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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

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Title: Grid Connected Wind Energy Generation at Andhra Pradesh.
Version: 05.0
Date of completion of PDD: 12/03/2013

A.2. Description of the project activity:

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Vish Wind Infrastucture LLP (hereafter referred as "VWILLP") is installing 20.8 MW wind energy power plant in the state of Andhra Pradesh in India. The project activity involves supply, erection, commissioning and operation of 26 machines with rated capacity of 800 KW each. All the machines are Enercon E-53 make. The project will generate 40.057 GWh of electricity per year which shall be supplied to the state electricity utility thereby contributing to reducing the energy demand-supply gap in the state of Andhra Pradesh. The project activity will contribute to the sustainable development of the region by providing clean and green electricity to the state electricity grid.

Purpose of the project activity:

The purpose of the project activity is to utilize wind energy potential for generation of electricity. The project activity replaces anthropogenic emissions of greenhouse gases (GHG's) into the atmosphere, which is estimated to be approximately 36,738 tCO_{2e} per year, by displacing an equivalent amount of electricity generation through the operation of existing fuel mix in the grid comprising mainly fossil fuel based power plants and future capacity expansions connected to the grid.

Pre-Project Scenario:

In the absence of the project activity an equivalent amount of electricity would have been generated from the connected/ new power plants in the Southern grid, which are predominantly based on fossil fuels[1], whereas no GHG emission takes place from power generation by wind energy generators (WEGs). As per the applicable methodology the baseline scenario for the project activity is the grid based electricity system, which is also the pre-project scenario.

Nature of Project

The Project harnesses renewable resources in the region, thereby displacing non-renewable natural resources and leading to sustainable economic and environmental benefits. Enercon (India) Limited ("Enercon") will be the equipment supplier and the operations and maintenance contractor for the Project. The generated electricity would be supplied to Electricity Distribution Company (DISCOM) under a long-term power purchase agreement (PPA).

Contribution to Sustainable Development

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

The National CDM Authority (NCDMA) which is the Designated National Authority (DNA) for the Government of India (GoI) in the Ministry of Environment and Forests (MoEF) has stipulated four indicators for sustainable development in the interim approval guidelines for Clean Development Mechanism (CDM) projects from India[2]. The contributions of this project activity towards these indicators are provided below:

1. **Social well being:**

   - The project activity will lead to the development of supporting infrastructure such as road network etc., in the wind park location, the access to which is also provided to the local population.

   - The project activity will lead to alleviation of poverty by establishing direct and indirect benefits through employment generation and improved economic activities by strengthening of local grid of the state electricity utility.

   - Use of a renewable source of energy reduces the dependence on imported fossil fuels and associated price variation thereby leading to increased energy security.

2. **Environmental well being:**

   - The project activity employs renewable energy source for electricity generation instead of fossil fuel based electricity generation which would have emitted gaseous, liquid and/or solid effluents/wastes.

   - Being a renewable resource, using wind energy to generate electricity contributes to resource conservation. Thus the project causes no negative impact on the surrounding environment and contributes to environmental well-being.

3. **Economic well being:**

   - The project activity requires temporary and permanent, skilled and semi-skilled manpower at the wind park; this will create additional employment opportunities in the region

   - The generated electricity will be fed into the Southern grid through local grid, thereby improving the grid frequency and availability of electricity to the local consumers (villagers & sub-urban habitants) which will provide new opportunities for industries and economic activities to be setup in the area thereby resulting in greater local employment, ultimately leading to overall development.

4. **Technological well being:**

   - Increased interest in wind energy projects will further push R&D efforts by technology providers to develop more efficient and better machinery in future.

[2] http://envfor.nic.in/cdm/host_approval_criteria.htm

- In addition to this, the project proponent will contribute 2% of the CDM revenue realized from the candidate CDM project for sustainable development including society / community development. PP is aware about the Indian DNA guideline on commitment of 2% of the CDM revenues towards sustainable development and a formal undertaking is being submitted separately.

A.3. Project participants:

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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)
India (Host)	Vish Wind Infrastructure LLP (Private entity)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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India

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

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Southern region – State of Andhra Pradesh

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

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Districts – Anantapur & Kurnool
Villages – Nallakonda & Thummalapenta

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

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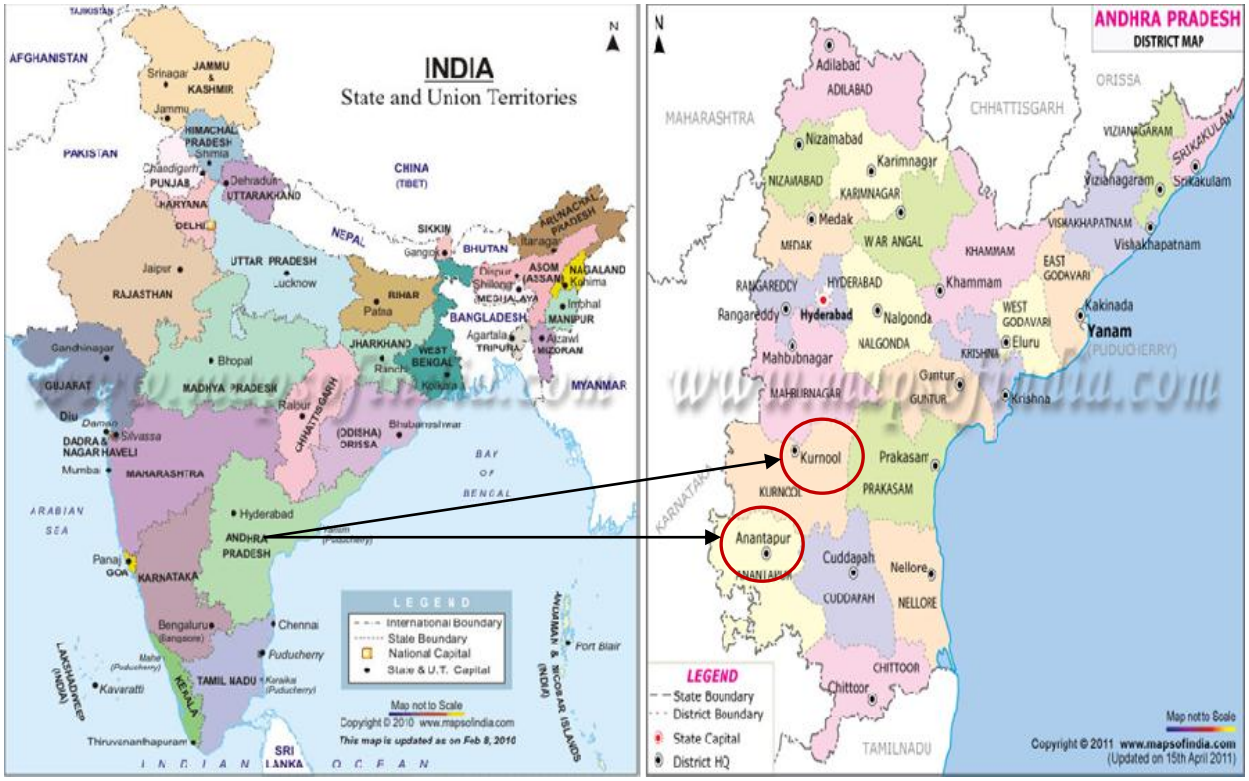
The details of the geographical coordinates of the project locations are provided in the Appendix 1. Nearest railway station is at Anantapur which is about 70 km away from the site. Nearest airport is at Bangalore which is about 200 km from the site.



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

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The project activity is considered under CDM category zero-emissions 'Grid **Connected Electricity Generation from Renewable Sources'** that generates electricity in excess of 15 MW (limit for small scale project). 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 **Sectoral Scope - 1 [Energy industries (renewable/ non-renewable sources)].**

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

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The project activity involves 26 wind energy generators (WEGs) of Enercon make (800 kW E-53) with internal electrical lines connecting the project activity with local evacuation facility. The WEGs generates 3-phase power at 400V, which is stepped up to 33 KV. The project activity can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V ± 12.5%. The average life time of the WEG is around 20 years as per the industry standards; however, the project activity is yet to be commissioned. The other salient features of the state-of-art-technology are:

E 53 Specifications

Turbine model	Enercon E- 53

Rated power	800 KW
Rotor diameter	53 m
Hub height	75 m
Turbine Type	Gearless horizontal axis wind turbine with
Power regulation	Independent electromechanical pitch system for each blade.
Cut in wind speed	2.5 *m/s*
Rated wind speed	12 *m/s*
Cut out Wind speed	28-34 *m/s*
Extreme Wind Speed	59.5 *m/s*
Rated rotational speed	32 rpm
Operating range rot.	12-29 rpm
Orientation	Upwind
No of Blades	3
Blade Material	Fibre Glass Epoxy reinforced with integral
Gear box type	Gear less
Generator type	Synchronous generator
Braking	Aerodynamic
Output Voltage	400 V
Yaw System	Active yawing with 4 electric yaw drives
Tower	74 m concrete

Transfer of Technology and Know-how to the host party:

Enercon (India) Limited has secured and facilitated the technology transfer for wind based renewable energy generation from Enercon GmbH and has established a manufacturing plant at Daman in India, where along with other components the "Synchronous Generators" using "Vacuum Impregnation" technology are manufactured.

Purpose of the Project Activity

Pre-project scenario: No Project Activity
As has been discussed in section A.2 of the PDD, the baseline is same as the pre-project scenario, i.e. continuation of supply of electricity to the Southern grid by a conventional source of power generation (Coal, Gas, etc).

Post Project Scenario: Implementation of Project
The proposed project activity would displace an equivalent amount of power from conventional sources and would thus meet the electricity deficit through a clean technology.

The project facility essentially involves:

Components

1. 26 WEGs of E-53 type supplied by EIL each with a generating capacity of 800 kW
2. Step up transformers (400 V to 33 kV)
3. Transmission lines connecting the generating facility to the local sub-station.

In the absence of the project activity the equivalent amount of electricity would have been generated from the connected/ new power plants in the Southern grid, which are/ will be predominantly based on fossil fuels[3], hence baseline scenario of the project activity is the grid based electricity system, which is also the pre-project scenario.

Thus, the baseline scenario is the same as the pre-project scenario (as per the guidelines to complete the PDD, a repeat of the description of the baseline scenarios is not required).

During the operation of WEGs no adverse effect on environment takes placeas this technology is environmentally safe and sound and does not contribute to any GHG emission. Moreover, after the operational lifetime, the disposal of the WEGs does not involve any hazardous material.

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

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The estimated emission reductions over the 10 year fixed crediting period would be 367,380 tCO2e as per details on annual emission reductions provided below:

Years	Annual estimation of emission reductions in tonnes of CO_2e
Year 1 *	36,738
Year 2	36,738
Year 3	36,738
Year 4	36,738
Year 5	36,738
Year 6	36,738
Year 7	36,738
Year 8	36,738
Year 9	36,738
Year 10	36,738
Total estimated reductions (tonnes of CO_2e)	**367,380**
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	36,738

* Year 1st begins from the date of registration, and each year extends for 12 months

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

A.4.5. Public funding of the project activity:

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There is no public funding from Annex 1 countries and no diversion of Official Development Assistance (ODA) involved in 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:

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Title: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Reference: Approved consolidated baseline methodology ACM0002 (Version 12.2.0, Annex 16, EB 65)

ACM0002 draws upon the following tools which have been used in the PDD:

- Tool to Calculate the Emission Factor for an Electricity System – Version 02.2.1, Annex 19, EB 63
- Tool for the Demonstration and Assessment of Additionality – Version 06.0.0, Annex 21, EB 65

Further information with regards to the methodology / tools can be obtained at http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

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The Project is a wind based zero emission power project connected to the Southern electricity grid. The project activity involves installation of a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant) The Project will displace fossil fuel based electricity generation that would have otherwise been provided by the operation and expansion of the fossil fuel based power plants in Southern electricity grid.

