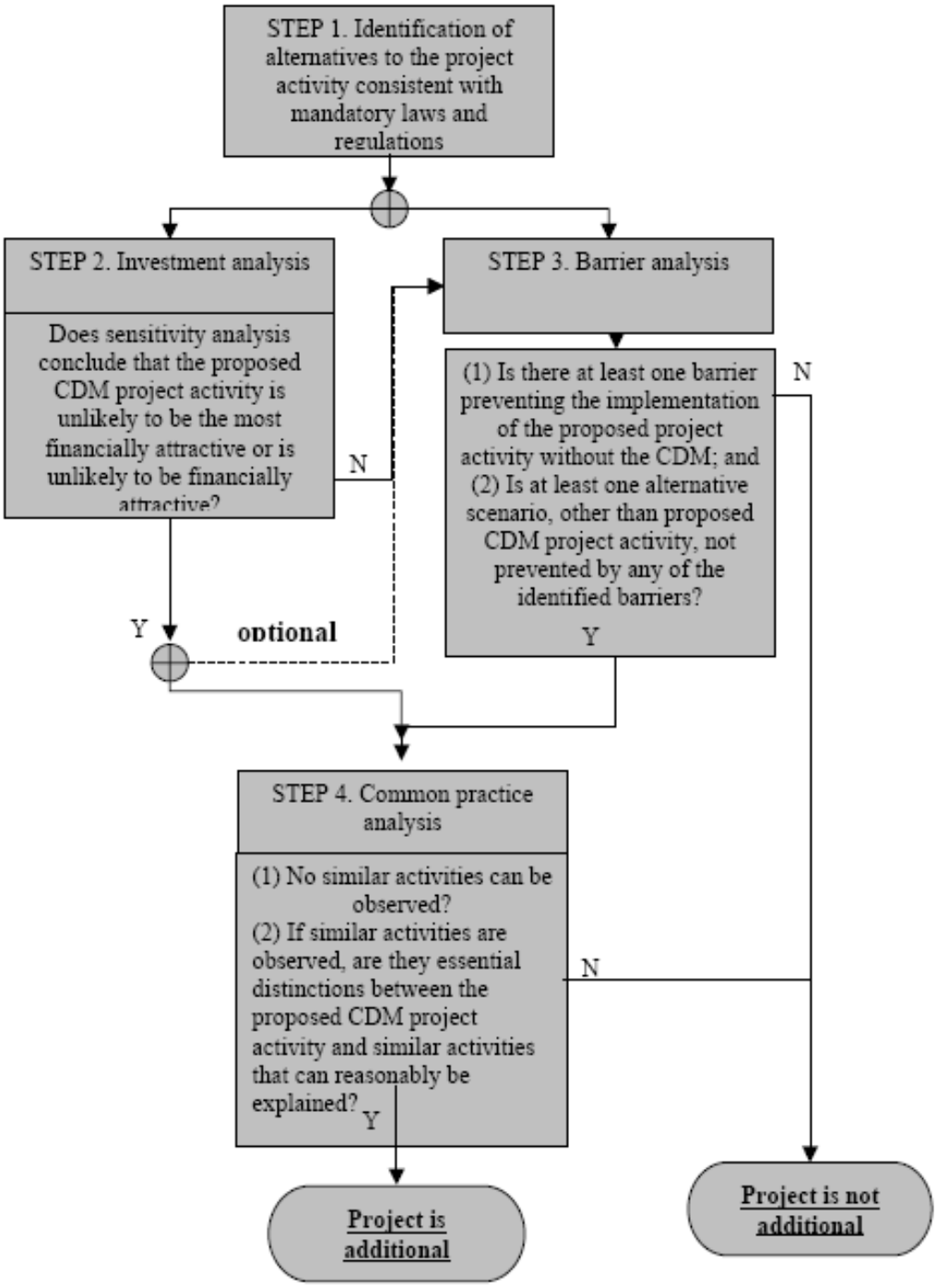
In accordance with "*Guidance on the demonstration and assessment of prior consideration of the CDM"* Version 3, since the start date of the project activity falls after 02 August 2008, the project participant is required to inform the host party DNA and UNFCCC Secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. This notification was made by Hindustan Zinc Limited to the UNFCCC Secretariat and Ministry of Environment and Forests on 02 September 2011 hich

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

is within six months of the project activity start date and contains the precise geographical location and a brief description of the proposed project activity.

Demonstration of Additionality for the project activity

As required in ACM0002 Version 12.3.0, additionality has been demonstrated and assessed using the latest version of the *"Tool for the demonstration and assessment of additionality"*, *Version 06.0.0*



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

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

Sub-step (1a): Define alternatives to 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. These alternatives are to include:

(a) The proposed project activity undertaken without being registered as a CDM project activity;

(b) Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario that deliver outputs services (e.g., cement) or services (e.g. electricity, heat) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology;

(c) If applicable, continuation of the current situation (no project activity or other alternatives undertaken).

The proposed project activity is a wind power project involving supply of electricity to Southern grid. Hence, according to baseline methodology ACM0002 Version 12.3.0, since the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

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

Paragraph 103 of the "Clean Development Mechanism Validation and Verification Manual" Version 01.2 states that "*The PDD shall identify credible alternatives to the project activity in order to determine the most realistic baseline scenario, unless the approved methodology that is selected by the proposed CDM project activity prescribes the baseline scenario and no further analysis is required*."

Since, the methodology has prescribed the baseline scenario as given above, no further analysis is required. The baseline alternative identified is continuation of the current situation (no project activity or other alternatives undertaken), in which case electricity delivered to the grid by the project activity would have been generated by the operation of grid-connected power plants and by the addition of new generation sources.

Therefore the following baseline alternatives are considered for further analysis:

Sl No.	**Alternative**
1	*The proposed project activity undertaken without being registered as a CDM project activity;*
2	*Continuation of the current situation (no project activity or other alternatives undertaken)*

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

The baseline alternative identified above is in compliance with the applicable legal and regulatory requirements as follows:

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

Thus, the baseline alternative is in line with the applicable legal and regulatory requirements.

The "Tool for the demonstration and assessment of additionality" (Version 06.0.0) states that project participants may choose to apply Step 2 (Investment analysis) OR Step 3 (Barrier analysis) to demonstrate the additionality of the project. In the present case, Step 2 is used to demonstrate the additionality of the project.

Step 2: Investment Analysis

Sub-step 2a. Determine appropriate analysis method

As the electricity generated from the project activity will be sold to the state utility, it will generate financial benefits in terms of revenues from the sale of electricity units. Thus simple cost analysis (option I) cannot be applied to the proposed CDM project activity.

