



**Project design document form for
CDM project activities
(Version 06.0)**

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	22.5 MW Wind Power Project in Rajasthan, India
Version number of the PDD	2.00
Completion date of the PDD	14/03/2016
Project participant(s)	Orange DND Wind Power Private Limited¹
Host Party	India
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	Sectoral Scope 1: Energy Industries(renewable – /non renewable sources)
Estimated amount of annual average GHG emission reductions	43,328 tCO₂

¹ Earlier name is 'Green Horse Bioenergy Private Limited'. The name is changed to 'Orange DND Wind Power Private Limited' on 22/05/2015

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The project activity is a 22.5 MW wind power project, promoted by Orange DND Wind Power Private Limited (Orange DND). The purpose of the project activity is to generate clean electricity with utilization of wind energy.

The project consists of 15 Wind Turbine Generators (WTGs) of 1.5 MW class ReGenV87 make. GHBPL is installing WTGs at Badi Ambeli, Rampuriya Maido KaKheda, Daman Dungri, Devgarh, Raypur Jungle, Doli villages of Pratapgarh districts of Rajasthan state in India.

The project originally was conceived in the name of **Green Horse Bioenergy Private Limited** however, in the due course of reorganizing in the parent company, project names were standardised and the company name was changed to **Orange DND Wind Power Private Limited** via name change certificate from "Ministry of Corporate Affairs" dated 22nd May 2015. Subsequently, the PPA was as well amended on 7th September 2015.

How the proposed activity reduces GHG emissions

The electricity generated by the project is exported to the NEWNE electricity grid. The project activity will therefore displace an equivalent amount of electricity which would have otherwise been generated by fossil fuel dominant electricity grid. Since wind power is Greenhouse Gas (GHG) emissions free, the power generated will prevent the anthropogenic gas emissions generated by fossil fuel based thermal power stations comprising coal, diesel, furnace oil and gas. Hence, the generation by the proposed activity is non-GHG source and thus reduces the proportion of fossil fuel based generation in the grid leading to lesser carbon intensive grid.

Scenario existing prior to the implementation of project activity:

There was no activity at the site prior to implementation of the project activity. Hence the scenario existing prior to the project activity is same as baseline scenario which is continual use of highly carbon intensive electricity in the regional grid.

Baseline Scenario:

As the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following as per applied methodology: ACM0002 "Grid-connected electricity generation from renewable sources" (Version 16.0). Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system". Hence, pre-project scenario and baseline scenario are the same.

The estimation of GHG reductions by this project is limited to carbon dioxide (CO₂) only. Thus the project activity leads to an annual emission reduction of 43,328 tCO₂ for the chosen crediting period of 7 years renewable.

Project Contribution to Sustainable development:

Ministry of Environment and Forests, Govt. of India has stipulated the following indicators for sustainable development² in the interim approval guidelines for CDM project.

- a) Social well-being
- b) Economic well-being

²http://envfor.nic.in/divisions/ccd/cdm_iac.html

- c) Environmental well-being
- d) Technological well-being

These project activity contributions towards the sustainable development are as follows;

Economic well-being:

- The project activity would help in alleviation of poverty in the area as it creates employment opportunities to the local people.
- The project activity would bring in additional investment to the region which would have not been possible in the absence of project activity. The development of project activity would contribute significantly towards infrastructure development of the region which ultimately leads to rural area development.
- The project activity evacuating power to the nearest regional grid would lead to improvement of electricity availability as the electricity is fed into a deficit grid.

Social well-being:

- The project activity would improve the local infrastructure development.
- Power generated from this project activity can be used for small scale industries, thus would generate employment opportunities.

Environmental well-being:

- Wind is one of the cleanest form of renewable energy and power generation does not involve any fossil fuels.
- The project activity by replacing electricity generated from fossil fuels would result in reduction of both GHG emissions and air borne pollutants, such as oxides of nitrogen, oxides of sulphur, carbon monoxide and particulates.
- Produces electricity without any GHG emissions.

Technological well-being:

- The project would use the environmental safe and sound technologies in small scale hydroelectric power sector.
- It will improve the power quality and the improvement of transmission and distribution congestion.

The successful implementation and operation of the project would serve as demonstration for harnessing wind potential and encourage setting up of similar projects in future.

A.2. Location of project activity

A.2.1. Host Party

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India

A.2.2. Region/State/Province etc.

>>
Rajasthan

A.2.3. City/Town/Community etc.

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Villages of Pratapgarh District.

A.2.4. Physical/Geographical location

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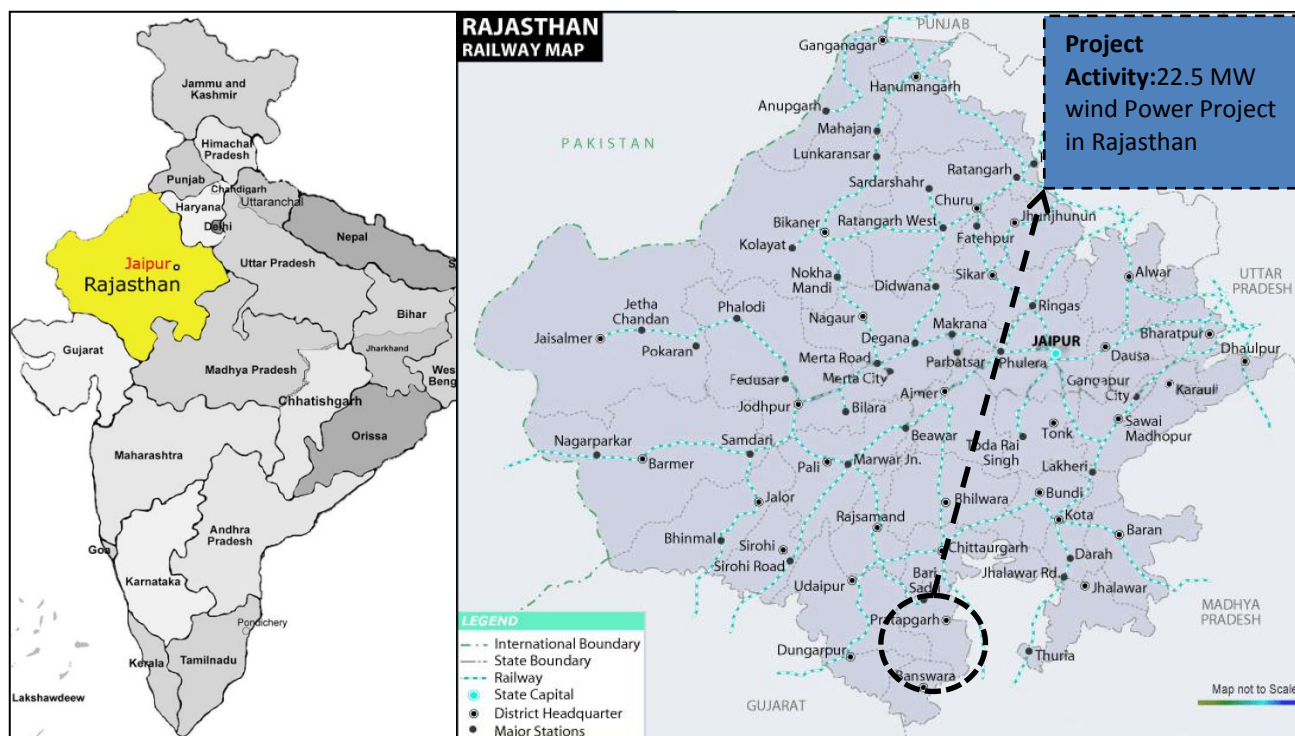
Dalot Site

No	Location ID	Village	Geographical coordinates
1	RDP3_04	Raipur Jungle	74° 45' 46.4985" N 23° 41' 53.3629" E
2	RDP3_07	Raipur Jungle	74° 45' 1.0905" N 23° 39' 41.4335" E
3	RDP3_08	Raipur Jungle	74° 44' 34.2174" N 23° 40' 3.5664" E
4	RDP3_09	Raipur Jungle	74° 44' 31.5863" N 23° 40' 13.0246" E
5	RDP3_10	Raipur Jungle	74° 44' 6.5127" N 23° 40' 16.6243" E
6	RDP3_19	Raipur Jungle	74° 44' 32.3449" N 23° 40' 22.2608" E