The approved consolidated baseline and monitoring methodology ACM 0002, Version 12.2.0 is the choice of the baseline and monitoring methodology and it is applicable because:

Sl.No.	Applicability Criteria as per ACM 0002	Applicability to Project Activity
1	This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity is grid connected greenfield renewable power generation from wind where no renewable power plant was operated prior to the implementation of the project activity.
2	The project activity is the installation, capacity	This condition is not relevant, as the

	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	project activity does not involve capacity additions, retrofits or replacements.
3	In case of hydro power plants: • The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs. • 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 definitions given in the Project Emissions section, is greater than 4 W/m^2. The project activity results in new single or multiple reservoirs and the power density of each reservoir the power plant, as per definitions given in the project emissions section, is greater than 4 W/m^2.	This condition is not relevant, as the project activity is not the installation of a hydro power plant.
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; Hydro power plant that result in new single reservoir or in the increase in existing single reservoir where the power density of the power plant is less than 4 W/m^2.	The project activity does not involve any of the given criteria hence methodology is applicable for the project activity.
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".	The project activity is a new wind power plant. No replacement, modification or retrofit measures are implemented here. Hence, this criterion is also not relevant to the project activity.

The description provided in the table above shows that the project activity satisfies the applicable conditions of the methodology, ACM0002 version 12.2.0.

This ACM 0002 also refers to the latest approved versions of the following tools:

1) Tool to calculate the emission factor for an electricity system", version 02.2.1:- This tool is used in line with ACM0002 requirement. This tool is used to determine the CO2 emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the combined margin emission factor (CM) of the electricity system. Since the project activity displaces the grid generation by renewable energy power, hence the tool is applicable for project activity and used to calculate emission reductions for the project activity. Further CEA database has also used the same tool to calculate the OM, BM & CM for the electricity system.

2) Project activity has applied "Tool for the demonstration and assessment of additionality", version 06.0.0, which is not mandatory for project participants when proposing new methodologies. Since project activity is using the established methodology ACM0002, project participant has used this toll to demonstrate the additionality of project activity. As per the tool 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. Justification on alternatives has been provided in details in section B.5 of PDD.

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

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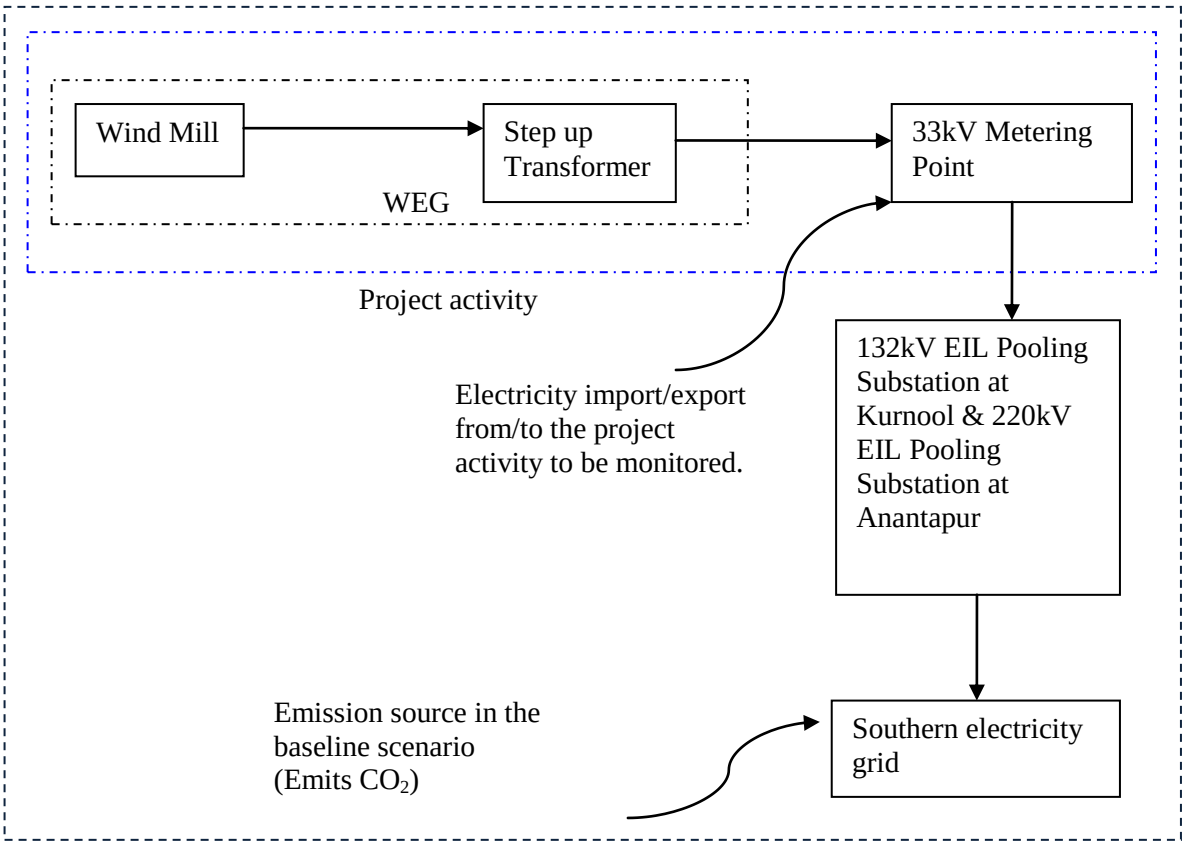
According to the applicable methodology, spatial extent of this project activity includes the project site and all the power plants connected physically to the electricity system that the CDM power project is connected to. The project activity is connected to the network of state transmission utility which falls under Southern grid. Thus the project boundary includes all the power plants physically connected to the Southern grid. Project activity is connected to 132kV Ankireddypalli substation at Kurnool site and 220kV Shahpuram substation at Anantapur site developed by Enercon (India) Limited.

The schematic diagram of the Project Boundary is as follows:



Represents project activity

Represents 1 unit of WEG (there are 26 such units in the project activity)

Represents project boundary

The baseline study of Southern grid shows that the main sources of GHG emissions in the baseline are CO2 emissions from the conventional power generating systems, the other emissions are that of CH4 and N2O but both emissions were conservative and are excluded for simplification of the project. The project activity is GHG emission free electricity generation from renewable sources.
Following table indicates the sources and gases included in the project boundary:

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable	CO_2	No	The project activity is a wind power project and thus these emission sources are not applicable to the project activity.
		CH_4	No	

	gases contained in geothermal steam	N_2O	No	
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	The project activity is a wind power project and thus these emission sources are not applicable to the project activity.
		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 thus these emission sources are not applicable to the project activity.
		CH_4	No	
		N_2O	No	

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

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According to ACM0002 version 12.2.0, for project activities that do not modify or retrofit an existing electricity generation facility, the baseline scenario is the following:

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

The project activity is the installation of a new power generating facility utilizing the kinetic energy of wind to produce electricity and supply the same to the grid. In the absence of the project activity, the equivalent amount of electricity would have otherwise been supplied by the operation of grid-connected power plants and by the addition of new generation sources.

In the web hosted PDD baseline emission reductions were calculated based on "Tool to calculate the emission factor for an electricity system", Version 02.2.0 available at the time of webhosting. During the course of validation the latest "Tool to calculate the emission factor for an electricity system", Version 02.2.1 was published by UNFCCC which is applicable to the project activity.

As per the applicability condition of latest "Tool to calculate the emission factor for an electricity system", version 02.2.1, "*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)".*
Since the project activity supplies electricity to southern grid of India, the latest "Tool to calculate the emission factor for an electricity system", version 02.2.1 is applicable for the project activity and accordingly baseline has been calculated as per the latest available tool.

According to the approved baseline and monitoring methodology ACM0002, version 12.2.0, the baseline emissions are calculated as:

$\mathbf{BE_y = EG_{PG,y} * EF_{grid,CM,y}}$

BEy = Baseline emissions in year *y* (tCO2/yr)
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO2/MWh)

The project is a Greenfield renewable energy power plant and thus
$EG_{PJ,y} = EG_{facility,y}$

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

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

Calculation for $EF_{grid,CM,y}$ is given in Section B.6.1.

The details of India grid system is described in the table below:

S.No.	Electricity Grid (Present)	Electricity Grid (Earlier)	Geographical Areas Covered
1.	NEWNE Grid	Northern	Chandigarh, Delhi, Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand
		Western	Chhattisgarh, Gujarat, Daman & Diu, Dadra & Nagar Haveli, Madhya Pradesh, Maharashtra, Goa
		Eastern	Bihar, Jharkhand, Orissa, West Bengal, Sikkim, Andaman- Nicobar
		North-Eastern	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura
2.	Southern Grid	Southern	**Andhra Pradesh**, Karnataka, Kerala, Tamil Nadu, Pondicherry, Lakshadweep

Andhra Pradesh state falls under Southern grid. The power sector in India including the Southern region largely comprises thermal power stations[4]; as can be seen from the table below[5]:

Sector	Hydro (MW)	Thermal				Nuclear (MW)	Renewable (MW)	Total (MW)
		Coal	Gas	Diesel	Total			
State	27065	44977	4046.12	602.61	49625.73	0.00	2701	79391.85
Central	8565.40	31165	6702.23	0.00	37867.23	4560	0.00	50992.63
Private	1233.00	8056.38	6307.50	597.14	14961.02	0.00	12819.99	29014.01
All India	36863.40	84198.38	17055.85	1199.75	102453.98	4560	15521.11	159398.49

It is evident from the above table that the installed capacity in India is predominantly thermal power plants (64.27%); thermal power generation is GHG intensive and is a major source of CO2 emissions. In the absence of the project activity equivalent amount of electricity would have been generated from the existing grid connected power plants and planned capacity additions which are also largely fossil fuel based. Thus generation from the project displaces the electricity generated from existing and planned power plant capacities in the southern grid whose emission intensities are represented by the Combined Margin Emission Factor of the Southern Grid.

The baseline emissions and emission reductions from the project activity are estimated by multiplying the amount of electricity exported by the project activity to the Southern grid with the emission factor of the Southern grid calculated as the combined margin (CM) of the operating margin (OM) and build margin (BM) emission factors.