Amongst the other two options – investment comparison analysis (option II) and benchmark analysis (option III), the benchmark analysis has been adopted in accordance with the guidance on the assessment of investment analysis wherein the Internal Rate of Return (IRR) of the project activity serves as a financial indicator to assess the financial attractiveness of the project activity.

The Guidelines on the Assessment of Investment Analysis', EB 62, Annex 5, Paragraph 19, states that "*If the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate.*"

Since the project activity supplies electricity to the grid and since the baseline scenario does not involve any investment, a benchmark analysis has been applied to the project activity.

Option III assesses if the project's returns are sufficient for investors to make the initial investment and further bear the associated costs of successfully operating the project activity over the crediting period of the project.

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

As per paragraph 14 in the Guidelines on the Assessment of Investment Analysis, EB 62 Annex 5:
"In the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on parameters that are standard in the market."
In accordance with the guideline, the benchmark has been determined using parameters standard in the market, and is based on the expected return on equity calculated using the Capital Asset Pricing Model (CAPM). The Capital Asset Pricing Model (CAPM) is a well accepted methodology for estimating the expected rate of return on equity. The reliability of CAPM as a tool for evaluating the minimum rate or return for an investor, is well documented.

It may be noted that there market indices (BSE Sensex, BSE 100, and BSE 200) were analyzed for calculating the market returns and the most conservative value of the market return has been used while

calculating the Benchmark for the project activity. BSE 500 is not considered in the analysis since the index was launched in the year 1999 and BSE 500 data is available for only 10 years which is not comparable to the project life time of 20 years. Similarly, other market indices listed are not considered as the available data is not comparable to the project lifetime and/or because they are sectoral indices and not representative of the market. The benchmark calculation applying the three market indices is provided in the consolidated excel sheet.

As per CAPM, the required return on investment is computed as follows:

$$\mathbf{K_e = R_f + \beta \times (R_m - R_f)}$$

where:
K_e = Rate of return on equity capital;
R_f = Risk-free rate of return;
β (Beta) = The stock's risk relative to that of the whole market;
$R_m – R_f$ = Market risk premium;

Risk free rate:

The risk free rate is understood as the rate of return on an asset that is theoretically free of any risks. Therefore the weighted average yield of Government of India Securities is considered as risk free rate determined at the time of project start. This data is published by Reserve Bank of India. The latest risk free rate available at the time of decision making was for the year 2009-10 (20 years maturity period has been taken to be conservative) published on 12h November 2010 by RBI

(Reference: http://www.rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=11731)

The applicable risk free rate is 8.30%.

Risk Premium:

The market risk premium is the premium above the risk-free rate of return that investors expect to earn on a well-diversified portfolio of equities. The most common approach for estimating the risk premium is to base it on historical data. The premium is estimated by looking at the difference between average return on stocks (market rate of return) and return on government securities over a period of time.

The market rate of return for BSE 100, BSE 200, and BSE Sensex has been evaluated from January 1991 onwards, thus providing the market returns for 19.92 years which is comparable with the operational lifetime of the project activity (20 years). Further, the use of data from 1991 is appropriate as the economic liberalization of the Indian economy started in 1991.[6] The economic growth path of India changed from 1991 and the use of data from this year provides a realistic representation of the market returns used to estimate the benchmark.

The market rate of return was evaluated as the compounded annual growth rate of the respective market index from January 1991 to November 2011 (prior to investment decision). The historical market index was taken from the BSE web-site (http://www.bseindia.com/index_op.htm), and the market rate or return for the three indices was determined to be:

BSE 100: 16.37%

[6] Reference: http://www.indiainbusiness.nic.in/economy/economic_reforms.htm

BSE 200: 15.87%

BSE Sensex: 16.19%

On a conservative basis, the market returns are applied in accordance with BSE 200.

Market rate of return, R_m = 15.87%

The risk premium has been calculated as the difference in market rate of return and the risk risk free rate available at the time of decision making. The detailed calculations are presented in the benchmark calculation spreadsheet submitted to the DOE.

The applicable risk premium is determined as: 15.87% – 8.30% = 7.57%.

Beta:

Beta (β) indicates the sensitivity of the company to market risk factors. For companies that are not publicly listed, the beta is determined by referring beta values of publicly listed companies that are engaged in similar types of business. The project activity type is wind power generation; the approach therefore should be to base the beta for the project on the beta values of listed wind power generation companies in India. However, in the absence of adequate data on companies which are exclusively into the exactly same type of business (i.e. wind power projects), the next best option for assessing the risk of these projects is to consider the data available on companies which are involved in similar businesses.

Therefore, we have considered beta values of electricity generating companies in India. The group of companies considered includes renewable as well as conventional power generating companies. Investors demand a higher return from renewable energy projects than from conventional energy ones, given the higher risks in renewable, including risks of technology, risks from significantly varying and unpredictable resource availability and a lower established support base for such projects relative to that for conventional power (e.g. grid connections, bank finance, suppliers, etc.). The use of this Beta value is therefore considered conservative, as it does not add for the higher risk of non conventional energy.

The Beta value taken for this analysis is based on the beta values of the listed power producing companies engaged in similar business as the project activity at the time of investment decision estimated by regressing monthly returns on stock against local index, using 5 years[7] of data. The equity beta values have been taken from BSE.The beta value for PTC has not been considered in the analysis as it is a power trading company. Further, companies with less than 5 years of data (date of listing after December 2005) have not been considered in the analysis. The beta values for the five years period prior to the time of investment decision (December 2005 to November 2010) has been evaluated. The beta values determined applying **BSE 200** are as follows:

Name	Effective Tax	Debt/Equity	Levered Equity beta	Unlevered Equity Beta
CESC Ltd.	17%	0.621	1.0713	0.7088
Gujarat Industries Power Co Ltd	17%	0.725	1.2145	0.7860

[7] Five years of Beta value has been chosen in line the Crisil Report on Cost of Capital for Central Sector Utilities which states that 'for such economies, and for companies whose capital structure and operating environment has been changing, the time period over which beta is calculated should be small',

TATA Power	25%	0.525	0.9953	0.7119
Reliance Infrastructure Limited	11%	0.425	1.7585	1.3015
Neyveli Lignite Corporation	22%	0.379	1.4702	1.1625
BF Utilities	29%	1.101	2.0982	1.5101
NTPC	20%	0.563	0.6200	0.4467
Jaiprakash Power Venture Limited	17%	1.586	1.7082	0.7416
Average				**0.9211**

The average asset beta of companies engaged in power sector is thus **0.9211**

The required return on equity computing using CAPM, is **15.27%** based on the average beta value and market risk premium for BSE 200, and risk free rate as given above.