DevgarhSite

No	Location ID	Village	Geographical coordinates
1	B4	Doli	74° 37' 47.2473" N 23° 57' 13.3230" E
2	B5	BadiAmbeli	74° 37' 43.5991" N 23° 57' 27.0685" E
3	B6	BadiAmbeli	74° 38' 12.1875" N 23° 57' 27.2344" E
4	B16	Rampuriya	74° 38' 6.1750" N 23° 59' 6.8489" E
5	B20	MaidoKakheda	74° 39' 22.7743" N 23° 58' 47.6463" E
6	B22	Daman Dungri	74° 39' 41.1812" N 23° 58' 32.2097" E
7	B28	Devgarh	74° 39' 18.0181" N 24° 1' 32.2633" E
8	B31	Devgarh	74° 39' 8.4966" N 24° 2' 37.5333" E
9	B34	Devgarh	74° 39' 9.3689" N 24° 1' 36.4708" E

The geographical location of the project site is as shown below:

**A.3. Technologies and/or measures**

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The technology employed, converts wind energy to electrical energy. In wind power generation, energy of wind is converted into mechanical energy and subsequently into electrical energy. The technology is an environment friendly technology since there are no GHG emissions associated with the electricity generation. There is no transfer of technology involved in the project activity. The project activity comprises of 15 WTGs of ReGen'sV87model 1500kW.

The commissioning of the project activity has been completed and details are mentioned in section A.2.4.

POWER	
Rated power	1500 kW
Cut-in wind speed (10 min. mean)	3 m/s
Rated Wind Speed (10 min. mean)	approx 12.5 m/s
Cut-out wind speed (10 min. mean)	22 m/s
Survival wind speed	52.5 m/s
Generator	Variable Speed, Multi-pole Synchronous with Permanent Magnet Excitation
ROTOR	
Diameter	86.7 m
Swept area	5325 sq.m
Speed range (variable)	9 to 17.3 rpm
TOWER AND FOUNDATION	
Hub height	85 m
Design	Tubular, Four sections
Foundation type	Floating foundation
CONTROL AND SAFETY SYSTEMS	
Control of output	Pitch Regulation
Speed control	Variable, Micro-controller based
Low Voltage Ride Through (LVRT)	3 seconds
Primary brake system	Aerodynamic Brake, Single Pitch Control/triple redundant
Pitch System	Electromechanical, Maintenance Free Toothed Belt Drive (Patented)
Remote Monitoring	VPN, Visualization via web-browser
TYPE CLASSES	
Wind turbine type class	GL III A

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	Orange DND Wind Power Private Limited ³ (Private entity)	No

A.5. Public funding of 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.

³ Earlier name is 'Green Horse Bioenergy Private Limited'. The name is changed to Orange DND Wind Power Private Limited on 22/05/2015

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

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Title: Consolidated baseline and monitoring methodology for “Grid-connected electricity generation from renewable sources”

References: Approved consolidated baseline methodology ACM0002 “Grid-connected electricity generation from renewable sources” (Version 16.0, EB 81⁴)

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

“Tool to Calculate the Emission Factor for an Electricity System” – version 5.0,⁵.

“Tool for the demonstration and assessment of Additionality” – version 07, EB 70, Annex 8⁶.

B.2. Applicability of methodology and standardized baseline

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The project activity meets the applicability conditions of the approved consolidated baseline and monitoring methodology ACM0002, version 16.0, as described below:

Applicability Criteria	Applicability status
This methodology is applicable to grid-connected renewable power generation project activities that: (a) install Greenfield power plant; (b) involve a capacity addition to (an) existing plant(s); (c) involve a retrofit of (an) existing plant(s)/unit(s); (d) involve a rehabilitation of (an) existing plant(s)/unit(s); or (d) involve a replacement of (an) existing plant(s)/unit(s)	The proposed project activity is a Greenfield, NEWNE grid connected renewable power plant. Therefore, it confirms to the said criteria
The methodology is applicable under the following conditions: The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit	The project activity is the installation of a new grid connected renewable wind power project. Thus, it meets the first applicability condition
In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit or rehabilitation of the plant/unit has been undertaken	The proposed project activity is the installation of a new wind power plant/unit. Therefore, the said criteria is not applicable

⁴<http://cdm.unfccc.int/methodologies/DB/EY2CL7RTEHRC9V6YQHLAR6MJ6VEU83>

⁵<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf>

⁶http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf/history_view

between the start of this minimum historical reference period and the implementation of the project activity	
In case of hydro power plants, one of the following conditions shall apply: (a) The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or (b) The project activity is implemented in an existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3) is greater than 4 W/m²; or (c) The project activity results in new single or multiple reservoirs and the power density calculate equation (3), is greater than 4 W/m². (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density of any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m², all of the following conditions shall apply. (i) The power density calculated using the total installed capacity of the integrated project, as per equation (4) is greater than 4W/m²; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m²shall be: (a) Lower than or equal to 15 MW; and (b) Less than 10% of the total installed capacity of integrated hydro power project	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable
In the case of integrated hydro power projects, project proponent shall: Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criterion is not applicable

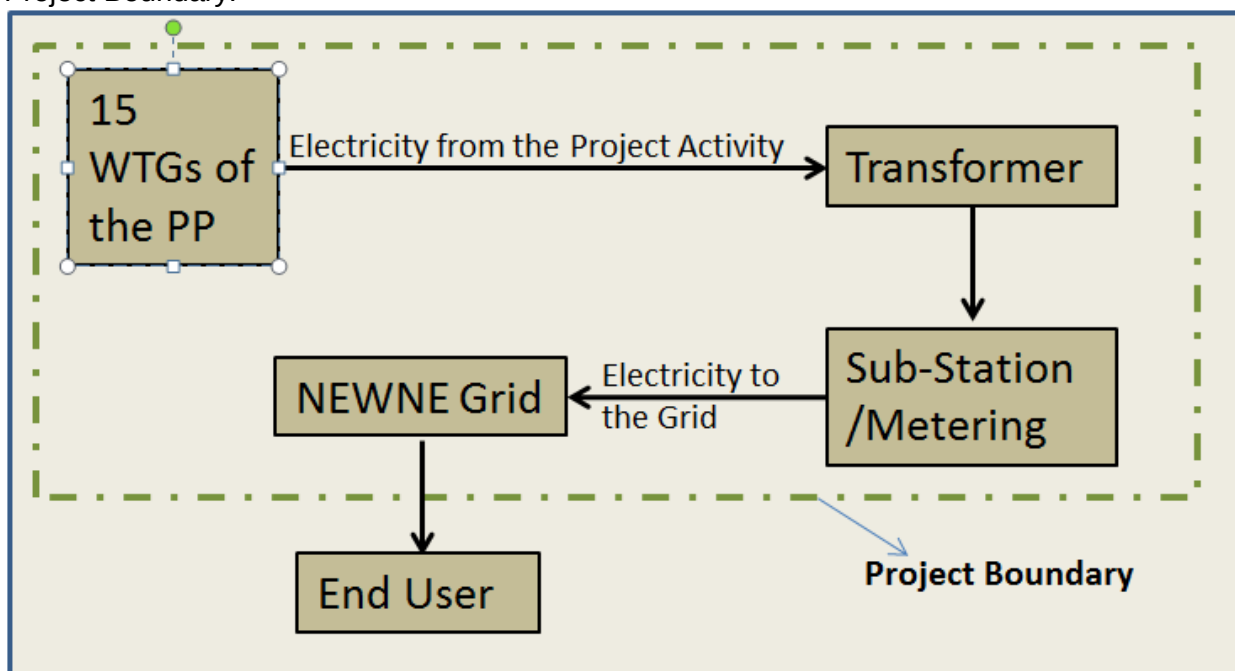
constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability indifferent seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	
The methodology is not applicable to: (a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; (b) Biomass fired power plants;	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable
In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is “the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.	The proposed project activity is the installation of a greenfield wind power plant. Therefore, the said criterion is not applicable.
This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid(e.g. demand-side energy efficiency projects).	This condition is applicable. OM, BM and CM are estimated using the tool under section B.6.1 for calculating baseline emissions.
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, the conditions specified in “Appendix 2: Procedures related to off-grid power generation” should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	Since the project activity is grid connected, this condition is applicable and the emission factor has been calculated accordingly.
In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project activity is located in India, an non-Annex I country. Therefore, this criterion is not applicable for the project activity

Under this tool, the value applied to the CO ₂ emission factor of biofuels is zero	The project activity is a grid connected wind power project and not a hydro power plant. Therefore, this criterion is not applicable for the project activity
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B.3. Project boundary

Project boundary has been ascertained using para 21 of ACM0002, version 16.0, - "The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to".