Variable	**Data Source**
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)	Records maintained by project proponents
Parameter	**Data Source**
$EF_{grid,OM,y}$ = Operating Margin Emission Factor (tCO2/MWh)	CEA Database for CO2 emission factor, version 6
$EF_{grid,BM,y}$ = Build Margin Emission Factor (tCO2/MWh)	CEA Database for CO2 emission factor, version 6
EF_y = Grid Emission Factor	Calculated as the weighted average of the operating margin and build margin

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):

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The project activity has been conceived as a CDM project since its inception. The project start date is 02 April 2011 and the PP has intimated UNFCCC and DNA on 28/06/2011 about the project activity

[4] http://www.cea.nic.in/

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

initiative which is within six months of the start date. Therefore it complies with the "Guidelines on the demonstration and assessment of prior consideration of the CDM", version 04, EB-62, Annex 13. The acknowledgement from UNFCCC and email to Indian DNA shall be provided to the DoE for verification. Chronology of events for project activity is as follows

Activity	**Dates**
Board Resolution	01/04/2011
Purchase Order of WEGs	02/04/2011
Appointment of DOE	28/05/2011
Prior consideration sent to UNFCCC & NCDMA	28/06/2011

According to decision 17 /CP.7 paragraph 43, a project will be defined additional if the anthropogenic GHG emissions from the source are reduced below that would have occurred in the absence of the registered project activity and that either the project is facing barriers or is not viable / profitable for the investor.

Within the scope of the adopted baseline methodology, the additionality of the project activity has been demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" (Version 06.0.0 from EB 65). The tool prescribes the following steps for proving additionality of a project.

Step1. Identification of alternatives to the project activity consistent with current laws and Regulations

As per Para II of ACM0002, version 12.2.0, pg. 4, *"If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:*

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

Therefore, the baseline alternative for the project activity is generation of equivalent amount of electricity by operation of grid-connected power plants and by addition of new generation sources. Accordingly, the realistic and credible alternatives to the project activity are:

(a) The Project is undertaken without registering it as a CDM activity.
(b) Equivalent amount of electricity being generated through operation of grid-connected power plants and addition of new generation sources

National policies and circumstances relevant to the baseline:

National Policies relevant to the baseline of project activity are as below:

1) "Baseline CO_2 database" Version 06 – Central Electricity Authority
2) Electricity Act 2003

The Electricity Act, 2003 provides an enabling framework for accelerated and more efficient development of the power sector. The Act seeks to encourage competition with appropriate regulatory intervention. Competition is expected to yield efficiency gains and in turn result in availability of quality supply of electricity to consumers at competitive rates.
The Section 3 (1) of the Electricity Act 2003 requires the Central Government to formulate, inter alia, the National Electricity Policy in consultation with Central Electricity Authority (CEA) and State Governments. The provision is quoted below:

"The Central Government shall, from time to time, prepare the National Electricity Policy and tariff policy, in consultation with the State Governments and the Authority for development of the power system based on optimal utilization of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy".

Further, as per section 5.2.12 of the National Electricity Plan:

Even with full development of the feasible hydro potential in the country, coal would necessarily continue to remain the primary fuel for meeting future electricity demand. The National Electricity Plan also emphasizes the use of other fossil fuel like gas, LNG, Lignite, other imported fossil fuels in meeting the future electricity need.

It further emphasize on the Renovation and Modernization (R&M) of the low performing thermal power stations in the country. This will enable to achieve improved PLF of the thermal power plant.

The implementation of the National Electricity Plan is clearly evident from the installed capacity in the project boundary i.e. the Southern Grid:

Outcome of Step 1a: Alternatives (a) and (b) above have been identified as realistic and credible alternative scenario(s) to the project activity

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

Investing in wind power is not a mandatory requirement in the region. Also, there are no legal and regulatory requirements that prevent alternatives (a) and (b) from occurring. As discussed in the Sub-step 1a), the laws respective to the power sector in India are mainly:

i) National Electricity Act, 2003
ii) National Electricity Policy, 2005
iii) Integrated Energy Policy, 2006

All the above mentioned policies do not restrict or compel any entity/organization for the selection of fuel for power generation. In addition, it is not mandatory for any project developers to invest in renewable energy projects in India.

Outcome of Step 1b: Identified realistic and credible alternative scenario(s) to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations.

Step 2: Investment Analysis

Sub step 2(a): Determine Appropriate Analysis Method

In accordance with the additionality tool version 06.0.0, sub-step 2(a), *"If the CDM project activity and the alternatives identified in Step 1 generate no financial or economic benefits other than CDM related income, then apply the simple cost analysis (Option I). Otherwise, use the investment comparison analysis (Option II) or the benchmark analysis (Option III)."*

Since the project activity earns revenues from sale of generated electricity, option I cannot be considered.

Further in accordance with paragraph 19 of the Guidance to Investment Analysis version 05, *"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"*

The baseline to the project activity is the electricity generated by grid connected power plants, represented by the combined margin emissions of the Southern grid. Therefore, the benchmark approach is appropriate.

In this case the benchmark analysis (option III) is most appropriate.

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

The Project Proponent proposes to use **Option III – Benchmark Analysis** and the financial indicator is identified as *post-tax* equity IRR (Since the project activity involves 100% equity participation).

The guidance to investment analysis issued in EB 62, Annex 5 (paragraph 12) states that in cases where a benchmark approach is used, the applied benchmark shall be appropriate to the type of IRR calculated. Weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity (Cost of Equity) are appropriate benchmarks for equity IRR.

The tool for demonstration and assessment of additionality [para-5, sub step 2(b)] states that in cases where the project has more than one potential developer, the benchmark shall be based on parameters that are standard in the market, considering the specific characteristics of the project type. Accordingly, the cost of Equity applicable to the project type has been considered as the benchmark to be compared against equity IRR.

As per para 15 of EB 62 Annex 13, "*if the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors*". The project proponent has chosen option a (values as provided in Appendix A of the guidance on assessment of investment analysis version 5). As per para 7 of the appendix A, "*in situations where an investment analysis is carried out in nominal terms, project participants can convert the real term values provided in the table below to nominal values by adding the inflation rate. The inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period*".

As the analysis has been carried out in nominal terms, the default value of expected return on equity (given in real terms in EB 62 Annex 13) has been adjusted with the inflation. The inflation value has been taken as per the forecast by the Reserve Bank of India (RBI).

The benchmark has been calculated as:

Nominal Benchmark = {(1+ Real Benchmark[6])*(1+Expected Inflation Rate[7]) – 1}
= {(1+11.75%)*(1+5.4%) – 1}
= 17.78%

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

Key assumptions used for calculating post-tax Equity IRR are set out below:

Capacity of Machines in kW	800		Enercon Offer dated 22/03/2011
Total Number of Machines	26		
Number of Machines per site	Anantapur	Kurnool	
	24	2	Enercon Offer dated 22/03/2011
Project Capacity in MW	19.20	1.60	
Project Cost per MW (Rs. In Millions)	59.34		
Operations	**Anantapur**	**Kurnool**	
Plant Load Factor	22.00%	21.80%	Third party PLF report
Insurance Charges @ % of capital cost	0.12%		Insurance Quotation
Operation & Maintenance Cost base year @ % of capital cost	1.30%		Enercon Offer dated 22/03/2011
% of escalation per annum on O & M Charges	6.00%		
Service Tax rate	10.00%	*Indian Union budget 2010-11*	http://indiabudget.nic.in/ub2010-11/bh/bh1.pdf
Surcharge	Not applicable on LLP	*Indian Union budget 2010-11*	http://indiabudget.nic.in/ub2010-11/fb/bill11.pdf
Edu. Cess	3.00%	*Indian Union budget 2010-11*	http://indiabudget.nic.in/ub2010-11/fb/bill11.pdf
Service Tax on O&M	10.30%		

[6] Default value for expected return on equity of 11.75% published by UNFCCC under investment guidance version 5.0 has been used by PP.

[7] Expected Inflation rate for over 10 years period has been published by RBI (http://rbi.org.in/scripts/PublicationsView.aspx?id=13050). As per investment guidance, inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period. The crediting period for the project activity is 10 years and the mean WPI and CPI inflation rate are 5.40% and 6.4%. Conservatively, PP has selected 5.40% inflation rate based on data published by RBI.

expenses			
Tariff			
Tariff 2010-11 (Rs./kWh)	3.50		APERC Tariff Order, dated 29-03-2010, pg 3
Project Cost	**INR Million**		
Land and Infrastructure, Generator & Electrical Equipments, Mechanical Equipments, Civil Works, Instrumentation & Control, Other Project Cost, Pre operative Expenses, etc.	1,234.22		
Total Project Cost	**1,234.22**		Enercon Offer dated 22/03/2011
Means of Finance		**INR Million**	
Own Source	100%	1,234.22	The project is 100% equity project (CA certificate has been submitted to DOE)
Term Loan	0%	-	
Total Source		1,234.22	
Income Tax Depreciation Rate (Written Down Value basis)			
Depreciation as per IT Act	80%	*80% u/s section-32 of income-tax-act, rule 5(1), Appendix I of Indian IT Rules 1962.*	http://law.incometaxindia.gov.in/DIT/File_opener.aspx?page=ITRU&schT=rul&csId=4a23cee1-1818-45d6-ab19-f155e08ed789&rNo=&sch=depreciation&title=Taxmann - Direct Tax Laws
Additional depreciation	20%	*u/s section 32(i)(iia) of income tax act*	http://law.incometaxindia.gov.in/DIT/File_opener.aspx?page=ITAC&schT=&csId=e7d4edaa-f2fb-42b4-9cb1-2111050ffad7&rdb=sec&yr=d8867f97-7ef9-423c-99df-7ef492ca882f&sec=&sch=depreciation&title=Taxmann - Direct Tax Laws
Total depreciation on Wind	**100%**		

Energy Generators			
Book Depreciation Rate (Straight Line Method basis)			
On all assets	5.28%	As per Schedule XIV of companies act 1956	http://www.mca.gov.in/Ministry/latestnews/Explanatory_Statement_alongwith_Schedule_XIV_4dec2008.pdf
Book Depreciation up to (% of asset value)	90%		
Income Tax			
Income Tax	30.00%	*Indian Union budget 2010-11*	http://indiabudget.nic.in/ub2010-11/fb/bill11.pdf
Surcharge	Not applicable	*Indian Union budget 2010-11*	http://indiabudget.nic.in/ub2010-11/fb/bill11.pdf
Cess	3.00%	*Indian Union budget 2010-11*	http://indiabudget.nic.in/ub2010-11/fb/bill11.pdf
Income Tax rate with surcharge & cess	30.90%		
AMT rate for LLP	18.50%	*As per section 115JC Chapter XII-BA of income tax act; and Indian Union budget 2010-11*	http://law.incometaxindia.gov.in/DIT/File_opener.aspx?page=ITAC&schT=&csId=35b150af-915d-4aa1-bd2d-012d247aeb94&rdb=sec&yr=e5be6bdb-1fc4-42d6-ac7b-34a44fd65485&sec=115&sch=&title=Taxmann - Direct Tax Laws
AMT with cess	19.050%		
Working capital			
Receivables (no of days)	30		Billing Cycle
O & m expenses (no of days)	90		Enercon's Offer dated 22/03/2011

Debt Equity Ratio: The project activity is on 100% equity investment.

Plant Load Factor: As per EB 48, annex 11, Plant load factor provided by independent third party source can be used for investment analysis. Plant load factor for the project activity is taken from True Wind International Certification. The plant load factors for the project site as determined by third party verifier are 22.0% for Anantapur and 21.8% for Kurnool.

Salvage Value: The project is depreciated up to 90% of the project cost (except for land that is non depreciable item); therefore we have considered land cost and 10% of the remaining value as salvage in the cash flow for computing equity IRR.

The post tax equity IRR for the Project without CDM revenues is 7.60%.