The required rate on equity based on BSE 200 is the most conservative among the three indices as tabulated below:

Market Index	**Average Beta**	**CAPM**
BSE 100	**0.9304**	**15.81%**
BSE 200	**0.9201**	**15.27%**
BSE Sensex	**0.9703**	**15.96%**

The detailed benchmark calculation spreadsheets for all three market indices have been submitted to the DOE.

Therefore, the benchmark for the project activity is applied as **15.27%** on a conservative basis.

Sub-step 2c. Calculation and comparison of financial indicators (only applicable to options II and III):

The project proponent has adopted to establish the additionality of the project activity by performing an investment analysis using Post Tax Equity IRR; which is one of the known financial indicators used by banks, financial institutions and project developers for making investment decisions. The chosen indicator, Post Tax Equity IRR, represents the overall returns from an investment, and therefore, is duly considered as the financial indicator for the project activity.

Furthermore, in accordance with the Guidelines on the Assessment of Investment Analysis', EB 51, Annex 58, para and Guidance 16, which states that "*If the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate.*" And therefore, benchmark analysis is applied to the project activity.

The project proponents have hence identified post tax Post Tax Equity IRR as the most appropriate financial indicator for the project as the actual interest payable is taken into account in the calculation of income tax in the estimation of the IRR and carried out an investment analysis of the project activity in accordance with the *Guidance on the Assessment of Investment Analysis* Version 03.

The assumptions used to calculate the post tax equity IRR are listed below:

Capacity			
Project Size	21	MW	Techno-commercial offer from Suzlon dated 04/12/2010
Total Project Cost	1251.89	INR (x 10 Million)	Techno-commercial offer from Suzlon dated 04/12/2010
Means of Finance			
Debt (0%)	0	INR (x 10 Million)	Investment decision
Equity (100%)	1251.89	INR (x 10 Million)	Investment decision
Total Project Cost	1251.89	INR (x 10 Million)	Techno-commercial offer from Suzlon dated 04/12/2010
Operating Parameters			
Plant Load Factor	25.00%	%	Wind Resource Assessment Report by Power and Energy consultants received 20/10/2011 (Conservative in comparison to PLF based on Techno-commercial offer from Suzlon dated 04/12/2010)
Life of the WTG	20	Years	WTG technical specifications
Operation & Maintenance Cost			
O & M Cost Exemption	2.00	year	Techno-commercial offer from Suzlon dated 04/12/2010
O & M Cost	1.425	INR million/WTG	Techno-commercial offer from Suzlon dated 04/12/2010
O & M escalation	5.0%	%	Techno-commercial offer from Suzlon dated 04/12/2010
Tax on OMS	10.30 %	%	Techno-commercial offer from Suzlon dated 04/12/2010
Insurance cost			
Insurance Cost	0.11	INR million/WTG	Insurance costs incurred in previously commissioned wind power projects
Depreciation Rate			
Yearly book depreciation	5.28%	%	As per Companies Act[8]
Yearly tax depreciation	7.69%	%	As per IT Act[9]

[8] http://asa-india.com/asa/Depreciation%20Rates%20Companies%20Act.pdf

[9] http://law.incometaxindia.gov.in/DIT/File_opener.aspx?page=ITRU&schT=rul&csId=2f13c0bd-dec4-4df6-a273-431e3b91a01b&rNo=&sch=&title=Taxmann%20-%20Direct%20Tax%20Laws

Tax			
Income Tax Rate	33.22%	%	As per IT Act[10]
Minimum Alternate Tax	19.93%	%	As per IT Act
Tariff			
Tariff	3.39	INR	Tamil Nadu tariff order dated 20/03/2009
GBI	0.5	INR / kWH	http://mnre.gov.in/file-manager/UserFiles/faq_wind.pdf

Using the assumptions in the table above, the post-tax equity IRR for the project activity works out to be **7.88%,** calculated in accordance with the "Guidance on the Assessment of Investment Analysis" Version 03, which clearly depicts the fact that the project activity is not very attractive as an investment option since the returns are much below the selected benchmark.

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

A sensitivity analysis has been carried out, by varying the critical parameters of the project activity. As per paragraph 20 of the "Guidance on Assessment of Investment Analysis", EB 62 Annex 5: "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."

Sensitivity analysis has been carried out considering variations in PLF, tariff rate, O&M cost, and project cost. In accordance with Paragraph 21 of the guidance, a range of +10% to -10% has been considered as the range of variation.

Upon introducing the variation of 10% in crucial parameters the IRR figures do not surpass the benchmark. The results of sensitivity analysis for the project activity are as given below:

S. No.	Parameters	Variation	IRR without CDM
1.	PLF	+ 10 %	9.45%
		- 10 %	6.27%
2.	Tariff rate	+10 %	9.43%
		-10 %	6.28%
3.	O&M Cost	+10%	7.62%
		-10 %	8.13%
4.	Project Cost	+10%	6.40%
		-10 %	9.65%

Further, the variations in critical parameters required for the equity IRR to attain the benchmark rate of returns are tabulated below.

10 http://www.incometaxindiapr.gov.in/incometaxindiacr/contents/forms2010/pamphets/COMPANIES_2012_13.htm

S. No.	Parameters	Variation for IRR without CDM revenue to attain benchmark
1.	PLF	49%
2.	Tariff rate	50%
3.	O&M Cost	-375%
4.	Project Cost	-32%

It is unlikely that the above variations would be achieved as:

- The actual average PLF for the project activity since the time of commissioning has remained below the PLF considered for the investment analysis (based on third party report). An increase of 49% is highly unlikely.
- The project proponent has entered into a power purchase agreement valid for 20 years. The tariff would not be varying further as the PPA has been signed.
- The equity IRR remains below the benchmark at no O&M costs (-100% of O&M costs considered) and it is not possible for O&M costs to be reduced below -100%.
- The purchase orders for the project have been signed based on the offer letter considered at the time of investment decision. Therefore any decrease in the investment cost is not possible.

Step 4: Common Practice Analysis

Sub-step 4a: Analyze other activities similar to the proposed project activity:

Provide an analysis of any other activities that are operational and that are similar to the proposed project activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc. Other CDM project activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis. Provide documented evidence and, where relevant, quantitative information. On the basis of that analysis, describe whether and to which extent similar activities have already diffused in the relevant region.

Paragraph 47 of the Additionality Tool Version 06.0.0 has been applied for the analysis of other activities similar to the proposed project activity. The following step-wise procedure is applied.