Project Boundary:



The GHG emission sources considered for the project boundary and their explanations are as follows:

	Source	GHGs	Included?	Justification/Explanation
Baseline scenario	Grid-connected Electricity Generation	CO ₂	Yes	Major emission sources
		CH ₄	No	Excluded for simplification. This is conservative.
		N ₂ O	No	Excluded for simplification. This is conservative.
Project scenario	Green Field Wind Energy Power Project	CO ₂	No	The project activity does not emit any emissions
		CH ₄	No	No methane generation is expected to be emitted.
		N ₂ O	No	No nitrous oxide generation is expected to be emitted.

B.4. Establishment and description of baseline scenario

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As per the approved consolidated methodology ACM 0002;

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

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

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) and build margin (BM). Calculations for this combined margin must be based on data from an official source⁶ (where available) and made publically available.

The combined margin of the NEWNE grid used for the project activity is as follows:

Parameter	Value	Nomenclature	Source
$EF_{grid,CM,y}$	0.9770 tCO ₂ /MWh	Combined margin CO ₂ emission factor for the project electricity system in year y	Calculated as the weighted average of the operating margin (0.75) & build margin (.25) values, sourced from Baseline CO ₂ Emission Database, Version 10.0 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,OM,y}$	0.9862 tCO ₂ /MWh	Operating margin CO ₂ emission factor for the project electricity system in year y	Calculated as the last 3 year (2011-12, 2012-13, 2013-14) generation-weighted average, sourced from Baseline CO ₂ Emission Database, Version 10.0, published by Central Electricity Authority (CEA), Government of India
$EF_{grid,BM,y}$	0.9495 tCO ₂ /MWh	Build margin CO ₂ emission factor for the project electricity system in year y	Baseline CO ₂ Emission Database, Version 10.0, published by Central Electricity Authority (CEA), Government of India

B.5. Demonstration of additionality

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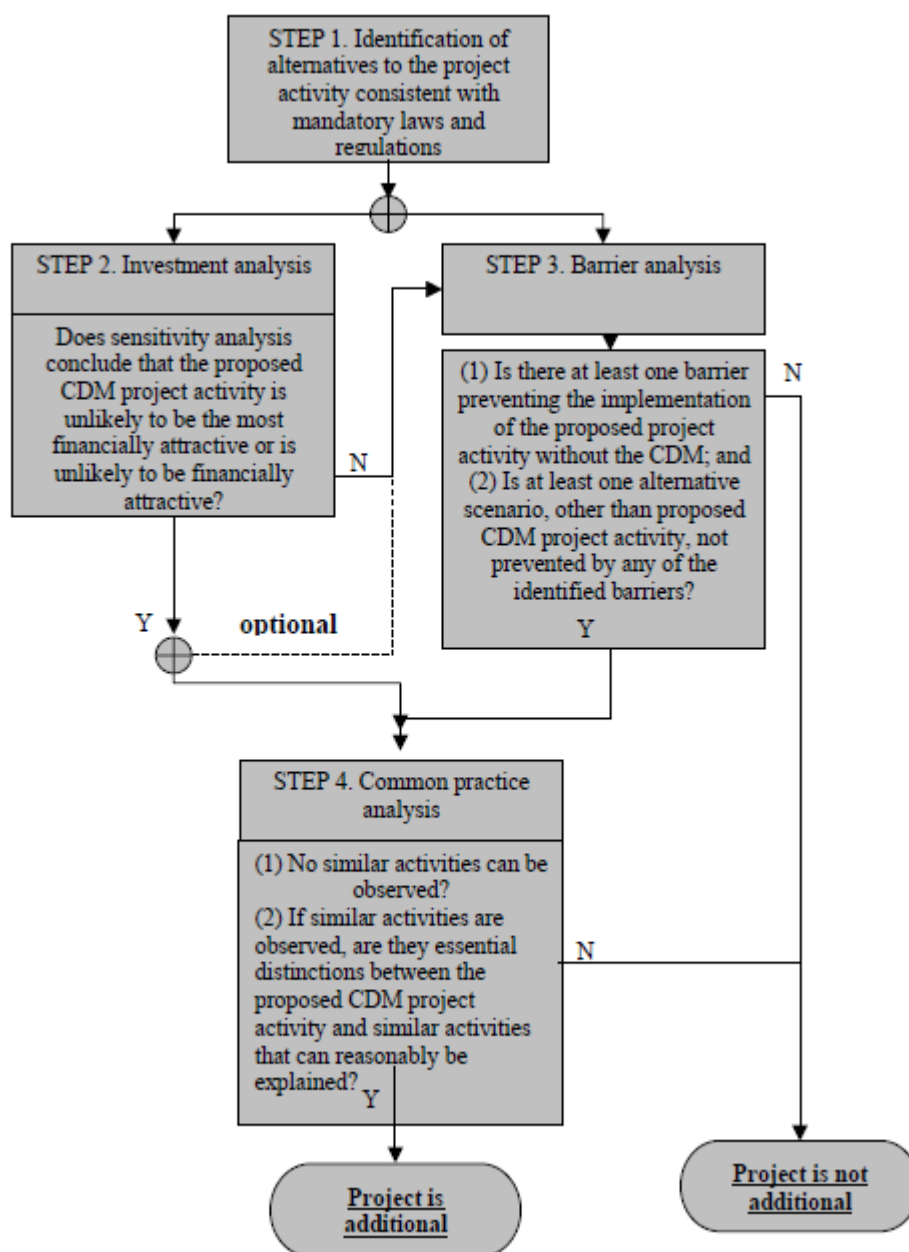
ADDITIONALITY

As per the decision 17/cp.7 Para 43, a project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered project activity. As per the selected methodology ACM0002, the project developer is required to establish that the GHG emission reductions due to the project activity are additional to those that would have occurred in the absence of the current project activity as per the methodological tool “Demonstration and Assessment of Additionality”, version 07.0, EB 70.

This document provides a step-wise approach to demonstrate and assess additionality of the project activity as shown in the flow chart given below. These steps include:

1. Identification of alternatives to the project activity;

2. Investment analysis to determine that the proposed project activity is either: 1) not the most economically or financially attractive, or 2) not economically or financially feasible;
3. Barriers analysis; and
4. Common practice analysis.



Tool for Demonstration of additionality

Step 0: Demonstration whether the proposed project activity is the first-of-its-kind

The proposed project activity is not the first of its kind. Hence, this step is not applicable.

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

Sub-Step 1a: Define alternatives to the project activity

Step 1 is to identify credible and realistic alternative scenarios to the project activity. The below section contains the discussion on the alternative scenarios of the project activity.

1. The Project is undertaken as without carbon credit benefits.
2. No project activity; continuation of the current scenario.

The alternatives are discussed in detail below.

Alternative 1- The project is undertaken without carbon credit benefits

Investment in wind energy involves high capital cost and low returns. This is due to the low plant load factor when as compared to the conventional power plants which could eventually end up in low returns and hence making the project less financially attractive. Therefore implementation of the project activity without carbon revenue is not financially attractive. The financial non-viability of the project is demonstrated in the subsequent sections and thus is not a baseline option.

Alternative 2- No project activity; continuation of the current situation

In this alternative the project activity is not established and the same amount of electricity is being supplied through current grid mix of NEWNE grid and there is no displacement of electricity of the grid mix of NEWNE grid with clean electricity.

In this alternative, an equivalent amount of electricity would be generated by the power plants comprising the NEWNE grid mix. An equivalent amount of Carbon Dioxide would be generated at the thermal power generation end. This is a realistic baseline for the project activity.

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

Step 2 is to check the compliance of the identified alternative baseline scenario with all mandatory applicable legal and regulatory requirements.

The alternative 2 (baseline case) is in compliance with all applicable legal and regulatory requirements and may be a part of the baseline. Also the National Electricity Policy (2005) asserts ***“coal would necessarily continue to remain the primary fuel for meeting future electricity demand”***⁷ and hence does not restrict the usage of coal for electricity generation.