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

The investment in wind power project shall be tested based on the following parameters:

- Capital Cost
- Tariff
- Plant Load Factor
- O&M cost

Capital Cost

In accordance with the investment guidance, the additionality for the project activity is demonstrated at the time of decision making. The project proponent has considered it appropriate to conduct the sensitivity at the variation of +/- 10% of the project cost.

Capital Cost	10% decrease over base case	Base case - INR 1234.22 Million	10% increase over base case
Post tax Equity IRR	9.45%	7.60%	6.06%

Further as per the purchase order placed by VWILLP the total project cost is INR 1144.00 million which is 7.31% below than the project cost used at the time of decision making, which comes under the 10% sensitivity analysis done and the IRR at actual project cost is 8.91% which is below than the benchmark.

The equity IRR does not surpass the benchmark (17.78 %) even after 37.85% reduction in base capital cost.

Tariff: Andhra Pradesh state electricity commission in the tariff order dated 29th March, 2010 has fixed the tariff for the period of 10 years and decided to fix the Single Part tariff for the first ten years at INR 3.50 per unit. As per the electricity act 2003 Section 61, the tariff should progressively reflect the cost of supply of electricity and return on investment only with an overall objective of reducing subsidies. The National tariff policy also determines tariff based on return on investment.

As per tariff order the levelized tariff for period of 20 years is INR 3.43 per unit. However commission has approved the tariff of INR. 3.50 for the first ten years which is higher than the levelized tariff of INR 3.43 per unit. Therefore it is estimated that the tariff of INR. 3.50 will be approved after 10th year assuming that the commission has provided a higher tariff for the first 10 years of operation.

Though being conservative PP has selected the tariff of INR 3.50 per unit after term of PPA and equity IRR is 8.29% which is less than the benchmark. However unrealistic but still PP has done sensitivity of +10% on tariff after 10th year and equity IRR is 8.80% which is lower than the benchmark.

Tariff	10% decrease over base tariff after 10 years	Base tariff after 10 years-INR. 3.50/KWh	10% Increase over base tariff after 10 years
Post tax Equity IRR	6.22%	7.60%	8.88%

From the above sensitivity analysis it is clear that an increase of 10% in tariff, the IRR for project activity is 8.88% which is below than the benchmark.

The equity IRR crosses the benchmark at the tariff of 6.73 INR/kWh which is unrealistic scenario for the project activity.

As can be seen, the equity IRR of the project activity remains well below the benchmark even under the sensitivity analysis. Therefore it can be concluded that the proposed CDM project activity is unlikely to be the most financially/economically attractive.

Plant Load Factor: The PLF estimated by third party is 22.0% at Anantapur and 21.8% at Kurnool after adjustment of transmission loss. We have conducted sensitivity at a variation of 10% over the base case.

PLF	10% decrease over base PLF	Base PLF	10% increase over base PLF
Post tax Equity IRR	6.22%	7.60%	8.88%

The sensitivity analysis clearly shows even with 10% higher PLF, the project is not able to generate sufficient returns.
Being more conservative PP did the analysis on PLF up to the value at which IRR crosses the benchmark. IRR crosses the benchmark at the PLF of 42.28 % for Anantpur site & PLF of 41.90% [8]for Kurnool site, which is 92.20% higher than the base PLF of both the sites, provided by third party which is unlikely scenario for the project site. The PLF value of 42.28% & 41.90% is not possible scenario considering all the factors of plant operation and considered unrealistic for sensitivity. It can therefore be concluded that the project is financially not viable without CDM benefits.

O&M Cost: The Sensitivity in O&M cost is conducted after taking to consideration +/-10% decrease in O&M Cost and at 5% escalation per annum on O & M Charges

[8] To cross the benchmark the PLF of 42.28% for Anantpur site & PLF of 41.90% for Kurnool site should be continuous during the entire life of project activity, which is unlikely scenario for the project activity.

O&M Cost	10% decrease in O&M Cost & 5% escalation per annum on O & M Charges	Base O&M Cost	10% increase in O&M cost & 5% escalation per annum on O & M Charges
Post tax Equity IRR	7.83%	7.60%	7.57%

The sensitivity analysis on O&M clearly shows even with 10% decrease in O&M cost and at 5% escalation per annum on O&M charges, the post tax equity IRR is 7.82%, which below the benchmark.

Being more conservative PP has done the analysis at 0% O&M cost and the IRR for the project activity is 8.79% which still below the benchmark value and project is still additional.

Outcome of Step 2: From the above analysis it is noted that the post tax equity IRR remains below than the benchmark even at different scenario of sensitivity. Therefore it can be concluded that the proposed CDM project activity is unlikely to be the financially/economically attractive and project is not viable without the CER revenue and project activity is additional.

Step 3: Barrier analysis:

Project Participant didn't opt for the barrier analysis for demonstration of additionality.

Step 4: Common practice analysis:

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

The description of common practice test (Step 4 of Additionality tool version 06.0.0) requires 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.

The project activity is a 20.8 MW wind power project set up by VWILLP in Andhra Pradesh to generate and supply electricity to the Andhra Pradesh state grid. The project is a large scale CDM activity. The applicable tariff for the project has been determined by the Andhra Pradesh Electricity Regulatory Commission.

For the project activity the default region is India though for common practice analysis only the state of Andhra Pradesh is being considered as a reason of common practice analysis since in India the regulatory framework is different for different states and tariff policy and other regulations are state specific and are governed by state electricity regulatory commission.

It may be noted that common practice analysis is required to be carried out only in case of large scale CDM projects i.e. projects of more than 15 MW capacity. Further, the common practice guidance also states that projects of similar scale only need to be considered. Accordingly, for carrying out the common practice analysis the PP have considered following criteria to define similar scale projects viz:-

1) Wind power projects that fall under the large scale definition of CDM i.e. that are of 15 MW of higher capacity.

2) The project activity has been set up by a private investor, in such cases; the additionality tool clearly states that the benchmark (Sub step 2 Paragraph 6a) for investment analysis should be increased to account for higher risks in private investments. Thus it is clear that government sector investments cannot be compared with private investments.

3) Further the small scale wind power projects by different investors combined to form a large scale bundled wind power project are not considered for common practice analysis since the investment risk profile of single private investor setting up a large scale project is different from the large scale bundled wind power projects.

4) Comparable regulatory framework & investment climate comparable to the project activity.

Accordingly, all wind power projects of greater than 15 MW capacity set by single private project proponent in the state of Andhra Pradesh, have been analyzed till the date of investment decision. Data for the common practice analysis have been sourced from the Indian Wind Power Directory 10th edition published in August 2010, which was available at the time of investment decision and captures the details of the project installed upto 31 March 2010.

Based on the data sourced from Wind Power Directory 2010, there are only two investors who have wind installations greater than 15 MW in the state of Andhra Pradesh which are under operation till 31 March 2010. Out of the two projects, the 20 MW project by RCI Power Limited was installed in the years 1999 and 2000. The Central tariff regime issued by MNES was applicable to this project activity. The Wind power projects governed by MNES policy were provided with the tariff of INR. 2.25 per unit for the base year 1994-95 with a 5% annual escalation.

MNES regime was superseded by the state policy by the orders of the regulatory commission (APERC). APERC issued first tariff order dated 01 May 2009 for "New Wind Based Power Projects" which replaced the MNES policy. APERC tariff order provides the fixed tariff of INR 3.50 per unit for 10 years for the wind power projects under the long term PPA. The proposed project activity is commissioned under the tariff order issued by the APERC commission which provides the tariff of INR. 3.50 per unit under long term PPA.
As can be seen above, MNES regime is different regulatory and investment environment and hence cannot be compared to the proposed project activity which falls under the tariff order of electricity regulatory commission (APERC). Therefore the installation of 20 MW by RCI Power Limited is not similar and hence not comparable to our project activity.

The other wind project of Vaayu (India) Power Coporation Private Limited (50.4 MW) in Andhra Pradesh with a capacity more than 15 MW has been installed under APERC policy framework. This project has applied for carbon credits and is already registered under CDM. The table below provides the details of the project:

Sl. No.	Investor	Capacity (MW)	CDM link
1	Vaayu (India) Power	50.4	http://cdm.unfccc.int/Projects/DB/DNV-

	Corporation Private Limited		CUK1302613748.83/view

It can be seen that, without exception, all investors in the state of Andhra Pradesh with installations greater than 15 MW under the similar regulatory regime have developed these projects as CDM projects. Therefore investing in similar wind power projects is not a common practice in the state of Andhra Pradesh.

Thus, Sub-step 4a is satisfied.

Sub-step 4b Discuss any similar options that are occurring:

Out of the above analysis only RCI power project is not in CDM pipeline. As discussed in Sub step 4(a) RCI power project was commissioned under the MNRES policy framework. MNES regime is different regulatory and investment environment and hence cannot be compared to the proposed project activity which falls under the tariff order of electricity regulatory commission (APERC). Therefore the installation of 20 MW by RCI Power Limited is not similar and hence not comparable to our project activity.

Therefore RCI power project of 20 MW can be eliminated using the explanation provided above in sub-step 4(a).

From sub-step 4a it is clear that all similar projects have been undertaken only as CDM projects. Hence it can be concluded that similar activities are not widely observed or commonly carried out. Thus Sub-step 4b is not applicable.

Therefore, the project activity is considered to be additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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According to the approved methodology ACM0002 (Version 12.2.0) Emission Reductions are calculated as:-

ERy = BEy – PEy …….. (1)

Where:

ERy = Emission reductions in year *y* (t CO2e/yr)
BE**y** = Baseline Emissions in year *y* (t CO2e/yr)
PE**y** = Project Emissions in year *y* (t CO2e/yr)

Estimation of Baseline Emissions:

Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity

generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$BE_y = EG_{PJ,\ y} * EF_{grid,\ CM,\ y}$ …….. (2)

Where:
BEy = Baseline emissions in year *y* (tCO2/yr)

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

$EF_{grid,CM,y}$ = Combined margin CO2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO2/MWh)

Since the project activity is the installation of a new grid connected renewable power plant the $EG_{PJ,y}$ is calculated as :

$EG_{PJ,y} = EG_{facility,y}$ …….. (3)

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

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

The proposed project activity is in the state of Andhra Pradesh which falls under Southern grid, baseline emission factor is calculated as combined margin, consisting of a combination of operating margin and build margin factors according to the procedures prescribed in the latest tool "Tool to calculate the emission factor for an electricity system – Version 02.2.1 (EB-63, Annex19)" for calculating the emission factor for an electricity system. The steps of calculation are as follows:

STEP 1: Identifying the relevant electricity systems:

The Indian electricity system is divided into two regional grids, viz. (1) Northern, Eastern, Western, North-Eastern and (2) Southern grid. Each grid covers several states. As the regional grids are interconnected, there is inter-state and inter-regional exchange. A small power exchange also takes place with neighboring countries like Bhutan and Nepal.

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 its demand with its 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. The regional grid thus represents the largest electricity grid where power plants can be dispatched without significant constraints and thus, represents the "project electricity system" for

the project activity. As the project activity is connected to the Southern regional electricity grid, the Southern grid is the "project electricity system".

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

Option I is chosen for the project activity i.e. only grid power plants are included in the calculation.

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

According to the tool, the calculation of the operating margin emission factor 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.