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

As the proposed project activity is of 21.0 MW capacity, the applicable output range for the identification of projects is 10.5 MW to 31.5 MW.

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have

started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities shall not be included in this step.

For this analysis the applicable geographical area is applied in accordance with the definitions given in the Additionality Tool Version 06.0.0. As per the tool, "the applicable geographical area" covers the host country by default; however project participants may provide justification that the applicable geographical area is smaller than the host country for technologies that vary considerably from location to location depending on local conditions. Further, "different technologies" are defined as technologies that deliver the same output but differ by any of various factors including investment climate, energy source / fuel, feed stock, size of installation, etc. In India the regulatory regime and tariff structure is unique for each state, and therefore the investment climate varies considerably from state to state. Therefore, the applicable geographical area for the analysis is considered as the state of Tamil Nadu.

Further, all types of power plants have been considered for the common practice analysis. The number of projects in the applicable output range of 10.5 MW to 31.5 MW has been identified, covering thermal, hydro, biomass & wind and other types of power plants. The Thermal & Hydro projects in the applicable range have been taken from CEA database version 6.0[11]. Registered CDM projects are also excluded from the analysis, for determination of N_{all}. There are 28 wind power projects in Tamil Nadu in the capacity range of 10.5 to 31.5 MW. Out of these 28, 27 projects are under the CDM Process as tabulated below.

Following is the result of this analysis[12]:

Technology Area	No. of projects in applicable capacity range	Projects excluding CDM projects in applicable capacity range, N(all)	N(diff)
Thermal	5	5	5
Hydro	25	25	25
Wind*	28	1	0
Nuclear	0	0	0
Solar	0	0	0
Biomass	18	11	11
Tidal-Mechanical &Thermal	0	0	0
Geothermal	0	0	0
Total	**76**	**42**	**41**

Therefore, Nall = Thermal projects[13]+ Hydro Projects[14]+ Wind Projects[15]+Biomass

[11] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf

[12] Details of data collated and analysis done are provided to DOE for validation.

[13] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf

[14] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf

Projects[16]*+Nuclear projects*[17]*+ solar projects+ Geothermal & Tidal projects*[18]

= 5+25+1+11+0+0+0+0

=42

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}.

From the projects identified above, those projects which employ "different technologies", have been excluded and the number of such projects has been identified as N_{diff}.

Thermal power project, hydropower projects and biomass projects are different from the project activity (a wind based project) as they use different *Energy source/fuel* (para 9a of the Additionality Tool). Therefore, the thirty six projects identified in the determination of N_{all}, apply technologies different from the proposed project activity.

Therefore, N_{diff} = 41

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

F= 1 – 41/42 = 0.02

As per the Additionality Tool, the proposed project activity is a "common practice" within a sector in the applicable geographical area if the factor F is greater than 0.2 and N_{all}-N_{diff} is greater than 3.

As the factor F has been calculated to be 0.03 (less than 0.2), and N_{all} – N_{diff} = 1, the proposed project activity is not in common practice

Name of Owner	Total Capacity in Tamil Nadu (MW)	CDM	Web links and Explanation

[15] Source, Directory Indian Wind Power, dated August,2010

[16] http://mnre.gov.in/schemes/grid-connected/biomass-powercogen/

[17] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf

[18] http://www.eai.in/ref/ae/oce/oce.html

Ambika cotton mills	15.4	Yes	PDD titled" Bundled Wind power project in Tamilnadu, India co-ordinated by the TamilNadu Spinning Mills Association (TASMA)"
			http://cdm.unfccc.int/Projects/DB/TUEV-SUED1173364563.43/view
Arvind A traders	19.35	Yes	PDD titled" 37.6 MW bundled wind power project in Nagercoil, Tamilnadu"
			http://cdm.unfccc.int/Projects/DB/DNV-CUK1174976416.26/view
			PDD titled" 16.45 MW bundled grid connected renewable energy project in Tamil Nadu, India"
			http://cdm.unfccc.int/Projects/Validation/DB/ABFMBRFUS8RHP90TSOL3MQ2K4PLTM5/view.html
			PDD titled" Bundled Grid Connected Wind Power Project from Tamilnadu, India"
			http://cdm.unfccc.int/Projects/Validation/DB/6YL2AXZ5ITKXD4XTHBG2B3TW9XW0DC/view.html
Bannari Amman Spinning Mills	23.4	Yes	1) PDD titled" STL Wind Power Project, India Version 02 September 2005"
			http://www.dnv.com/focus/climate_change/upload/version%202%20-%20pdd%20%20sept%2005.pdf
			2) PDD titled "Bannari Amman Spinning Mills Wind Power Project managed by Enercon (India) Ltd."
			http://cdm.unfccc.int/Projects/Validation/DB/FYPAQ52NJB35JZRDUIC0GVD36E6S33/view.html
Best & Co.	25	Yes	PDD titled" Bundled Wind power project in Tamil Nadu, India, co-ordinated by Tamil Nadu Spinning Mills Association (TASMA-II)"
			http://cdm.unfccc.int/Projects/Validation/DB/4R4NBZ8HU31NRZMNQAMH37GJN07926/view.html
CLP Windfarm Pvt. Ptd.	21.45	Yes	http://cdm.unfccc.int/Projects/Validation/DB/AHUI0REMO7Y5YXH4DKL26CAYNWPR2U/view.html

CPCL	17.6	Yes	PDD titled" 17.6 MW captive grid connected electricity generation from wind energy project by Chennai Petroleum Corporation Limited. " http://cdm.unfccc.int/Projects/DB/BVQI1257245548.54/view
DCW limited	11.2	No	-
Grace Infrastructure (P) Ltd.	31	Yes	PDD titled" 31 MW Wind energy project in, India by Grace Infrastructure Pvt Ltd" http://cdm.unfccc.int/Projects/Validation/DB/FFZD3FVFDVCBV7VFLEO18LOFADFR7Z/view.html
Green Infra Wind Farms Ltd.	24	Yes	PDD titled "24 MW wind power project in Tamil Nadu, India" http://www.emergent-ventures.com/UploadedFiles/Catalogue/GIL_PDD.pdf
Integral Coach factory	10.5	Yes	http://cdm.unfccc.int/Projects/DB/RWTUV1289918552.25/view
Jayajyoti & Co. Ltd.	15	Yes	PDD titled" Bundled Wind power project in Tamilnadu, India co-ordinated by the TamilNadu Spinning Mills Association (TASMA)" http://cdm.unfccc.int/Projects/Validation/DB/0L0AS1GZWWW9I6J01GWYTQWF2TOV19/view.html
Jain Irrigation Systems Ltd.	13.2	Yes	PDD titled" 13.2 MW Wind Mill Power Project in Theni district of Tamil Nadu, by JISL-India" http://cdm.unfccc.int/Projects/Validation/DB/CTAB1JW6OXS0HR09NM29ZH3R43EETT/view.html
KPR Mills Pvt. Ltd.	19.27	Yes	PDD titled" 19.27 MW Grid connected wind electricity generation project by KPR Mills in Tamil Nadu. Version 02" http://cdm.unfccc.int/Projects/Validation/DB/KBAXDG75UAPOH4J4P20YB2AIQKM36G/view.html