Step 2. Investment analysis

As per the tool for additionality, it is determined that the proposed project activity is not an economically or financially feasible option.

To conduct the investment analysis, Methodological tool: Investment analysis, version 6.0 has been referred.

Sub-step 2a: Determine appropriate analysis method

Since the project activity shall generate financial income from sale of power to the grid, we shall rule out Option I (simple cost analysis) and apply either Option II (Investment comparison analysis) or Option III (Benchmark analysis).

As per tool “Investment Analysis”, “The benchmark approach is suited to circumstances where the baseline does not require investment or is outside the direct control of the project developer, i.e. cases where the choice of the developer is to invest or not to invest”.

As there is no alternative baseline for the project activity and the project proponent is left with the option to invest or not to invest. Hence, Option III (Benchmark analysis) is selected as the appropriate method for demonstration of Investment analysis.

Sub-step 2b: Option III - Apply Benchmark analysis

To analyze the financial viability of the project, as explained above in step 2a, project IRR has been chosen as the financial indicator.

As per the “Tool for the demonstration and assessment of Additionality”, version 07 IRR analysis is an appropriate financial indicator in cases where a benchmark analysis has been applied.

There are two types of IRR analysis referred in tool “Investment Analysis” version 06, project IRR and equity IRR.

The project activity is funded by both debt and equity. Since the project activity is funded with both debt & equity, project IRR is considered to be the appropriate financial indicator for investment

⁷http://www.powermin.nic.in/whats_new/national_electricity_policy.htm

analysis. A post tax project IRR have been calculated as financial indicator for demonstration of additionality for the project activity.

As per tool 'Investment Analysis', "In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. **Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR**".

Above referred guidance provides the project proponent with freedom to choose a proper benchmark against project IRR. Project proponent has chosen PLR of Bank Loans available at the time of decision making. The prime lending rate (PLR) of State Bank of India (SBI), (which is a major commercial bank in India) is considered as benchmark. The state bank prime lending rate at the time of investment decision is 14.45%⁸ (which is conservative when compared to the lending rates of other nationalized banks like ICICI bank (18.75%) and Standard chartered bank (14.25%) applicable at the time of investment decision) and the same is considered as benchmark of the project activity..

The Project proponent has chosen step 2b Option III for demonstration of Additionality.

Events related to project implementation	GS relevant events	Dates
Completion of DPR		29.08.2014
Board decision for investing in Project and securing carbon credits	Investment decision	01.09.2014
Placement of the Purchase Orders	Start date of the project activity	01.09.2014
Loan Application to Banks		04.09.2014
Loan Sanction by PTC India Financial Services Ltd		22.10.2014
	Appointment of the CDM consultant	17.11.2014
Signing of PPA with RSEB		21.01.2015
	Notices and Publication about Stakeholder' Feedback round Meeting	19.01.2015
	Stakeholder' Feedback round Meeting	23.01.2015
	Appointment of DOE	28.02.2015
Commissioning of Project		26.03.2015 to 31.03.2015

Details of data/ information and assumptions used by the project proponent in the financial analysis and the results of financial analysis for both the projects are presented below:

Particulars	Value	UoM	Ref Details
Energy Generation			
No. of generating units	15	Nos.	SBICAPS DPR
Capacity of each generating unit	1500	kW	SBICAPS DPR
Total generating Capacity	22500	kW	Calculated Value
Plant Load Factor	22.50%	%	Third party assessment report
Transmission & Transformation Losses	0%	%	Not considered as a conservative assessment
Derating	1.25%	%	SBICAPS DPR
Technical			
Tariff Rate	5.93	Rs./ kWh	SBICAPS DPR
O& M Free for the First Two Year	0.00	Rs. Lakh	SBICAPS DPR
O & M Expenses and Management Expenses	1.00%	% of project Cost	SBICAPS DPR

⁸<http://in.reuters.com/article/india-plr-idINL3N12Q2RJ20151026>

Annual Escalation	5.00%	%	SBICAPS DPR
Insurance	0.50%	% of project Cost	SBICAPS DPR
Working Capital Margin	25%	%	SBICAPS DPR
Financial			
Total project cost	16591.00	Rs. Lakh	SBICAPS DPR
Cost per MW	737.38	Rs. Lakh	Calculated Value
Debt	70%	%	SBICAPS DPR
Equity	30%	%	SBICAPS DPR
Term Loan	11613.70	Rs. Lakh	Calculated Value
Promoter's contribution	4977.30	Rs. Lakh	Calculated Value
Interest Rate on Term Loan	12.50%	%	SBICAPS DPR
Repayment Period	120	Months	SBICAPS DPR
Moratorium	6	Months	SBICAPS DPR

The input values used in the investment analysis are valid and applicable as per the investment decision making by the project participant. This is in-line with the tool “*Investment Analysis*”, version 06.

Considering the above mentioned assumptions and working out the project profitability, the Project IRR works out to **10.92%** as against the benchmark value of **14.45%**. Hence it is clearly evident that the project is not a business as usual scenario and this needs additional revenue stream to make to strengthen the project returns.

1. Result of Financial Assessment

Sl. No	Project Proponent	Benchmark (%)	IRR (%)
1	Project	14.45%	10.92%

2. Sensitivity Analysis:

The purpose of the sensitivity analysis is to examine whether the conclusion regarding the financial viability of the project activity is sound and tenable with those reasonable variation in the assumptions. The tool “INVESTMENT ANALYSIS” has been applied to carry out sensitivity analysis.

Sensitivity Analysis	
Guidance	Reasoning
Para: 28: Variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets. Where a DOE considers that a variable which constitute less than 20 per cent has a material impact on the analysis they shall raise a corrective action request to include this variable in the sensitivity analysis.	<i>In line with the guidance, the following variables are subjected to the variation in the sensitivity analysis carried out –</i> - Project Cost - Plant Load Factor (PLF) - Tariff Rate - Operation & Maintenance Cost

The financial performance of the project activity is found to be sensitive to the following factors –

1. Project cost
2. Plant Load Factor
3. Cost of O&M
4. Tariff

For Project 1:1. **Project cost:**

The project cost as envisaged by is INR. 16591 Lakh. A variation to the scale of 10% is unrealistic as the actual project cost realized by the project proponent (**INR other Lakh**) has also been provided to DOE. Hence any variation over it is not required.

Breaching Benchmark: This is only possible when the project cost is put to variation of 19.05% or in other words bringing the project cost down to INR. 13430.41 Lakh. Such variation in project cost is unlikely. Moreover, the project has been commissioned hence any change in project cost is not possible.

Change in Project cost	-10%	0%	10%	-19.05%
Project IRR	12.65%	10.92%	9.36%	Benchmark Breach

2. **Plant Load Factor (PLF):**

This is the most critical of all factors that can have a major impact on the financial performance of the project activity. However, PLF is based on many factors which project proponent has no control on and it carries a lot of uncertainty. The PLF for the project activity works out to be 22.50% and is referred from the DPR. Moreover, it is to be noted that the PLF as recommended by RERC Tariff order dated 29/05/2015, is also 20% only.

A change of even +10% in PLF however is not able to make the project financially attractive.

Breaching Benchmark: A gross PLF of 27.45% would be required to shoot up the IRR to such high. It is unrealistic for the PLF to suddenly rise to such an extent as the past generation data speaks otherwise.

Change in energy generation	-10%	0%	10%	22.00%
Project IRR	9.07%	10.92%	12.59%	Benchmark Breach

3. **Tariff Rate:**

As per the PPA with EB the project tariff is fixed for the lifetime of the project activity at Rs. 5.93/ kWh without any escalation. Any change in the tariff is unlikely for the life time of the project activity. Further as the project is already commissioned it can also be verified that the same PPA is applicable. Hence any sensitivity on tariff is not applicable.

Breaching Benchmark: A variation of 22.00% on the tariff is required to breach benchmark. Any variation in tariff is evidently unrealistic.

Change in Tariff Rate	-10%	0%	10%	22.00%
Project IRR	9.07%	10.92%	12.59%	Benchmark Breach

It can be seen that even at a sensitivity of +10% on tariff, the IRR is still below benchmark.

4. **Cost of O&M:**

The cost of O&M maintenance for the project lifetime is also one of the factors constituting more than 20% of the project cost. Hence this parameter also subjected to a variation of $\pm 10\%$.