Any of the four methods can be used for calculating OM, The simple adjusted OM and dispatch data analysis OM cannot be currently applied in India due to lack of necessary data however, the simple OM method (option a) can only be used if low cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

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

	2005-06	**2006-07**	**2007-08**	**2008-09**	**2009-10**
NEWNE	18.0%	18.5%	19.0%	17.3%	15.9%
South	27.0%	28.3%	27.1%	22.8%	20.6%
India	20.1%	20.9%	21.0%	18.6%	17.1%

Source: CO2 Baseline Database for the Indian Power Sector – Central Electricity Authority

The above data clearly shows that the percentage of total grid generation by low cost/must run plants (on the basis of average of five most recent years) for the Southern regional grid is less than 50 % of the total generation. Hence the Simple OM method can be used to calculate the Operating Margin Emission factor. The average operating margin method cannot be applied, as low cost/ must run resources in Southern grid constitute less than 50% of total grid generation.

The project proponents choose an ex ante option for calculation of the OM with 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.

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

The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

- Based on the net electricity generation, and a CO_2 emission factor of each power unit. (Option A), or
- Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option B)

The Central Electricity Authority, Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database i.e. The CO2 Baseline Database provides information about the Combined Margin Emission Factors of all the regional electricity grids in India. The Combined Margin in the CEA database is calculated ex ante using the guidelines provided by the UNFCCC in the "Tool to calculate the emission factor for an electricity system". We have, therefore, used the Combined Margin data published in the CEA database, for calculating the Baseline Emission Factor.

The CEA database uses the option A i.e. data on net electricity generation and CO_2 emission factor for each power unit, the average efficiency of each power unit and the fuel type(s) used in each power unit, to calculate the OM of the different regional grids.

The simple OM emission factor is calculated based on the net electricity generation of each power unit and an emission factor for each power unit, as follows:

$$\mathbf{EF_{grid,OMsimple,y} = \Sigma\ (EG_{m,y} \times EF_{EL,m,y}) / \Sigma EG_{m,y}} \quad \text{..... (a)}$$

Where:
$EF_{grid,OMsimple,y}$ = Simple operating 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 = 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

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

$$\mathbf{EF_{EL,m,y} = (\Sigma\ FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,I,y}) / EG_{m,y}} \quad \text{..... (b)}$$

Where:
$EF_{EL,m,y}$ = 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)
EGm,y = Net quantity of 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 unit m in year y

y = The relevant year as per the data vintage chosen in step 3

STEP 5: Calculate the build margin:

According to the "Tool to calculate the emission factor for an electricity system", (Version 02.2.0), EB 61, Annex 12. 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 participants should use the set of power units that comprises the larger annual generation. Accordingly, the CEA database calculates the build margin as the average emissions intensity of the 20% most recent capacity additions in the grid based on net generation. The build margin emission factor has been calculated 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. This option does not require monitoring the emission factor during the crediting period.

In terms of vintage of data, between one of the following two options shall be chosen:

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 build margin emissions factor is the generation-weighted average emission factor (tCO2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$\mathbf{EF_{grid,BM,y}} = \frac{\sum_{m} EG_{m,y} x EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \quad \textbf{.....(c)}$$

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m = Power units included in the build margin
y = Most recent historical year for which power generation data is available

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) is determined as per the procedures given in step 4 (a) for the simple OM, using option A1 for *y* most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

STEP 6: Calculate the combined margin emissions factor:

The emission factor *EFy* of the grid is represented as a combination of the Operating Margin (OM) and the Build Margin (BM). Considering the emission factors for these two margins as $EF_{OM,y}$ and $EF_{BM,y,}$ then the *EFy* is given by:

$EFy = wOM * EF_{grid,OM,y} + wBM * EF_{grid,BM,y}$ …… (d)

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO2 emission factor in year y (tCO2/MWh)
w_{OM} = Weighting of operating margin emissions factor (%)
w_{BM} = Weighting of build margin emissions factor (%)
(where *w*OM + *w*BM = 1).

According to ACM0002, Version 12.2.0, the weights for OM and BM are 0.75 and 0.25 respectively.

Using the values for operating and build margin emission factor provided in the CEA database and their respective weights for calculation of combined margin emission factor, the baseline carbon emission factor (CM) is 917.20 tCO_2e/GWh.

Details of Baseline data:

Data of operating for the three financial years from 2007-08, 2008-09 and 2009-10 and Build Margin for 2009-10 has been obtained from -

The CO_2 Baseline Database for the Indian Power Sector Ministry of Power: Central Electricity Authority (CEA) Version 06
Key baseline information is reproduced in Annex 3. The detailed excel sheet is available at:

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

Estimation of Project Emissions

The project activity involves harnessing of wind energy and its conversion to electricity. Hence according to ACM0002 Version 12.2.0, there will be no project emissions in the project activity

PEy = 0 …… (4)

Estimation of Leakage Emissions

As per ACM0002 Version 12.2.0, no leakage has been considered for the calculation of emission factor

LEy = 0 …….. (5)

The details on OM, BM and CM estimates as provided by the CEA are shown in Annex 3.

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

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO_2e/MWh
Description:	Operating Margin Emission Factor of Southern Regional Electricity Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector", version 6 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.9684
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated by using 3 years vintage (2007-2008, 2008-2009 and 2009-10) data obtained from "CO_2 Baseline Database for Indian Power Sector" version 6.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on the tool "Tool to calculate the emission factors for an electricity system" and in accordance with ACM0002, Version 12.2.0.
Any comment:	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO_2e/MWh
Description:	Build Margin Emission Factor of Southern Regional Electricity Grid
Source of data used:	"CO_2 Baseline Database for Indian Power Sector" version 6 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	0.7634
Justification of the choice of data or description of measurement methods and procedures actually applied :	2009-10 data obtained from "CO_2 Baseline Database for Indian Power Sector" version 6.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on the tool "Tool to calculate the emission factors for an electricity system", In accordance with ACM0002, Version 12.2.0.
Any comment:	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2e/MWh
Description:	Combined Margin Emission Factor of Southern Regional Electricity Grid
Source of data used:	The "CO_2 Baseline Database for Indian Power Sector" version 6 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO_2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in
Value applied:	In case of wind power projects default weights of 0.75 for $EF_{grid,OM}$ and 0.25 for $EF_{grid,BM}$ are applicable as per ACM0002, Version 12.2.0. **Combined Margin Emission Factor (EFy or $EF_{CM,y}$) = 0.9172** Refer Annex 3 for comprehensive calculation of Combined Margin Emission Factor.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002, Version 12.2.0, and Tool to Calculate the emission Factor for an Electricity System.
Any comment:	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

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

>>

Emission reductions are calculated as follows:
ERy = BEy – PEy – Ley

Where:

ERy = Emission reductions in year y (t CO2e/yr)
BEy = Baseline emissions in year y (t CO2/yr)
PEy = Project emissions in year y (t CO2e/yr)
LEy = Leakage emissions in year y (t CO2e/yr)

Emission reductions from the project activity are equal to the baseline emissions as project emissions and leakage are nil.

Baseline emission factor (Combined Margin) (EFy)
= 0.9172 tCO2e/MWh

Annual electricity supplied to the grid by the Project ($EG_{PJ,y}$) is calculated as:

= 19.2 MW (Capacity) x 22% (PLF) x 8,760 (hours) +1.6 MW (Capacity) x 21.8% (PLF) x 8,760 (hours) MWh

= 40,057.73 MWh

Annual Baseline Emissions Reduction: $ERy = EFy * EG_{PJ,y}$
= 0.9172 tCO2e/MWh x 40,057.73 MWh
= 36,738 tCO2e

Whereas,

PEy = 0 tCO2e
LEy = 0 tCO2e

Therefore,
ERy = BEy – PEy - LEy
= 36,738 – 0 – 0
= 36,738 tCO2e/yr

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

>>

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
Year 1*	0	36,738	0	36,738
Year 2	0	36,738	0	36,738
Year 3	0	36,738	0	36,738
Year 4	0	36,738	0	36,738
Year 5	0	36,738	0	36,738
Year 6	0	36,738	0	36,738
Year 7	0	36,738	0	36,738
Year 8	0	36,738	0	36,738
Year 9	0	36,738	0	36,738
Year 10	0	36,738	0	36,738
Total (tonnes of CO2e)	**0**	**367,380**	**0**	**367,380**

*1st year begins from the application date for registration, and each year extends for 12 months.

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**$EG_{PJ,y}$**
Data unit:	MWh (Mega-watt hour)
Description:	Net electricity supplied to the grid by the Project activity.
Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Annual electricity supplied to the grid by the Project activity ={ 19.2 MW (capacity) x 22.0% (PLF) x 8760 hrs (operating hour)} + {1.6 MW (capacity) x 21.8% (PLF) x 8760 hrs (operating hour)} = 37002 + 3056 = 40,057.73 MWh
Description of measurement methods and procedures to be applied:	• Metering system of project activity consists of cluster metering points at 33kV at project site (both at Kurnool & Anantpur). Each cluster metering point will have one main and one check meter (33kV metering point). All the WEGs of project activity will exclusively connected to individual cluster metering points i.e. there will be no WEGs of other project owners that are connected to these cluster. In a particular wind-farm of Enercon, each cluster has WEGs of only one project owner. • In addition to cluster metering point there is one set of main & check meter (bulk/billing metering point) at Enercon Pooling sub-station, where all the WEGs of project activity and non-project activity are connected and billing is done at Enercon sub-station. • From the Enercon Pooling sub-station electricity is supplied to LILO to EB –station. • Summation of electricity supplied to grid by project activity at both the sites (Kurnool & Anantpur) will provide the net electricity supplied to the grid by the Project activity. • All main and check meters installed at cluster metering point & at Enercon pooling sub-station are two-way electronic tri-vector meters capable of recording import and export of electricity and under the control of state electricity utility. • All main and check meters are of 0.2s of accuracy class. • The procedures for metering and meter reading will be as per the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. • Monthly Joint Meter Reading will be recorded at all the cluster metering points (at project site) and bulk/ billing metering point (installed at Enercon pooling sub-stations) is done by the Discom utility in the presence of PP's representative (Enercon). • Joint meter reading recorded at cluster metering point indicates the values of export & import by the WEGs of project activity connected to 33 kV metering point. There will be individual Joint meter reading for individual cluster metering point. • Joint meter reading recorded at the metering point at Enercon pooling sub-

	station indicates the values of export & import by the all the WEGs of project activity and WEGs of non-project activity connected to the metering point. • Net electricity supplied to the grid value is used in calculation of emission reduction of the project activity. Refer Annex 4 for an illustration of the provisions for measurement methods. Detailed procedure calculating net electricity supplied to the grid is given in section B.7.2.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter and check meters at cluster metering points for project activity & Enercon Pooling sub-station are calibrated by state utility once in five years and records are available with PP. Refer Annex– 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

Data / Parameter:	$\mathbf{EG_{JMR,Export,y}}$
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity Export recorded at 33kV (JMR at 33kV metering points) cluster metering points connecting WEGs of the project activity.
Source of data to be used:	Electricity export to grid sourced from joint meter reading recorded at cluster metering point.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	40,057.73
Description of measurement methods and procedures to be applied:	Electricity to export to the grid will be recorded by cluster meters (main and check) connecting all turbines at 33kV level. Please refer Annex 4 for details of metering procedure & metering equipment.
QA/QC procedures to be applied:	Value of $\mathbf{EG_{JMR, Export,y}}$ can be crosschecked from transmission loss calculation sheet provided by the state utility. QA/QC procedures will be as implemented by Discom/ State Utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter and check meters at cluster metering points for project activity & Enercon Pooling sub-station are calibrated by state utility once in five years and records are available with PP. Please refer Annex 4 for details for QA/QC procedure.
Any comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