			PDD titled" 19.8MW grid connected Wind farm project by K.P.R Mill Private Limited, Tamil Nadu, India at Villages: Keelaveeranam, Kuruchampatti, Vadi, Ayansurandi, Rajagopalaperi, District: Tirunelveli, Tamilnadu by M/s K. P. R. Mill Private Limited"
			http://cdm.unfccc.int/Projects/Validation/DB/AB7TO0OZGUKE6HYPB4TWCP5536AGVF/view.html
Lakshmi Machine Works Ltd.	27.95	Yes	PDD titled" 27.95 MW wind energy project in Coimbatore district in Tamilnadu, India. "
			http://cdm.unfccc.int/Projects/Validation/DB/MFHV5EFC9PJIZQ16ZPUQ3ZYQ5JUBNI/view.html
Loyal textiles	20.45	Yes	PDD titled" 22.25 MW Captive Wind Power Project in Tamil Nadu"
			http://cdm.unfccc.int/Projects/Validation/DB/ED7XENPZW06ZNTMVUOXKGQXEGZMUZV/view.html
Muthoot Fincorp. Ltd.	18.75	Yes	1) PDD titled" 23.75MW grid connected electricity generation project at Tirunelveli in Tamil Nadu"
			http://cdm.unfccc.int/Projects/Validation/DB/JGFW5O1TPVDU1AANHSLX8UMW5900BF/view.html
			2) PDD titled" Wind based bundled renewable energy project, Tamilnadu, India"
			http://cdm.unfccc.int/Projects/Validation/DB/NL768PUSVEEJJWKRMJ52W0F1GGT8A2/view.html
NEG- Micon (I) Pvt. Ltd.	18.55	Yes	Bundled Project http://cdm.unfccc.int/Projects/DB/DNV-CUK1174976416.26/view
Premier Mills Pvt. Ltd.	14.85	Yes	PDD titled" Grid connected renewable electricity generation project by M/s. Premier Mills Pvt Ltd in Tamilnadu, India"
			http://cdm.unfccc.int/Projects/Validation/DB/J0J2B6K3O92EEUAFD3OGYLE03TNZ7I/view.html
Paharpur cooling towers Ltd.	16.8	Yes	PDD titled" Wind energy based electricity generation project located at Manur and Vakaikulam, Tirunelveli district, Tamilnadu India"

			http://cdm.unfccc.int/Projects/Validation/DB/655DAB5QBOT3K7J584UPACWSUJVN3M/view.html
Powerica Ltd.	16.5	Yes	PDD titled" Wind power project at Tamilnadu by Powerica Limited"
			http://cdm.unfccc.int/Projects/Validation/DB/XIBTKKDPMONX9RG3T5ZNWM6GWRWMRL/view.html
Rasi Seeds (P) Ltd.	16.25	Yes	PDD titled" 40.68 MW grid connected electricity generation project by Indian Wind Power Association at Tirunelveli
			in Tamil Nadu."
			http://cdm.unfccc.int/Projects/Validation/DB/1VD4I971NMFAB70C0LGFR01GV4RI4H/view.html
Sapthagiri Distilleries	28.5	Yes	PDD titled" 53.75 MW Bundled wind Power project in Tamil Nadu and Karnataka by KBD Group, India"
			http://cdm.unfccc.int/Projects/Validation/DB/ZSGOS9T3629EQQBKKJ8S3S5KQCSRP9/view.html
Shanmugaval mills	25.5	Yes	PDD titled" Bundled Wind power project in Tamilnadu, India co-ordinated by the TamilNadu Spinning Mills Association (TASMA)"
			http://cdm.unfccc.int/UserManagement/FileStorage/AE2042RXII12SBXNF29XDKVT2BCEWG
			PDD titled" Wind Energy Project in Tamilnadu, India – structured by Sri Shanmugavel Group"
			https://cdm.unfccc.int/UserManagement/FileStorage/PKTBRXYOZNMWGV4J9SDLIE3Q1FH75C
Shriram EPC Limited	15	Yes	http://cdm.unfccc.int/Projects/DB/RWTUV1310469708.36/view
Simran Wind Project Pvt. Ltd.	21	Yes	PDD titled" Grid connected wind energy project in Tamil Nadu by Simran Wind Project Private Ltd."
			http://cdm.unfccc.int/Projects/Validation/DB/IVRFOXG4PHX66FTOIH9AHHP55OHR4L/view.html

Tamil Nadu newsprint & Paper Ltd.	13.75	Yes	http://cdm.unfccc.int/Projects/DB/BVQI1323706561.41/view
TCS Textile Ltd.	19.8	Yes	PDD titled" 19.80 MW bundled wind energy project in Tirunelveli and Coimbatore districts in Tamilnadu, India."
			http://cdm.unfccc.int/Projects/Validation/DB/QCDOZFYAQ1NMKR2SATF56PMJNH0TIU/view.html

It can be seen that, without exception, all private investors in the state of Tamil Nadu with installations between 10.5 and 31.5 MW have developed these projects as CDM projects.

.B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Emission Reductions

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. The emission reduction ER_y by the project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (LE_y), as follows:

$$ER_y = BE_y - PE_y - LE_y$$

where

ER_y = Emission reductions in year *y* (t CO_2/y)
BE_y = Baseline Emissions in year y (t CO_2/y)
PE_y = Project emissions in year y (t CO_2/y)
LE_y = Leakage emissions in year y (t CO_2/y)

Baseline Emissions:

$$BE_y = EG_{BL,y} * EF_{CO_2,grid,y}$$

Where:

BE_y = Baseline Emissions in year y (tCO_2)
$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{CO2,grid,y}$ = CO_2 Emission Factor in year y (tCO_2/MWh)

In accordance with the "Tool to calculate the emission factor for an electricity system" Version 02.2.1, combined margin CO_2 emission factor for grid connected power generation is calculated in section B.4

The data used for the calculation of the baseline emission factor was obtained from the baseline calculations published by the CEA, *CO_2 Baseline Database for the Indian Power Sector – Version 6.0*[19]

[19] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver6.pdf

which uses "Tool to calculate the emission factor for an electricity system". The relevant parts of the calculations are referenced in the methodology outline below. A complete explanation of the assumptions employed by the CEA can be obtained from the *CO_2 Baseline Database for the Indian Power Sector - Version 6.0*.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**$EF_{grid,OM,y}$**
Data unit:	tCO_2/MWh
Description:	Operating Margin emission factor for Southern grid
Source of data used:	Referred from CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority Version 6.0.
Value applied:	0.9671 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	The operating margin emission factor has been published by CEA in accordance with the 'Tool to calculate the emission factor for an electricity system." The option of ex ante calculation based on Simple Operating Margin Method have been applied using a three year generation weighted average (2007-08, 2008-09 and 2009-10) as given below:
Any comment:	This value is determined ex-ante and will be fixed for the crediting period.