Breaching Benchmark: It is clear that the project does not cross benchmark at a variation of 10%. Even 100% variation in the O&M cost the does not breach benchmark.

Change in O&M Cost	-10%	0%	10%	-100%
Project IRR	11.04%	10.92%	10.80%	Not Applicable

As evident, Project IRR is below the benchmark even in most favourable conditions. The project IRR reaches benchmark only through unrealistic variation to the parameters of project cost, PLF and tariff. Further the IRR does not reach the benchmark even if the O & M cost is reduced to 0. All the four scenarios are not possible.

Conclusion of Financial Analysis:

The implementation of the project activity would result in anthropogenic GHG emission reductions. However, the PP is dependent on the projected revenues to be accrued from the sale of carbon credits as it would provide the necessary cover to overcome or alleviate the risks or the barriers faced. Registering the project activity as a GS project, would provide additional revenue to the project activity improving the project's profitability and economic viability. Thus in accordance with the above barrier analysis, the project activity is deemed to be additional.

Step 4: Common practice analysis

Unless the proposed project type has demonstrated to be first-of-its kind (according to Sub-step 3a), and for measures different from those listed in paragraph 6 the above generic additionality tests shall be complemented with an analysis of the extent to which the proposed project type (e.g. technology or practice) has already diffused in the relevant sector and region.

The project activity is not first-of-its kind and also not a measure listed in paragraph 6 of the tool. Therefore, the common practice analysis is carried out as mentioned below:

The project activity is a power generation based on renewable energy, which falls under measures listed in definition section of "Tool for the demonstration and assessment of additionality". Hence, substep 4a is been followed and latest version of tool on Common Practice Version 03.1.

Sub-step 4a: Analyze other activities 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. Therefore, activities similar to the proposed project activity have been selected based on the following assumption:

For Common practice analysis, Version 03.1 of the tool COMMON PRACTICE has been used. As per the tool the following steps have been suggested:

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

The project activity is a 22.5 MW wind power project set up in Rajasthan to generate and supply electricity to the Rajasthan state grid. The project is undergoing GS cycle. The applicable tariff for the project has been determined by the Rajasthan Electricity Regulatory Commission.

Accordingly, all wind power projects set by private project proponents in the state of Rajasthan, have been analysed. Data for the common practice analysis have been sourced from the Indian Wind Power Directory. Considering +/- 50% of the project activity capacity the output range to be considered for the common practice analysis is 11.25 MW to 33.75 MW.

Step 2: identify similar projects (both Carbon Credit and non-Carbon Credit) which fulfil all of the following conditions:

- a) *The projects are located in the applicable geographical area*
- b) *The projects are located in the applicable geographical area.*
- c) *The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity*
- d) *The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant*
- e) *The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1*

The projects started commercial operation before the project design document is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity

As described earlier, similar regulatory tariff framework is applicable in the state of Rajasthan and hence the region of Rajasthan has been chosen for analysis.

The Electricity Act 2003, which came into effect from June 10, 2003, replaced all the acts governing the Indian power sector. Since this Act is applicable to the project activity, all projects commissioned before 2003 have not been considered for the common practice analysis.

Every state in India has its own State Electricity Regulatory Commission. The policy / regulations for each SERC are unique and different from the other. For example parameters like tariff, regulatory frameworks and investment climate varies from state to state. Hence only the projects located in Rajasthan can be compared with the project. The proposed project activity is governed by the policy / regulations of Rajasthan Electricity Regulatory Commission. Wind projects in other states will follow their respective policy / regulations and will be different from that of the proposed project activity. In line with the aforesaid guidelines, the investment climate in the state of Rajasthan is different from that of other state in India. Therefore, the applicable geographical area for common practice analysis has been limited to the state of Rajasthan alone and for projects commissioned after 2003.

- a) The proposed project is a wind power project supplying electricity to the grid. Hence, similar projects in the capacity range which use the same source of energy and apply the same measure have been selected.
- b)
- c) The energy source used by the project activity is wind. Hence, only wind energy projects have been considered for analysis.
- d)
- e) The plants which produce goods or services with comparable quality, properties and applications have been considered.
- f)
- g) The projects within the applicable capacity range have been considered.
- h)
- i) The projects which started commercial operations before the start date of the project activity have been considered as the project start date is before the date of global stakeholder consultation.

Thus, all power plants which supply electricity to the grid in the applicable capacity range and commissioned before the project start date have been considered. From Indian wind energy directory 33 projects were found to satisfy these conditions i.e. between 11.25 MW – 33.75 MW grid connected wind power projects installed in the Rajasthan state before project start date.

Wind projects by individual investors in Rajasthan where the installed capacity is more than 15MW are presented in the table below:

S. No	Project Proponent	Capacity	CDM/GS/IV CS	Reference or Comment
1	Rajasthan State Mines & Mineral Limited	14.8	Yes	14.8 MW small scale grid connected wind power project in Jaisalmer state Rajasthan, India by RSMML. http://cdm.unfccc.int/Projects/DB/BVQI1139048635.42/view
		22.5	Yes	22.5 MW grid connected wind farm project by RSMML in Jaisalmer, India. http://cdm.unfccc.int/Projects/DB/BVQI1201770524.09/view
		15	Yes	15 MW Grid connected renewable energy generation by RSMML. http://cdm.unfccc.int/Projects/DB/DNV-CUK1243661243.16/view
		22.5	Yes	22.5 MW grid connected Wind Energy Project of RSMML of Rajasthan State Mines and Minerals Limited in Jaisalmer Rajasthan State. http://cdm.unfccc.int/Projects/Validation/DB/Y3O8IX2VXOH6L1WCZP48IC1UM74CU3/view.html
		31.5	Yes	31.5 MW grid connected wind power project in Rajasthan http://cdm.unfccc.int/Projects/DB/SIRIM1356423157.78/view
2	Enercon Wind farms Hindustan P. Limited	60	Yes	PDD titled "Enercon Wind Farm (Hindustan) Limited in Rajasthan" http://cdm.unfccc.int/Projects/DB/SGS-UKL1181742063.57/view
3	Senergy Global Private Limited	33.25	Yes	http://cdm.unfccc.int/Projects/Validation/DB/VQM5TF4DSH43SCWUJ90TK4W040VHT2/view.html
4	Rajasthan Ren. Energy Corp. Limited	25	Yes	25 MW Grid Connected Wind Farm project by RRECL in Jaisalmer, India. http://cdm.unfccc.int/Projects/Validation/DB/Y8W0UMSG3DA1VHPT2U3Y4IF9N7S4G/view.html
5	DLF Home Developers	67.5	Yes	PDD titled "Wind Power based electricity generation project in India by DLF Home Developers Limited" http://cdm.unfccc.int/Projects/Validation/DB/34CAG54CUL49MILW9S0SKWCWU38SSX/view.html
6	Enercon Wind Farms (Raj) Private Limited	30.59	Yes	PDD titled "Bundled wind energy power projects (2003 policy) in Rajasthan" http://cdm.unfccc.int/Projects/DB/SGS-UKL1181738388.43/view
7	Enercon Wind Farms (Jaisalmer) Pvt. Ltd.	25	Yes	PDD titled "Bundled Wind power project in Jaisalmer (Rajasthan in India) managed by Enercon (India) Ltd" https://cdm.unfccc.int/Projects/DB/DNV-CUK1143050217.74/view
8	Hindustan Petroleum Corporation Limited	25	Yes	PDD titled "Bundled grid-connected electricity generation using wind energy by Hindustan Petroleum Corporation Limited." https://cdm.unfccc.int/Projects/Validation/DB/H88VQDBMZDVSK37NPUUWXHR25K08FR/view.html