Data / Parameter:	$EG_{JMR, Import,y}$
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity Import recorded at 33kV (JMR at 33kV metering point) cluster metering points connecting all WEGs of the project activity.
Source of data to be used:	Electricity import from the grid as per the joint meter reading recorded at cluster metering point.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0 (Assumed)
Description of measurement methods and procedures to be applied:	Electricity import from the grid will be recorded by cluster meters (main and check) connecting all turbines at 33kV level. Please refer Annex 4 for details of metering procedure & metering equipment.
QA/QC procedures to be applied:	Value of $EG_{JMR, Import,y}$ can be crosschecked from certified "statement showing energy admitted and amount paid details of M/S. Enercon India Ltd clients" given by state utility/APPCC (Andhra Pradesh Power Co-Ordination Committee) It may be noted that energy import by the project activity will be export by the grid to the project activity and therefore electricity import by the project activity is denoted as export by the grid in the certified statement by the state utility. QA/QC procedures will be as implemented by Discom/ State Utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter and check meters at cluster metering points for project activity & Enercon Pooling sub-station are calibrated by state utility once in five years and records are available with PP. Please refer Annex 4 for details for QA/QC procedure.
Any comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

Data / Parameter:	$EG_{Export,y}$
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity exported by project activity to grid after apportioning of line losses between 33kV metering point (Cluster meter) & Bulk metering point (132kV metering point at Kurnool /220 kV metering point at Anantapur) at Enercon sub-stations
Source of data to be used:	Certified "transmission loss calculation sheet" given by state utility/APCPDCL (Andhra Pradesh Central Power Distribution Company Limited).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	40057.73
Description of measurement methods and procedures to be	Value of $EG_{Export,y}$ will be calculated by Electricity Board independently. Either Enercon or PP doesn't have any role or control on calculation of net

applied:	electricity generation/export. Detailed procedure calculating $EG_{Export,y}$ is given in section B.7.2. Please refer Annex 4 for details of metering procedure & metering equipment.
QA/QC procedures to be applied:	Value of $EG_{Export,y}$ can be crosschecked from the tariff invoices raised by PP on the DISCOM. QA/QC procedures will be as implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter and check meters at cluster metering points for project activity & Enercon Pooling sub-station are calibrated by state utility once in five years and records are available with PP. Please refer Annex 4 for details for QA/QC procedure.
Any comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

Data / Parameter:	**$EG_{Import,y}$**
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity import by project activity from grid after apportioning of line losses between 33kV metering point (Cluster meter) & Bulk metering point (132kV metering point at Kurnool /220 kV metering point at Anantapur) at Enercon sub-stations
Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0 (Assumed)
Description of measurement methods and procedures to be applied:	Detailed procedure calculating $EG_{Import,y}$ is given in section B.7.2. Please refer Annex 4 for details of metering procedure & metering equipment.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter and check meters at cluster metering points for project activity & Enercon Pooling sub-station are calibrated by state utility once in five years and records are available with PP. Please refer Annex 4 for details for QA/QC procedure.
Any comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

Data / Parameter:	**T_E**
Data unit:	% (Percentage)
Description:	Percentage Line loss between the 33 kV metering points (cluster meters including

	project activity and non project activity) and the Bulk metering point (132kV metering point at Kurnool /220 kV metering point at Anantapur) at Enercon sub-stations
Source of data to be used:	Certified "transmission loss calculation sheet" given by state utility/APCPDCL (Andhra Pradesh Central Power Distribution Company Limited).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be directly applied. 0 (Assumed)
Description of measurement methods and procedures to be applied:	Percentage Line loss between metering point at 33kV and the metering point at 132kV at Kurnool substation and at 220 kV at Anantapur substationis applied directly to the meter reading taken at cluster meters at 33 KV for the project activity. Enercon pooling Substation is connected to the machines of the project activity and the machines commissioned by the other project owners. Therefore Line loss is applied to the project activity by the state utility as reflected in the Monthly billing records taken at 33kV level. The line loss calculation is done by state utility and is directly used for adjusting the net export recorded at 33kV metering clusters. Refer Annex 4 and Section B.7.2 for an illustration of the provisions for measurement methods.
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by Discom/ State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter and check meters at cluster metering points for project activity & Enercon Pooling sub-station are calibrated by state utility once in five years and records are available with PP. Refer Annex 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived both in electronic and hard paper format for crediting period + 2 years.

B.7.2. Description of the monitoring plan:

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Enercon (India) Limited is the O&M contractor for the project activity. Enercon (India) Limited will be responsible for maintaining all the monitoring data on behalf of VWILLP in respect of the project activity. Enercon (India) Limited has implemented the management structure for managing the monitored data.

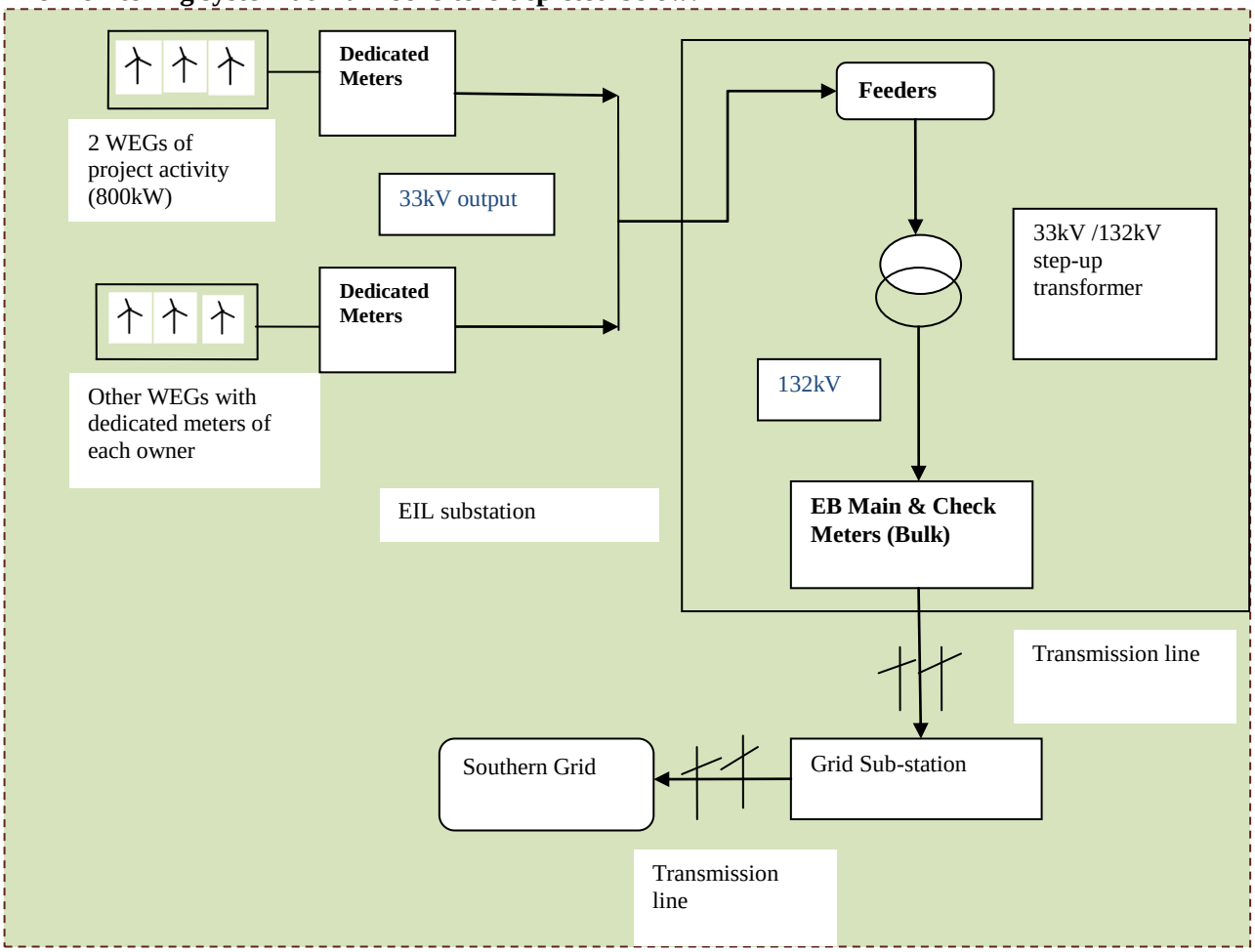
This approved monitoring methodology requires monitoring of the electricity generation from the project activity.

Since the baseline methodology is based on ex ante determination of the baseline, the monitoring of operating margin emission factor and build margin emission factor is not required. Further, wind based electricity generation is not associated with any kind of leakages.

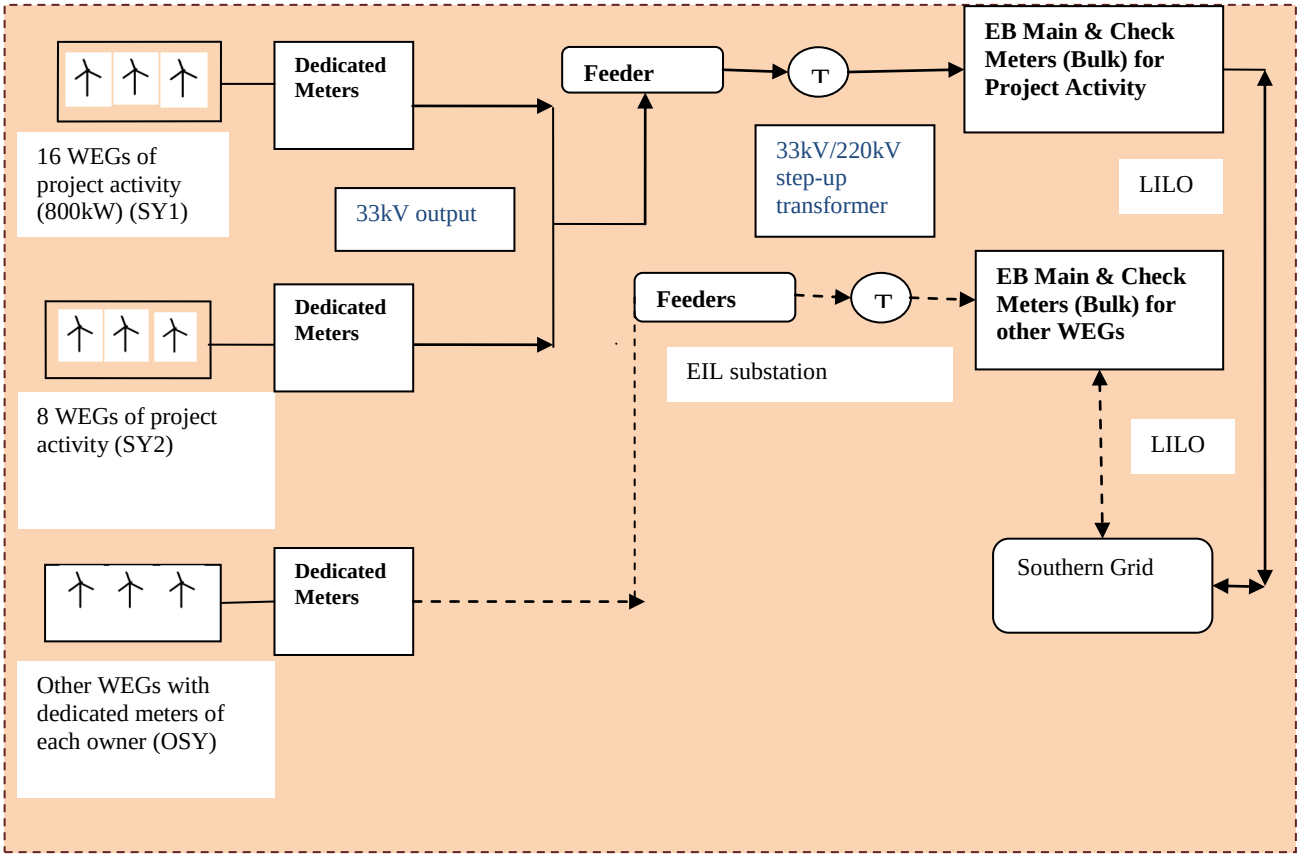
The Project is operated by Enercon and managed by the PP. The operational and maintenance contract for the project is with Enercon. Enercon is an ISO 9001:2008 certified Quality Management system from Germanischer Lloyd. Enercon follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, finance, construction, commissioning and operation of the wind power project.