Operating Margin Estimation for Southern Grid (tCO_2 / MWh)	
OM, 2007-08	0.9909
OM, 2008-09	0.9729
OM, 2009-10	0.9415
Net Electricity Generated (GWh), 2007-08	114634
Net Electricity Generated (GWh), 2008-09	121471
Net Electricity Generated (GWh), 2009-10	134717
Average OM ($EF_{grid, OM,y}$)	**0.9671**

Data / Parameter:	**$EF_{grid,BM,y}$**
Data unit:	tCO_2/MWh
Description:	Build Margin emission factor for Southern grid
Source of data used:	Referred from CO_2 Baseline Database for the Indian Power Sector prepared by Central Electricity Authority Version 6.0.
Value applied:	0.7634 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	The build margin emission factor has been published by CEA in accordance with the 'Tool to calculate the emission factor for an electricity system." The build margin is calculated as the average emissions intensity of the 20% most recent capacity additions in the grid based on net generation. The build margin has been taken corresponding to the year 2009-10, the latest year for which data is available.

Any comment:	This value is determined ex-ante and will be fixed for the crediting period.

Data / Parameter:	**$EF_{grid,CM,y}$/$EF_{CO2,grid,y}$**
Data unit:	tCO_2/MWh
Description:	Combined Margin CO_2 emission factor for Southern grid
Source of data used:	Estimated figure based on 75% of OM and 25% of BM values
Value applied:	0.9161 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	The combined margin emission factor has been determined based on data published by the CEA, applying a 75% weightage for $EF_{grid, OM,y}$ and 25% for $EF_{grid,BM,y}$ in accordance with the 'Tool to calculate the emission factor for an electricity system."

Combined Margin Estimation for Southern Grid (tCO_2/MWh)	
Operating Margin ($EF_{grid, OM,y}$)	**0.9671**
Build Margin ($EF_{grid, BM, y}$)	**0.7634**
Combined Margin (**$EF_{CO2,grid,y}$**)	**0.9161**

Any comment:	This value is determined ex-ante and will be fixed for the crediting period.

B.6.3. Ex-ante calculation of emission reductions:

	Parameter	Value	Units	Source
A	Baseline Emission factor ($EF_{CO2,grid,y}$)	0.9161	tCO_2/ MWh	CEA Database Ver 6.0
B	Capacity per WTG	1.5	MW	Technical Specifications
C	PLF	25	%	Third Party PLF Study
D	Net Energy Generation	45,990	MWh	Calculated as: B x 13 x 24 x 365 x C%
E	Baseline Emissions (BE_y) = $EF_{CO2,grid,y}$ x $EG_{BL,y}$	42,131	tCO_2/y	Calculated as: D x A

For a given year, the emission reductions contributed by the project activity (ER_y) is calculated as follows:

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

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
$EG_{BL,,y}$	=	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 version 02.2.1 of the "Tool to calculate the emission factor for an

electricity system"

BE_y = 45,990 MWh/annum x 0.9161 tCO_2/MWh
= 42,131 tCO_2e/annum

$ER_y = BE_y - PE_y$

Where:

ER_y	=	Emission reductions in year *y* (t CO_2e/yr)
BE_y	=	Baseline emissions in year *y* (t CO_2e/yr)
PE_y	=	Project emissions in year *y* (t CO_2e/yr)

ER_y = 42,131 – 0 = 42,131 tCO_2e/annum

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
2012*	0	42,131	0	42,131
2013	0	42,131	0	42,131
2014	0	42,131	0	42,131
2015	0	42,131	0	42,131
2016	0	42,131	0	42,131
2017	0	42,131	0	42,131
2018	0	42,131	0	42,131
Total (t CO_2e)	**0**	**294,917**	**0**	**294,917**

*1 December 2012 to 30 November 2013

B.7. Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{BL,y}$ **($EG_{y\ export}$ - $EG_{y\ import}$)**
Data unit:	MWh
Description:	Net electricity exported to the southern grid by the project
Source of data to be used:	Statements issued by TNEB to the project proponent on electricity generation
Value of data applied for the purpose of calculating expected emission reductions in section B.5	45,990 The same shall be monitored ex-post and CERs will be calculated at actual
Description of measurement methods and procedures to be applied:	Statements issued by TNEB to the project proponent on electricity generation will report the net electricity export, $EG_{BL,y}$. Energy meters of 0.2 accuracy class provided at each WTG continuously measure the export as well as the import from the turbine at the project site. The net electricity exported shall be calculated by subtracting import from the export values measured for each WTG. The total net electricity exported by the project activity will be calculated as the sum of the net electricity exported from each WTG. Meter readings will be taken monthly by the representative of the TNEB. The detailed monitoring plan and personnel responsible is described in section B.7.2.
QA/QC procedures to be applied:	The values can be cross checked with the invoice raised by the project proponent/supplier to TNEB for the electricity supplied to the southern grid.
Any comment:	The data will be kept for two years after the crediting period or from last

	issuance. The values shall be monitored ex-post and CERs will be calculated at actual.

Data / Parameter:	**$EG_{y\ export}$**
Data unit:	MWh
Description:	Electricity exported to the state electricity board by the project activity
Source of data to be used:	Statements issued by TNEB to the project proponent on electricity generation
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	Statements issued by TNEB to the project proponent on electricity generation will report the electricity exported, $EG_{y\ export.}$ Energy meters of 0.2 accuracy class installed at each WTG will continuously measure the electricity exported by the WTG. TNEB officials will take down monthly reading of the energy meters. The detailed monitoring plan and personnel responsible is described in section B.7.2.
QA/QC procedures to be applied:	In order to ensure the optimum accuracy levels the monitoring equipments used for measuring the parameter will be calibrated at least once in three years.
Any comment:	The data will be kept for two years after the crediting period or from last issuance.