9	Modern Road Makers Private Limited	20	Yes	PDD titled "MRMPL Wind Power Project " http://cdm.unfccc.int/Projects/Validation/DB/AERX8YCUI2RBEAK41JC7IF8SN67G1P/view.html
10	Enercon Wind farms Hindustan P. Ltd.	60	Yes	Enercon Wind Farm (Hindustan) Ltd in Rajasthan https://cdm.unfccc.int/Projects/DB/SGS-UKL1181742063.57/view
11	CEPCO Industries Pvt. Ltd.	23.2	Yes	Cepco Wind Power Project in Rajasthan. http://cdm.unfccc.int/UserManagement/FileStorage/L054TBIUYEQWD9XRZ6KP82SJGONHM3
		12	Yes	Bundled wind energy power projects (2004 policy) in Rajasthan http://cdm.unfccc.int/Projects/DB/SGS-UKL1181723770.26/view
		30.59	Yes	Bundled wind energy power projects (2003 policy) in Rajasthan http://cdm.unfccc.int/Projects/DB/SGS-UKL1181738388.43/view
12	Kohinoor Planet construction Pvt Ltd.	24	Yes	Kohinoor Wind Power Project in Rajasthan. http://cdm.unfccc.int/UserManagement/FileStorage/VSH1BAM05YKP6RLX4F3D7UEWTNIOJ2
13	Ruchi Soya Industries Ltd.	35.1	Yes	35.10 MW Wind Energy Project by Ruchi Soya Industries Limited, India. http://cdm.unfccc.int/UserManagement/FileStorage/REB0AY72GUDJ3WC4P69MF8TO1SQVHN
14	Gujarat Fluorochemicals Ltd.	31.5	Yes	31.5 MW bundled wind power project in Rajasthan by Gujarat Fluorochemicals Limited (GFL) http://cdm.unfccc.int/Projects/Validation/DB/VQM5TF4DSH43SCWUJ90TK4W040VHT2/view.html
		10.5	Yes	10.5 MW wind power project in Ossiya, Rajasthan by Gujarat Fluorochemicals Limited (GFL) http://cdm.unfccc.int/Projects/DB/RWTUV1350294460.35/view
		12	Yes	12 MW wind power project in Sadiya, Rajasthan by Gujarat Fluorochemicals Limited (GFL) http://cdm.unfccc.int/Projects/Validation/DB/4CEPEEWFC0THHS6JK2HEYF64HB9X60/view.html
		19.5	Yes	19.5 MW wind power project in Ossiya, Rajasthan by Gujarat Fluorochemicals Limited (GFL) http://cdm.unfccc.int/Projects/DB/RWTUV1359639593.02/view
		110	Yes	110 MW wind power project in Rajasthan by Gujarat Fluorochemicals Limited https://cdm.unfccc.int/Projects/Validation/DB/YN04VZVGZJGDZ4VVB9G88FU6X3N59H/view.html
15	ReNew Wind Energy (Devgarh) Private Limited	51	Yes	Wind Power Project at Devgarh, Rajasthan https://cdm.unfccc.int/Projects/Validation/DB/T0KNRORQWLDP5BBLUU29D8OKDKC7Q/view.html
16	ReNew Wind Energy (Sipla) Private Limited	50.4	Yes	Wind Power Project at Sipla, Rajasthan https://cdm.unfccc.int/Projects/Validation/DB/Q2GD6XL6TX6UP4SN50Y61KMYF77GU4/view.html
17	CLP Wind Farms (India) Private Limited	67.2	Yes	Wind Energy Project in Sipla, Rajasthan – Phase I https://cdm.unfccc.int/Projects/Validation/DB/5UXXBKOSHMOTDX3FOGTESUAPEBMGON/view.html

18		35.2	Yes	Wind Energy Project in Sipla, Rajasthan – Phase II https://cdm.unfccc.int/Projects/Validation/DB/ON64RNIDNFAJRR6HE2KMPTGLTXEDIO/view.html
19		100.8	Yes	Wind Energy Project in Tejuva, Rajasthan https://cdm.unfccc.int/Projects/Validation/DB/5Z8152I2QTA6EI1AOGYSXIAR9EQVP1/view.html
20		102.4	Yes	Wind energy project near Bhakrani village in Rajasthan https://cdm.unfccc.int/Projects/Validation/DB/WDZP5800SZ931LGP69WPWTK23VC2RB/view.html
21	India Power Corporation Limited (IPCL)	60	Yes	Greenhouse Gas Abatement through installation of wind power project in Jaisalmer, Rajasthan, India. http://cdm.unfccc.int/Projects/Validation/DB/4KTUDCNX5Y93UEFQIREOXB1P0SN249/view.html
22	Green Infra Wind Farms Assets Limited (GIWFAL)	45	Yes	45 MW Wind Energy based Power Generation in Pratapgarh, Rajasthan https://cdm.unfccc.int/Projects/Validation/DB/SSCJ K18JQBKLQ4FLF0YARBAFWZX1Z/view.html
23	Wind World (India) Limited (Earlier Enercon (India) Limited)	54	Yes	Bundled Wind power project in Jaisalmer (Rajasthan in India) managed by Enercon (India) Ltd. https://cdm.unfccc.int/Projects/DB/DNV-CUK1143050217.74/view
		30.59	Yes	Bundled wind energy power projects (2003 policy) in Rajasthan https://cdm.unfccc.int/Projects/DB/SGS-UKL1181738388.43/view
		24.8	Yes	Bundled wind energy power projects (2004 policy) in Rajasthan https://cdm.unfccc.int/Projects/DB/SGS-UKL1181723770.26/view
		20	Yes	Wind Power Project in Tinwari, Rajasthan http://www.vcsprojectdatabase.org/#/project_details/1102
24	VishWind Infrastructure LLP	29.6	Yes	Renewable Energy Wind Power Project in Rajasthan https://cdm.unfccc.int/Projects/DB/BVQI1312546277.77/view
25	Vaayu (India) Power Corporation Private Limited	50.4	Yes	Vaayu India Wind Power Project in Jaisalmer, Rajasthan https://cdm.unfccc.int/Projects/DB/DNV-CUK1315481394.7/view
27	Wind Urja India Private Limited	38.4 (out of 50.4)	Yes	Installation of wind power project in Rajasthan and Tamil Nadu https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1320667973.11/view
28	Terapanth Foods Limited	16.5	Yes	16.5 MW Grid-connected, Bundled Wind Power Project, Jodhpur, Rajasthan, India http://cdm.unfccc.int/Projects/DB/RWTUV1349092273.88/view

29	Hindustan Zinc Limited	27.3	Yes	27.3 MW Wind energy farm at Mokla Rajasthan by HZL http://cdm.unfccc.int/Projects/DB/DNV-CUK1351155785.18/view
		52.50	Yes	52.50 MW Wind energy farm at Mokla Rajasthan by HZL http://cdm.unfccc.int/Projects/DB/DNV-CUK1351252642.79/view
30	IL&FS Wind Power Limited	26.4	Yes	Wind power project in Rajasthan, India https://cdm.unfccc.int/PRCCContainer/DB/prcp795565392/view
31	Mytrah Energy (India) Limited	42	Yes	Wind power project in Rajasthan http://cdm.unfccc.int/Projects/DB/DNV-CUK1354785555.66/view
32	BinduVayuUrja Private Limited (BVUPL)	75.6	Yes	Kaladonger wind power project in Rajasthan
33	LNJ Power Ventures Limited	20	Yes	20 MW LNJP Wind Project Power Project, Rajasthan http://cdm.unfccc.int/Projects/DB/KBS_Cert1356901378.31/view
34	Chamber Constructions Pvt. Ltd.	19.5	Yes	Large Scale Wind Power Project by Chamber Constructions Pvt. Ltd. (EKI-CDM.Mar-11-01) https://cdm.unfccc.int/Projects/Validation/DB/LM6QXZ79TCSO5RR09VE1LFQFVKVB17/view.html
35	EN Wind Power Pvt Ltd	20	Yes	20 MW Wind Project in Rajasthan https://cdm.unfccc.int/Projects/Validation/DB/997FQUCGRM4AI9HMGYLE6D8AYOGRR/view.html
36	Khandke Wind Energy Private Limited (KWEPL)	44	Yes	Wind energy project by KWEPL – 1 https://cdm.unfccc.int/Projects/Validation/DB/1UXQVIT82MSRDLYKGVCKK0LL447YI/view.html
37	Clean Wind Power (Devgarh) Private Limited (CWPPL)	37.5	Yes	37.5 MW Wind power project at Pratapgarh, Rajasthan https://cdm.unfccc.int/Projects/Validation/DB/JIFE5NWIWQUBZSXTGZB7X9J1HCRXNB/view.html
38	DCW Ltd	20	Yes	Clean energy generation from wind energy in the state of Rajasthan http://www.vcsprojectdatabase.org/#/project_details/1063
39	Friends Group of Companies	35.7	Yes	BUNDLED WIND POWER PROJECT IN RAJASTHAN BY FRIENDS GROUP http://www.vcsprojectdatabase.org/#/project_details/842

40	K S Oils Ltd	7.5	Yes	7.5 MW Wind Power project in Jodhpur, Rajasthan http://cdm.unfccc.int/Projects/DB/SGS-UKL1283255712.35/view
		8	Yes	8 MW Wind power project by K.S Oils Ltd http://cdm.unfccc.int/Projects/Validation/DB/9K96F1AVNBCPWHZA103MFZZAEFC345/view.html
		6	Yes	Grid connected wind Power Project in Jodhpur, Rajasthan http://cdm.unfccc.int/Projects/DB/RWTUV1344170771.85/view

It can be seen that, without exception, all private investors in the state of Rajasthan with installations capacity similar to the project activity have those projects as CDM projects. In addition, all similar activities in the state of Rajasthan are CDM projects.