Project activity is installed at two sites (Kurnool & Anantpur). The monitoring system of both the site is given below:-

The monitoring system at Kurnool site is depicted below:



The monitoring system at Anantapur site is depicted below:



SY1 – Switch yard 1
SY2 – Switch yard 2
OSY – Switch yard for other WEGs outside CDM project activity

Calculation of Net Electricity Supplied to the grid by project activity (Kurnool):

From the above line diagram of Kurnool site it is clear that metering system for the project activity consists of cluster metering points at 33kV at project site. Each cluster metering point will have one main and one check meter (33kV metering point). All the WEGs of project activity will exclusively connected to individual cluster metering points i.e. there will be no WEGs of other project owners that are connected to these cluster. In a particular wind-farm of Enercon, each cluster has WEGs of only one project owner.

In addition to cluster metering point there is one set of main & check meter (bulk/billing metering point) at 132kV Ankireddy palli sub station (Enercon Pooling sub-station), where all the WEGs of project activity and non-project activity are connected.

From the 132 kV Enercon Pooling sub-station at Ankireddy palli, electricity is supplied to LILO (Line In Line Out) with 132kV Gooty –Tadipatri Line connected to state electricity grid

The 2 WEGs of project activity at Kurnool site is connected to total 01 cluster metering points at the project site

From the above line diagram it is clear that the machines of the project activity and other project developers at the wind farm have individual metering points at 33kV at the project site. Since the main

and check meters (bulk meter) at 132 kV metering point at the ENERCON pooling substation is connected to the machines of the project activity and the machines commissioned by the other project developers, therefore in order to determine the net electricity supplied to the grid at 132 kV at the ENERCON substation, the state utility apply Line loss to the meter reading recorded at the 33 KV.

The total % of Line loss from WEGs (33kV metering point) to Enercon substation (132kV metering point) is calculated by the state utility. Net Electricity supplied to the grid by project activity is calculated by applying Line loss to the meter readings taken at 33 kV metering point of the project activity.

The procedure for calculation of the percentage Line loss is set-out below:

$$T_E = \frac{(X1+X2+X3+X4+.....Xn) - Y}{(X1+X2+X3+X4+.....Xn)} \times 100\%$$

Where,

T_E = *Percentage Line loss incurred in Line between the meters located at 33 kV metering point (including the machines of the project activity and other project developers) and the meters located at 132kV metering point (bulk meter: main and check) at high voltage side of receiving sub-station. Refer above picture for schematic of the flow diagram.*

(X1+X2+X3+X4+…..Xn) = *Summation of meter readings (Export) at 33 kV metering points for all the project developers connected to receiving substation (including the machines of the project activity and other project developers)*

Y = *Export Reading at bulk meter installed at high voltage side of transformer of the receiving sub-station at 132 kV connecting machines of the project activity and other project developers. Refer above picture for schematic of the flow diagram.*

Monthly JMR recorded at 33 kV metering points as given by APCPDCL contains the following data:-

1. Electricity Export ($\mathbf{EG_{JMR, Export,y}}$) : Electricity export to the grid at 33kV metering point.
2. Electricity Import ($\mathbf{EG_{JMR, Import,y}}$) : Electricity import from grid at 33kV metering point.

Net Electricity supplied to the Grid is calculated as:-

$$\mathbf{EG_{PJ,y} = EG_{Export,y} - EG_{Import,y}}$$

Where,

$$\mathbf{EG_{Export,y} = EG_{JMR, Export,y} \times (1 - T_E)} \quad \text{.....(1)}$$

$$\mathbf{EG_{Import,y} = EG_{JMR, Import,y} \times (1 + T_E)} \quad \text{.....(2)}$$

In Andhra Pradesh state the electricity imported by WEGs (Electricity exported by grid to WEGs) is charged by state utility based on KVAH & KVA reading of import instead of the reading of kWh and at the rate of applicable HT tariff, while payment against electricity exported by WEGs (Electricity imported

by grid from WEGs) to PP is made based on kWh reading (after deducting transmission loss between 33kV & 132 kV level). Hence to arrive the net import at 132 kV PP has applied the same transmission loss (value in %) factor in import value (kWh reading) of WEGs recorded at 33kV as per formula mentioned above (refer formula 2).

Monthly "statement showing energy admitted and amount paid details of M/S. Enercon India Ltd clients" given by State utility contains following data:-

1. Energy export to grid after deducting line loss (or Import to APTRANSO)
2. Energy import from the grid (or Export from APTRANSO)
3. Net Electricity supplied to the Grid (or Energy Admitted)

Calculation of Net Electricity Supplied to the grid by the project activity (Anantapur):

From the above line diagram of Anantpur site it is clear that metering system for the project activity consists of cluster metering points at 33kV at project site. Each cluster metering point will have one main and one check meter (33kV metering point). All the WEGs of project activity will exclusively connected to individual cluster metering points i.e. there will be no WEGs of other project owners that are connected to these cluster. In a particular wind-farm of Enercon, each cluster has WEGs of only one project owner.

In addition to cluster metering point there is one set of main & check meter (bulk/billing metering point) at 220kV Shahpuram Sub-station (Enercon Pooling sub-station), where all the WEGs of project activity and non-project activity are connected.

From the 220 kV Enercon Pooling sub-station at Shahpuram sub-station, electricity is supplied to LILO (Line In Line Out) with 220kV Gooty –Hindupur Line connected to state electricity grid

The monitoring system of Anantpur site will be same as of Kurnool site, only the step-up voltage will be at 220 kV and there will be two cluster metering pints (switching yards) comprising 16 WEGs and 8 WEGs as depicted in the diagram above in this section. Procedure to calculate net electricity supplied by the WEGs of project activity installed at Ananatpur site will follow the same procedure as of Kurnool site.

The summation of net electricity supplied to the grid from the two sites (Kunool & Anantpur) under project activity shall comprise the "Net Electricity Supplied to the Grid by the Project Activity ($EG_{,PJ,y}$)".

Procedure to deal with data uncertainty:

During the calibration, if the meter is found to be outside the permissible limits of the error and if that meter readings have been used in JMR, the (–ve) error value would be applied to electricity export and (+ve) error value will be applied to import of electricity from grid to all the JMR values since the date of last calibration. The meter would be replaced immediately with new calibrated meter

In case both main and check meters are found not to be working in the accuracy range during the calibration test, both the meters shall be replaced immediately and the correction will be applied to the consumption registered by the main meter to arrive the correct delivered energy for the billing purpose for the period of one month upto the time of such test check, computation of the delivered energy for the period thereafter till the next monthly meter reading shall be as per the replaced main meter.

QA/QC process:

The accuracy of monitoring parameter is ensured by adhering to the calibration and testing procedure. The project will adhere to all the mandatory regulatory and statutory requirements at the state as well as National level. Enercon is Operation and Maintenance contractor for the project activity and provides the daily generation report to the Project proponent. The project proponent also maintains the records of daily generation report and joint meter report.

The meter readings are noted in the form of joint meter report and are signed jointly by the representatives of Enercon and the state utility.

Enercon provides the daily generation report to the Project proponent. The project proponent also maintains the records of daily generation report and joint meter report.

Action plan for monitoring of 2% CER revenue contributed towards sustainable development:-

Vish Wind Infrastucture LLP (VWILLP) is committed to contribute a minimum of 2% of the CER revenue accrued every year for sustainable development activities for the local population.

VWILLP will undertake an annual review process of the actual CERs accrued and the price transacted. On the basis of the actual price and exchange rate, VWILLP will commit 2% of the revenue for sustainable development activities in the local areas.

As part of the annual review, VWILLP will undertake informal discussions with the locals at the project site and commit the revenue towards society / community developmental activities in areas that are of most concerned to the local population. These areas could include health, education, sanitation, skill development, infrastructure development, etc. The annual review process will detail the exact activities that would be undertaken using the 2% revenue and the detailed mode of implementation of the proposed activity.

Training and maintenance requirements:

Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the WEG s, it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that Enercon's service staffs is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. The Enercon Training Academy provides need-based training to meet the training requirements of Enercon projects. The training is contemporary, which results in imparting focused knowledge leading to value addition to the attitude and skills of all trainees. This ultimately leads to creativity in problem solving.

Detailed monitoring information is given in Annex 4.

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):

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Date of completion: 10/07/2011

Name of responsible person/entity: The entity Vish Wind Infrastructures LLP determined the baseline is also the Project Participant. The details are given 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:

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02/04/2011, being the date of placement of purchase order for the Wind Energy Generators.

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

>>

20 years and 0 months

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

C.2.1. Renewable crediting period:

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

>>Not Applicable

C.2.1.2. Length of the first crediting period:

>>

Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

01/04/2012 or date of registration of project with UNFCCC whichever is later.

C.2.2.2. Length:

>>

10 years and 0 months

SECTION D. Environmental impacts

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

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As per the Schedule 1 of Ministry of Environment and Forests (Government of India) notification dated January 27, 1994 and EIA Notification (S.O 1533) dated 14th September 2006, a list of activities that require undertaking environmental impact assessment studies[9] has been provided. EIA is not a regulatory requirement in India for wind energy projects and PP does not expect any adverse impacts of the proposed CDM project activity on the environment. Further MoEF published two other amended notification dated, 11th Oct 2007[10] & 01st December 2009[11] and these amendment doesn't provide any change in regulatory requirement for Wind power project related to EIA.

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:

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The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. Hence, EIA is not required by the host party.

SECTION E. Stakeholders' comments

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

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The comments from local stakeholders were invited through a local stakeholder meeting conducted at Krishna and Anantapura District in Andhra Pradesh respectively on 24th and 25th June 2011. Personal invitations were sent to respective personnel from the villages associated with the project activity on 8th June 2011. The copies of invitation letter will be submitted to the DOE at the time of validation. Comments from the stakeholders were invited till 23rd June, 2011. The meeting was presided over by Mr. Y Pratap Kumar (ENERCON), Mr. S. Murali (ENERCON), Mr. Guruprasad and Ms. Anindita Bandyopadhyay (VWILLP). On behalf of the EIL Andhra Pradesh, State operation Head Mr. S. Murali chaired the meeting.