Data / Parameter:	**$EG_{y\ import}$**
Data unit:	MWh
Description:	Electricity imported from the southern grid. This is a monitored parameter.
Source of data to be used:	Statements issued by TNEB to the project proponent on electricity generation
Value of data applied for the purpose of calculating expected emission reductions in section B.5	- The same shall be monitored ex-post
Description of measurement methods and procedures to be applied:	Statements issued by TNEB to the project proponent on electricity generation will report the electricity imported, $EG_{y\ import.}$ Energy meters of 0.2 accuracy class installed at each WTG will measure the electricity imported by WTG continuously. TNEB officials will take down monthly reading of the energy meters. The detailed monitoring plan and personnel responsible is described in section B.7.2.
QA/QC procedures to	In order to ensure the optimum accuracy levels the monitoring

be applied:	equipments used for measuring the parameter will be calibrated at least once in three years.
Any comment:	The data will be kept for two years after the crediting period or from last issuance.

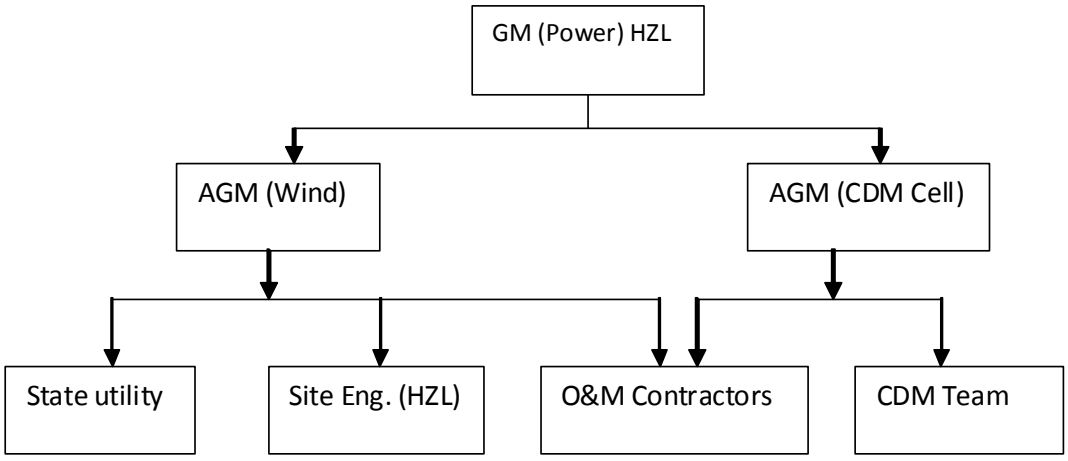
B.7.2. Description of the monitoring plan:

The purpose of the monitoring plan is to define the organizational structure of the monitoring team, monitoring practices, QA and QC procedures and archiving procedures. The monitoring plan will ensure that the emission reductions from the project activity are reported accurately and transparently.

Roles and Responsibilities of the Monitoring Team

The authority and responsibility of project management as well as registration, monitoring, measurement and reporting lies with HZL. The project proponent has formulated a Monitoring Team to ensure proper and continuous monitoring of the emission reductions as well as performance of turbines and generation of power.

To ensure trouble free operation of all the wind turbines, HZL has entered into a comprehensive Operation and Maintenance agreement with the manufactures of the turbines. The contractor, Suzlon Infrastructure Limited, would be responsible for the operation and maintenance of the WTGs. The O&M personnel are qualified engineers and are trained at the WEG manufacturing facility of Suzlon Infrastructure Limited.
The monitoring will interact with the O&M contractors as well as the State Utility officials for executing the monitoring plan. The structure of the Monitoring Team is as follows:



Monitoring Team	Roles & Responsibilities

General Manager (Power), HZL	• Communication with CDM EB • Communication with state utility
AGM (CDM Cell), HZL	• Overall coordination with monitoring team and DOE for verification activities • Maintaining data records, documentation and archiving
CDM Team	• Assisting the General Manager (Wind) with overall coordination and with maintaining data records, documentation, archiving etc.
AGM (Wind) HZL	• Coordinating with Site Engineer, O&M operators, and State Utility
Site Engineer, HZL	• Overseeing monitoring, operation and maintenance activites at site • Interacting with State Utility and O&M contractors for JMRs and calibration
O&M contractors	• Carrying out operation & maintenance of WTGs • Carrying out joint meter readings with state utility
State Utility	• Carrying out joint meter readings with representative of project proponent (O&M contractors) • Calibration of energy meters

Quality control and Quality Assurance procedures:

Calibration Procedures:

Energy meters are installed at each WTG for monitoring the energy exported and imported. The energy meters shall be tested for accuracy at least once in three years with reference to a portable standard meter. The meters shall be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2 accuracy class. The data registered by the energy meter will be adopted for the purpose of emission reduction calculation as long as the error in the main meter is within permissible limits. If the energy meter is found to be beyond the permissible limits of error, TNEB officials shall be notified for rectification or replacement of the meter. The rectified / replaced energy meter would be calibrated.

Data collection and archiving

Monthly data is collected and maintained in hard copy (copies of TNEB statements). The project proponent shall keep complete and accurate records of all the data as a part of monitoring for at least a

period of 2 years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later.

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

Date of completion of base line: 27 September 2011

Name of person/entity determining the baseline: Hindustan Zinc Limited

The entity is also a project participant listed in Annex 1 of this document.

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

28/03/2011

This date corresponds to the date of purchase orders for the project activity.

C.1.2. Expected operational lifetime of the project activity:

20 years from the starting date of project activity.

C.2. Choice of the crediting period and related information:

The project activity shall use the renewable crediting periods.

C.2.1. Renewable crediting period:

C.2.1.1. Starting date of the first crediting period:

01/12/2012

The project proponent confirms that the crediting period will not commence prior to the date of registration

C.2.1.2. Length of the first crediting period:

7 years 0 month

C.2.2. Fixed crediting period:

Not Applicable

C.2.2.1. Starting date:

Not Applicable.

C.2.2.2. Length:

Not Applicable.

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

As per the Ministry of Environment and Forests (Government of India) notification the project activity does not fall under the purview of the Environmental impact Assessment thus the project activity is exempted from the environmental clearances. It should be noted here that though EIA is not a regulatory requirement in India for wind energy projects.

There are no negative environmental impacts that are envisaged due to the project activity. The following are the positive impacts due to the project activity.