Step 3: Within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}

The project activity identified in Step 2 is already registered/under validation of Carbon Credit mechanisms.

Therefore $N_{all} = 0$

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}

As per paragraph 12 of tool on common practice, "Different technologies are technologies that deliver the same output and differ by at least one of the following (as appropriate in the context of the measure applied in the proposed clean development mechanism (CDM) project activity and applicable geographical area):

- Energy source/fuel.
- Feed stock.
- Size of installation (power capacity)/energy savings.
- Investment climate on the date of the investment decision,
- Nature of the investment

Since no projects have been identified under N_{all} , N_{diff} is found to be zero.

Hence, $N_{diff} = 0$

Step 5: calculate factor $F = 1 - N_{diff}/N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity

$$F = 1 - (0/0)$$

$$\text{Thus } F = 1$$

$$\text{And, } N_{all} - N_{diff} = 0$$

As per paragraph 18 of tool on common practice, the proposed project activity is a common practice within a sector in the applicable geographical area if both the following conditions are fulfilled:

- a) The factor F is greater than 0.2, and
- b) $N_{all} - N_{diff}$ is greater than 3.

Since the $N_{all} - N_{diff}$ is less than 3, the project activity cannot be considered as a common practice within the applicable geographical area.

Sub-steps 4a is satisfied.

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

From sub-step 4a it is clear that all similar projects have been undertaken only as CDM/VCS/GS 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 not a "Common Practice"

Conclusion:

The implementation of the project activity would result in anthropogenic GHG emission reductions. However, the PP is dependent on the projected revenues to be accrued from the sale of carbon credits as it would provide the necessary cover to overcome or alleviate the risks or the barriers faced. Registering the project activity as a CDM project, would provide additional revenue to the project activity improving the project's profitability and economic viability. Thus in accordance with the above analysis, the project activity is deemed to be **additional**.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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As per the applied approved methodology ACM0002 (Version 16.0) Emission Reductions are calculated as follows:

Emission Reductions

$$ER_y = BE_y - PE_y \quad (11)$$

Where:

ER_y = Emission reductions in year y (t CO₂e/yr)

BE_y = Baseline emissions in year y (t CO₂/yr)

PE_y = Project emissions in year y (t CO₂e/yr)

Baseline Emissions:

Baseline Emissions for the amount of electricity supplied by project activity, BE_y is calculated as

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \quad (6)$$

Where,

BE_y = 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)

Calculation of $EG_{PJ,y}$

The calculation of $EG_{PJ,y}$ is different for

- (a) Greenfield plants,
- (b) Retrofits and replacements, and
- (c) Capacity additions.

The project activity is the installation of windmills and it is a green field project. So the formula in option (a) i.e green projects is used to calculate the value of $EG_{PJ,y}$

(a) Greenfield renewable energy power plants: If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$$EG_{PJ,y} = EG_{\text{facility},y} \quad (7)$$

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)

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

The proposed project activity falls under NEWNE grid, which constitutes of both fossil fuels and non-fossil fuels sources of electricity generation. Emission reductions due to the project activity are considered to be equivalent to the baseline emissions, since the wind project would not lead to any project emission and leakage emissions. Emission reductions are related to the electricity exported by the project and the emission coefficient of the grid system

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 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.

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 opted for the project activity i.e. only grid connected 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:

Share of must run sources (% of Net Generation)	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
NEWNE	15.9%	17.6%	19.0%	17.2%	18.0%

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, 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 (tCO₂/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 CO₂ 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 CO₂ 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:

$$EF_{\text{grid,OMsimple,y}} = \sum (EG_{m,y} \times EF_{EL,m,y}) / \sum EG_{m,y} \dots\dots\dots (a)$$

Where:

$EF_{\text{grid,OMsimple,y}}$ Simple operating margin CO₂ emission factor in year y (tCO₂/MWh)

$EG_{m,y}$ Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ CO₂ emission factor of power unit m in year y (tCO₂/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:

$$EF_{EL,m,y} = (\sum FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}) / EG_{m,y} \dots\dots\dots (b)$$

Where:

$EF_{EL,m,y}$ CO₂ emission factor of power unit m in year y (tCO₂/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)
 $EF_{CO_2,i,y}$ CO₂ emission factor of fossil fuel type i in year y (tCO₂/GJ)
 $EG_{m,y}$ Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)⁹
 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

In India, the Central Electricity Authority (CEA) has estimated the baseline emission factor for the power sector. This data has also been endorsed by the DNA and is the most authentic information available in the public domain.

Following tables show the simple OM and Net generation⁹ respectively for the recent three years:

Simple Operating Margin (tCO ₂ /MWh) (incl. Imports)			
	2011-12	2012-13	2013-14
NEWNE	0.9699	0.9919	0.9953

Net Generation in Operating Margin (GWh)			
	2011-12	2012-13	2013-14
NEWNE	421,803	458,043	476,987

Therefore the 3 years net generation weighted OM average for NEWNE grid comes out to be 0.9862 tCO₂/MWh

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

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

- The set of five power units that have been built most recently, or
- 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.

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

⁹ CO₂ Baseline Database for the Indian Power Sector, Version 10.0, Dec 2014

$$EF_{grid,BM,y} = (\sum EG_{m,y} \times EF_{EL,m}) / \sum EG_{m,y} \dots\dots\dots (c)$$

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 CO₂ 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.

Build margin emission factor is calculated, ex-ante as per the most recent data available¹⁰. So, build margin emission factor for NEWNE grid for 2013-2014 is 0.9495 tCO₂/MWh

STEP 6: Calculate the combined margin emissions factor:

The emission factor EF_y 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 EF_y is given by:

$$EF_y = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y} \dots\dots\dots (d)$$

Where:

$EF_{grid,BM,y}$	Build margin CO ₂ emission factor in year y (tCO ₂ /MWh)
$EF_{grid,OM,y}$	Operating margin CO ₂ emission factor in year y (tCO ₂ /MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
w_{BM}	Weighting of build margin emissions factor (%)

According to “Tool to calculate the emission factor for an electricity system” 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 0.9770 tCO₂e/MWh.

Project Emission:

As per the ACM0002 ver-16.0.0, Project Emission for most renewable power generation project activities, $PE_y = 0$. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \dots\dots\dots (1)$$

Where:

PE_y	Project emissions in year y (tCO ₂ e/yr)
$PE_{FF,y}$	Project emissions from fossil fuel consumption in year y (tCO ₂ /yr)
$PE_{GP,y}$	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO ₂ e/yr)
$PE_{HP,y}$	Project emissions from water reservoirs of hydro power plants in year y (tCO ₂ e/yr).

¹⁰ CO₂ Baseline Database for the Indian Power Sector, Version 10.0, Dec 2014

The project activity involves the generation of electricity from the installation of wind turbines. Hence, as per ACM0002, Version 16.0.0 there is no project emission for windmill projects. Therefore, project emissions are zero.

Leakage Emissions: No leakage emissions are considered in the project activity. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). Since the emissions sources are small, it is neglected.