E.2. Summary of the comments received:

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

[10] http://www.fedmin.com/html/not-11-10-07.pdf

[11] http://mnre.gov.in/notification/env-notifn.pdf

No comment was received from the local stakeholders prior to the meeting. The consultation meeting had representatives from the nearby villages and representatives of VWILLP and Enercon (EPC and O&M contractor). Following stakeholders are identified for the project activity:

- Representatives of local community
- Village Panchayat head
- Employees from wind farm developer (Enercon)

The agenda of meeting was as follows:

1. Welcome address and introduction
2. Project profile
3. CDM, social issues and environmental issues
4. Suggestions and opinions
5. Queries by stakeholders and response by the respective authority
6. Vote of thanks
7. Lunch

The following queries were raised by the stakeholders:

1. Is there any effect on the cattle grazing near by the project after 4 to 5 years down the line from the commencement of project?
2. Will the machines installed create sound and disturb the surrounding?
3. Can the local people get works relating to project?

The clarifications that were addressed by the representatives of Enercon (Enercon is authorized by the PP to execute all the activities in relation to CDM i.e. project registration and verification including local stakeholder consultation) are listed in the table below:

S.No.	Villager Name	Question	Reply
1	Krishna Reddy	Is there any effect on the cattle grazing near by the project after 4 to 5 years down the line from the commencement of project?	There is no relation between the project activity and cattle grazing. Cattle can continue to graze near the WTG sites in the coming years as well.
2	Ibrahim	Will the machines installed create sound and disturb the surrounding?	Many companies have installed wind projects in several villages and no such problem has been faced. The sound from the machines is negligible and carries no significant effect or has a major concern.
3	N. Narasimhulu	Can the local people will get works relating to project.	Yes, there will be opportunities for the people living in the nearby areas of project by a proper selection process.

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

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The meeting was very cordial and ended on a positive note. No adverse comments were received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Vish Wind Infrastructure LLP
Street/P.O.Box:	A-9, Veera Desai Road
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City:	Mumbai
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URL:	
Represented by:	
Title:	Designated Partner
Salutation:	Mr.
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Middle name:	
First name:	Yogesh
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project activity does not involve any public funding.

Annex 3

BASELINE INFORMATION

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

Simple Operating Margin

	Southern Grid (tCO2e/MWh)
Simple Operating Margin – 2007-08	0.9908
Simple Operating Margin – 2008-09	0.9729
Simple Operating Margin – 2009-10	0.9415
Average Operating Margin of last three years	0.9684

Build Margin

	Southern Grid (tCO2e/MWh)
Build Margin- 2009-10	0.7634

Combined Margin Calculations

	Weights	**Southern Grid (tCO2e/MWh)**
Operating Margin	0.75	0.9684
Build Margin	0.25	0.7634
Combined Margin		0.9172

Detailed information on calculation of Operating Margin Emission Factor and Build Margin Emission Factor is available at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm (CEA data base version 6.0)

Annex 4

MONITORING INFORMATION

Metering and Monitoring Plan details: The general conditions set out for metering, recording, meter readings, meter inspections, Test & Checking and communication shall be applicable as per the PPA (Power purchase agreement) with the State electricity board except or otherwise explicitly mentioned in the PDD.

Metering: Enercon will make clusters of WEGs at the project site for the purpose of metering. Each cluster will have a set of main and check meter at 33 kV. All the clusters will exclusively be connected to WEGs of the project activity i.e. there will be no WEGs of other project owners that are connected to these clusters. Summation of meter reading for all the clusters (connecting 26 machines) will provide total electricity generated by the project activity.

The electricity supplied to the grid will be metered from main and check meters at 33kV that are connected to the 26 turbines of the project activity. The electricity export and import for the project activity will be taken from the summation of the joint meter readings noted from the cluster meters (dedicated meters) connecting 26 turbines of the project activity (i.e. at the two sites).

In addition to this there is one set of main and check meters each at Ankireddypalli sub-station and Shahpuram sub- station at 132kV and 220kV respectively (Enercon pooling sub-stations). Transmission loss between metering point at 33kV and the metering point at the Enercon substations would be applied to the meter reading taken at meters connected at 33 kV for the project activity. Enercon Substations are connected to the machines of the project activity and the machines commissioned by the other project owners. Therefore transmission loss is applied to the project activity by the state utility as reflected in the JMR taken at 33kV level. The JMR is signed by the representatives of Enercon and the state utility. The procedure for calculation of transmission loss is better described in B.7.2.

At Anantapur, two metering yards will be there at Shahpuram sub-station. One bulk meter will be connected to 16 WEGs under the project activity and 8 remaining WEGs will be connected to another bulk meter dedicated to the project activity. WEGs not under the current project activity will be connected to other cluster meters.

Metering Equipment:

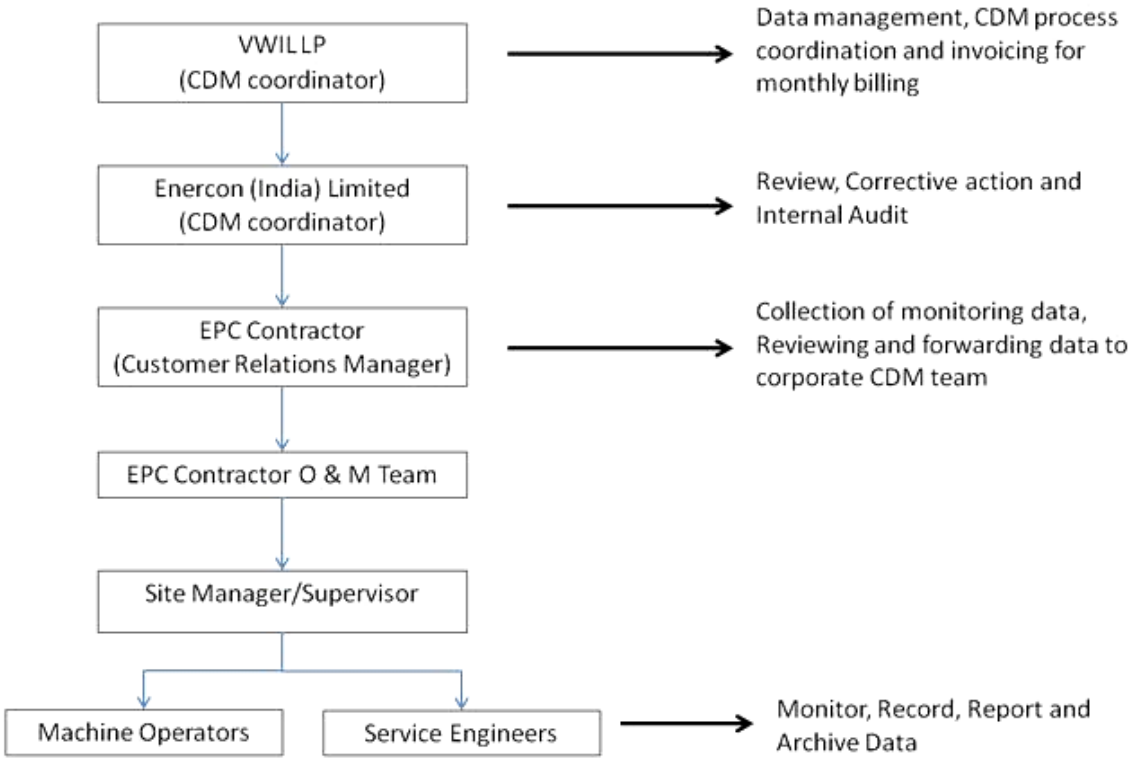
- All main and check meters are two-way tri-vector meters capable of recording import and export of electricity and under the control of state electricity utility.
- All main and check meters are of 0.2s of accuracy class.

Meter Readings: The monthly meter reading is taken jointly by the parties (Enercon personnel and personnel of State utility) for every last month. At the conclusion of each meter reading an appointed representative of State Utility and Enercon sign a document indicating the number of Kilowatt-hours (kWh) indicated by the meter. Details are narrated in Section B.7.1 of this document.

QA/QC Procedure: All the meters are calibrated/ tested once in five years. The calibration is done by the officials of the state utility. Copy of calibration/testing certificate will be kept as record by the PP and will be presented to the DoE during verification exercise.

The project proponent (Vish Wind Infrastructure LLP) will be keeping and monitoring the data for electricity generation and calibration reports post project implementation. Enercon (India) Limited will be the O&M contractor who will be having the responsibility of activities such as maintaining electricity generation records, calibration records and maintenance of the WEGs (Wind Energy Generators).

The operational and management structure implemented for data monitoring is as follows:



Main and Check meter: In case the main meter(s) is found to be operating outside the permissible limits, the main meter will be either replaced or calibrated immediately. Whenever a main meter goes defective, the consumption recorded by the Check meter will be referred.

In case the date of registration or start date of the crediting period of the project activity does not match with the date of joint meter report or billing cycle, PP will forego the emission reductions for that particular period.

Appendix 1: Geographical coordinates of the project activity

1) Location details for Anantapur Site, Village – Nallakonda

SL. NO.	LOCATION NO.	LATITUDE	LONGITUDE
1	1	14^{O} 03’ 51.2”	77^{O} 32’ 06.9”
2	2	14^{O} 03’ 55.8”	77^{O} 32’ 03.4”
3	3	14^{O} 03’ 49.4”	77^{O} 32’ 29.6”
4	4	14^{O} 03’ 59.9”	77^{O} 32’ 26.1”
5	5	14^{O} 04’ 22.9”	77^{O} 32’ 22.1”
6	6	14^{O} 04’ 27.5”	77^{O} 32’ 17.4”
7	7	14^{O} 04’ 34.0”	77^{O} 32’ 12.3”
8	8	14^{O} 04’ 33.5”	77^{O} 32’ 00.5”
9	9	14^{O} 04’ 40.7”	77^{O} 32’ 15.2”
10	10	14^{O} 04’ 45.4”	77^{O} 32’ 12.6”
11	11	14^{O} 04’ 50.0”	77^{O} 32’ 10.5”
12	12	14^{O} 04’ 41.1”	77^{O} 31’ 44.2”
13	13	14^{O} 04’ 47.4”	77^{O} 31’ 44.5”
14	14	14^{O} 04’ 51.5”	77^{O} 31’ 44.0”
15	15	14^{O} 04’ 56.5”	77^{O} 31’ 41.9”
16	16	14^{O} 05’ 01.1”	77^{O} 31’ 40.8”
17	39	14^{O} 08’ 41.1”	77^{O} 35’ 29.0”
18	41	14^{O} 08’ 50.3”	77^{O} 35’ 01.0”
19	42	14^{O} 08’ 57.2”	77^{O} 34’ 53.4”
20	43	14^{O} 09’ 01.2”	77^{O} 34’ 50.5”
21	44	14^{O} 09’ 43.5”	77^{O} 36’ 02.6”
22	45	14^{O} 09’ 51.4”	77^{O} 35’ 57.9”
23	46	14^{O} 09’ 57.4”	77^{O} 35’ 50.2”
24	47	14^{O} 10’ 00.8”	77^{O} 35’ 48.5”

2) Location details for Kurnool Site, Village - Thummalapenta

SL. NO.	LOCATION NO.	LATITUDE	LONGITUDE
1	1	15^{O} 02’ 40.3”	78^{O} 02’ 54.0”
2	2	14^{O} 03’ 59.2”	78^{O} 03’ 04.9”

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