- *Impact on air and water*: Wind energy is a form of renewable electricity generation; hence there would be no release of GHG into the atmosphere. Also as there is no fuel used for electricity generation no effluents or solid waste (such as ash) are generated.
- *Socio economic impact:* The project activity helps create demand for skilled and unskilled manpower in the region. The project will be providing employment opportunity to not only during the construction phase, but also during its operational life time. The project activity improves employment rate and livelihood of local populace in the vicinity of the project.

Moreover, the project generates eco-friendly, GHG free power, which contributes to sustainable development of the region.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The project activity i.e. electricity generation from wind, clean and green source of power which will result in no negative impact on environment. Further as per the applicable 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 dated 1 December 2009 regarding the requirement of Environment Impact Assessment (EIA) studies[20] 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 necessary.

[20] 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) http://envfor.nic.in/legis/eia/so1533.pdf

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

The project activity being undertaken envisages the installation of a wind farm for supply to grid. The stakeholders for a project activity are defined as the public, including individuals, groups or communities, affected, or likely to be affected, by the proposed CDM project activity.

A meeting was organized by Suzlon Infrastructure Services Ltd. on 12/09/2011 at Palladam, to inform the local stakeholders about the project activity and discuss their concerns, if any, regarding the project activity. Local stakeholders including Sarpanchs and residents of the neighbouring villages were invited to the meeting through a newspaper advertisement and a public notice.

The agenda of the meeting was as follows:

- Welcome Speech
- Introduction to Climate Change and Clean Development Mechanism
- Views expressed by the villagers
- Interactive session with the stakeholders
- Vote of Thanks

The representatives of Suzlon Infrastructure Services Ltd. and the project proponent presented the salient features of the project activity to the stakeholders. The opinions expressed by the local stakeholders and the respective responses were recorded.

E.2. Summary of the comments received:

A summary of the comments and queries from the stakeholders are presented below along with the responses from the representatives of the project participants:

Comment / Query from Stakeholder	Response from Representative of the Project Participant
Are coastal areas like Kanyakumari, Chennai at risk from global warming? Can something be done to mitigate the risk at the government level?	Yes, coastal areas are under risk from sea level rise. This is why it is imperative to mitigate greenhouse gas emissions through activities such as installation of renewable energy. Various initiatives have been taken including implementation of the Kyoto Protocol by the UNFCCC and by individual governments around the world.
What is the Kyoto Protocol?	The Kyoto Protocol is a legally binding agreement that arose out of the UNFCCC to tackle climate change through reduction of greenhouse gas emissions.
Do these projects affect rainfall?	No, such projects do not affect rainfall. The WTG is not higher than 80 meters and rainfall bearing

	clouds are at a much higher altitude.
Can the wind turbines affect groundwater in any manner?	No, the wind turbines do not have any effect on groundwater. The wind turbines capture the power of wind and convert it into electricity without any usage of water.

The stakeholders also acknowledged the socio-economic benefits of the project activity including improved infrastructure in the region, and employment opportunities for local residents.

E.3. Report on how due account was taken of any comments received:

There were no concerns raised by the local stakeholders. The potential benefits of the project activity for the local stakeholders were acknowledged.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Hindustan Zinc Limited
Street/P.O.Box:	CPP-CLZS,
Building:	Chanderiya lead zinc smelter,Putholi
City:	Chittorgarh-312021
State/Region:	Rajasthan
Postfix/ZIP:	312021
Country:	India
Telephone:	91-9928140302, +91-1472-2564801
FAX:	+91-1472-256593
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	Mr.
Last Name:	Jayaraman
Middle Name:	
First Name:	V.
Department:	
Mobile:	91-9928140302
Direct FAX:	-
Direct tel:	
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from parties included in annex I in the said project activity.

Annex 3

BASELINE INFORMATION

The baseline information has been provided in section B.6.

Annex 4

MONITORING INFORMATION

The monitoring plan has been already explained in section B.7.2.

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Annex 5

Action Plan for HZL's commitment of 2% earning (net realization value) from sale of CER towards Sustainable Development Activities including society and community development activities:

CSR Initiatives

The project activity would generate approximately 42,131 CERs per annum. HZL is committed to contribute a minimum of 2% of the CER revenue accrued every year for sustainable development activities for the local population. The CER revenues would be available for investment in sustainable development approximately 6 – 10 months after the end of the respective monitoring period (typical time frame for completion of verification and request for issuance). Assuming that the first monitoring period would be completed towards the end of 2013, CER revenues would be available to HZL from the calendar year 2014 onwards. The table below provides an estimation of the revenue that would be committed every year for sustainable development activities.

Years	Annual emission reductions (tonnes of CO_2e)	Estimated CER price* (Euro)	Exchange rate of CER* (Euro to INR)	Estimation of CER Revenue generated by the project (INR)	Estimation of minimum revenue for sustainable development ** (INR)
2014	42,131	11	60	27,806,460	556,130
2015	42,131	11	60	27,806,460	556,130
2016	42,131	11	60	27,806,460	556,130
2017	42,131	11	60	27,806,460	556,130
2018	42,131	11	60	27,806,460	556,130
2019	42,131	11	60	27,806,460	556,130
2020	42,131	11	60	27,806,460	556,130
Total reductions (tonnes of CO_2e)	**294,917**			**194,645,220**	**3,892,910**
number of years	**7**				

HZL would allocate revenues from sale of CERs for the environmental and socio-economic development of the region. The following is the indicative implementation plan for the sustainable development activities, funded by CER revenues:

Sustainable Development Initative	Estimated Annual Budget (INR)	Planned Implementation Timeframe / Frequency
Tree plantation programmes	200,000	At least 500 trees per annum
Promotion of education by providing supplies such as uniforms, shoes, school bags, books for school children	200,000	Free distribution of school supplies to at least two schools per annum
Promoting vocational training and skill development training to unemployed youth and SHG women	100,000	Conducting at least one training program per annum
Promoting health initiatives such as free medical camps, awareness-building programmes, etc.	56,130	Ongoing initiative on monthly basis

HZL will undertake informal discussions with the locals at the project site and commit the revenue towards society /community development activities in areas that are of most concern to the local population. HZL commits that a CSR team will be appointed to oversee the activities towards sustainable development and also to ensure that activities are undertaken and concluded in a timely manner each year. HZL will undertake an annual review of the actual CERs accrued and the price transacted. On the basis of the actual price and exchange rate, HZL will contribute 2% of the revenue for sustainable development activities in the local areas. Finally, HZL would carry out an annual internal audit the actual activities carried out, and actual expenses incurred towards sustainable development activities each year, as against the CER revenues accrued. Will also undertake impact assessment of social development projects by an external agency annually