B.6.2. Data and parameters fixed ex ante

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

Data / Parameter	$EF_{OM, y}$
Unit	tCO ₂ e/MWh
Description	Operating Margin Emission Factor of NEWNE Grid
Source of data	Central Electricity Authority: "CO2 Emission Database CEA CO2 Baseline database Version 10" published by Central Electricity Authority (CEA), Ministry of Power, Government of India. http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver10.pdf
Value(s) applied	0.9862
Choice of data or Measurement methods and procedures	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the Simple OM approach in accordance with the procedures prescribed in the approved "Tool to calculate the emission factor for an electricity system"
Purpose of data	The data is used to calculate baseline emission reductions.
Additional comment	The operating margin emission factor is a 3-year generation-weighted average (2011-14) Data calculated to be 0.9862. The operating Margin is calculated ex ante and fixed during the crediting period

Data / Parameter	$EF_{BM, y}$
Unit	tCO ₂ e/MWh
Description	Build Margin Emission Factor of NEWNE Grid
Source of data	Central Electricity Authority: "CO2 Emission Database CEA CO2 Baseline database Version 10" published by Central Electricity Authority (CEA), Ministry of Power, Government of India. http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver10.pdf
Value(s) applied	0.9495
Choice of data or Measurement methods and procedures	Build Margin Emission Factor has been calculated by the Central Electricity Authority with the approved "Tool to calculate the emission factor for an electricity system".
Purpose of data	The data is used to calculate baseline emission reductions.
Additional comment	The Build Margin would be calculated ex ante and fixed during the crediting period. For ex ante calculation the most recent data (2013-14) available has been used and the build margin thus calculated is 0.9495.

Data / Parameter	$EF_{CM, y}$
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Unit	tCO ₂ e/MWh
Description	Combined Margin Emission Factor of NEWNE Grid
Source of data	Central Electricity Authority: "CO ₂ Emission Database CEA CO ₂ Baseline database Version 10" published by Central Electricity Authority (CEA), Ministry of Power, Government of India. http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver10.pdf
Value(s) applied	0.9770
Choice of data or Measurement methods and procedures	Combined Margin Emission Factor has been calculated with the approved " <i>Tool to calculate the emission factor for an electricity system</i> " as weighted average of 75% of OM (three years average) and 25% of BM for the latest year.
Purpose of data	The data is used to calculate baseline emission reductions.
Additional comment	The combined margin would be calculated ex-ante and fixed for the entire crediting period and the combined margin thus calculated is 0.9770.

B.6.3. Ex ante calculation of emission reductions

>>

Ex-ante calculation of emission reductions is equal to ex-ante calculation of baseline emissions as project emissions and leakage associated with the project activity is nil.

Baseline Emission Factor (Combined Margin)= 0.9770tCO₂/MWh

Net electricity supplied to the grid by the project activity:

= 22.5 MW (capacity) X {22.5% (PLF) x100% (Grid Availability)} X 8760 (running hours)

= 44,348 MWh

Baseline emissions

= 44,348MWh X 0.9770 tCO₂/ MWh

= **43,328tCO₂**

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

Year	Baseline emissions (t CO ₂ e)	Project emissions (t CO ₂ e)	Leakage (t CO ₂ e)	Emission reductions (t CO ₂ e)
Year 1	0	43,328	0	43,328
Year 2	0	43,328	0	43,328
Year 3	0	43,328	0	43,328
Year 4	0	43,328	0	43,328
Year 5	0	43,328	0	43,328
Year 6	0	43,328	0	43,328
Year 7	0	43,328	0	43,328
Total	0	303,296	0	303,296
Total number of crediting years	7 years			
Annual average over the crediting period	0	43,328	0	43,328

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

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

Data / Parameter	EG _{facility,y} ¹¹
Unit	MWh
Description	Quantity of net electricity supplied to the grid during the year y.
Source of data	Share Certificate issued by ReGen and JMR (Joint Meter Reading)
Value(s) applied	XX
Measurement methods and procedures	Net electricity supplied is calculated based on the difference between calculated values of “export” (which already accounts for losses during transmission) and “import” on the EB energy meter at the Government substation.. Transmission loss is accounted in Net export at substation based on the readings of Government substation & “primary metering Point”. (Net Electricity = Net Export – Import)
Monitoring frequency	Measurement: Continuous Recording: Monthly Monitoring Method: recording in Joint Meter Reading (GSS meter reading) and in Share certificate (PSS meter/controller reading) Accuracy of GSS Energy Meter: 0.5 or better The JMR includes, monthly recording of electricity export & import of GSS meter and Share certificate includes apportioned export & import of each project owner.
QA/QC procedures	Net electricity supplied to the grid by the project activity will be cross checked with invoices submitted to EB. The meter(s) shall be calibrated and maintained by the state utility as per their own schedule, and this frequency of meter calibration is not within the control of the Project Proponent.
Purpose of data	Calculation of baseline emissions
Additional comment	

B.7.2. Sampling plan

>>

Not Applicable

B.7.3. Other elements of monitoring plan

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The project proponent has entered into agreement with the WTG Suppliers (ReGen) for the operation and maintenance of WTGs. The WTG supplier has dedicated and technically well-equipped O&M team for day to day Operation and maintenance of each WTG. O&M contractor will provide a monthly report, which includes generation data, major breakdown events and machine availability. Project manager is responsible for recording of monthly meter readings of export and import. Monthly power export and import data will be sent regularly to sire in charge of each project separately. All the records will be stored in hard and/or electronically until the end of crediting period plus two years.

¹¹ If the project activity is the installation of a Greenfield power plant, then: $EGPJ,y = EG_{facility,y}$

B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

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The study and application of baseline methodology was completed on 15/04/2015.

Contact Details (The person/entity is not a Project Participant):

Vamsi Krishna M

Kosher Climate India Private Limited,
First Floor, #945, 21st cross, 5th main,
Sector- 7, HSR Layout, Bangalore- 560102,
Mobile: +91- 9945343475
Ph: +91- 80- 25720814
Email: carbon@kosherclimate.com,

SECTION C. Duration and crediting period**C.1. Duration of project activity****C.1.1. Start date of project activity**

>>

01/09/2014- The first purchase order date issued for the project activity

C.1.2. Expected operational lifetime of project activity

>>

25 years 0 months

C.2. Crediting period of project activity**C.2.1. Type of crediting period**

>>

Renewable crediting period

C.2.2. Start date of crediting period

>>

01/04/2015 (Retroactive crediting start date)

C.2.3. Length of crediting period

7 years 0 months

SECTION D. Environmental impacts**D.1. Analysis of environmental impacts**

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As per the prevailing Ministry of Environment and Forest laws, the Schedule 1 of Ministry of Environment and Forests (Government of India) notification dated 14 September (2006), 38 activities are required to undertake environmental impact assessment studies. Environmental Impact Assessment study is not required for wind mill project as there is no negative environmental impact due to the project activity and wind energy is one of the cleanest sources of energy.

D.2. Environmental impact assessment

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Not Applicable

SECTION E. Local stakeholder consultation**E.1. Solicitation of comments from local stakeholders**

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The project is a retroactive GS project. Hence, the LSC meeting is not conducted. However, the LSC feedback round (SFR) has been conducted and the details of the same is explained in the Passport.

E.2. Summary of comments received

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Not Applicable

E.3. Report on consideration of comments received

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Not Applicable

SECTION F. Approval and authorization

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Not Applicable

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Green Horse Bioenergy Private Limited
Street/P.O. Box	301B, 3rd Floor,
Building	D-21 Corporate Park, Sector 21
City	Dwaraka
State/Region	New Delhi
Postcode	110077
Country	India
Telephone	011- 30501110
Fax	
E-mail	
Website	
Contact person	
Title	Director
Salutation	Mr
Last name	Sudhir Nunes
Middle name	
First name	
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Project participant and/or responsible person/ entity	☐ Project participant ☒ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Kosher Climate India Private Limited
Street/P.O. Box	First Floor, #945, 21 st cross, 5 th main
Building	Sector- 7, HSR Layout
City	Bangalore
State/Region	Karnataka
Postcode	560 102
Country	India
Telephone	+91 80 25720814
Fax	+91 80 25720814
E-mail	carbon@kosherclimate.com
Website	www.kosherclimate.com
Contact person	Vamsi Krishna M

Title	Sr. Manager
Salutation	Mr.
Last name	M
Middle name	Krishna
First name	Vamsi
Department	
Mobile	+91 9945343475
Direct fax	+91 80 22100052
Direct tel.	+91 80 22100052
Personal e-mail	vamsi@kosherclimate.com

Appendix 2. Affirmation regarding public funding

Appendix 3. Applicability of methodology and standardized baseline

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

Appendix 5. Further background information on monitoring plan

Appendix 6. Summary of post registration changes

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