Bundled Wind Power Project by Sembcorp Green Infra Limited in India

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Project Title	Bundled Wind Power Project by Sembcorp Green Infra Limited in India
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1 PROJECT DETAILS

1.1 Summary Description of the Project and its Implementation Status

The project activity is a 95.5 MW bundled wind power project consisting of 56 Wind Turbine Generators (WTGs). The purpose of the project activity is to generate clean electricity with utilization of wind energy. The bundled project activity consists of 3 individual projects promoted by:

Project Name	Project Promoters	Capacity	No of WTGs	Capacity & Make	Location
Project 1	Green Infra Wind Energy Limited	22 MW	11	2MW, INOX make (DF100-92M)	Amreli/Rajkot, Gujarat
Project 2	Green Infra Wind Energy Limited	24MW	12	2 MW each of INOX make (DF113-92M)	Surendra Nagar, Gujarat
Project 3	Green Infra Wind Solutions Limited	49.5MW	33	1.5 MW each of ReGen make (V87)	Kurnool, Andhra Pradesh

As described above Project 1 and Project 2 are promoted by the SPV 'Green Infra Wind Energy Limited" and Project 3 is promoted by the SPV "Green Infra Wind Solutions Limited" of which "**Green Infra Wind Energy Limited**" is the representative of promoters of this bundled project.

All the WTGs of the project activity are already commissioned and running.

Project Promoters	Installed Capacity	No of WTGs Commissioned	Capacity	Commissioning Date
Green Infra Wind Energy Limited	22MW	4	8MW	02/03/2017
		2	4MW	22/032017
		2	4MW	24/03/2017
		1	2MW	25/03/2017
		1	2MW	29/03/2017
		1	2MW	28/06/2017
Green Infra Wind Energy Limited	24MW	7	14 MW	31/03/2017
		3	6 MW	30/05/2017
		2	4 MW	30/06/2017
Green Infra Wind Solutions Limited	49.5MW	33	49.5MW	30/03/2017

The electricity generated by the project is exported to the Indian 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.

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.

The estimation of GHG reductions by this project is limited to carbon dioxide (CO2) only. The project activity leads to an emission reduction of 1,910,060 tCO_2 for the chosen crediting period of 10 years.

The current monitoring period chosen is from 02/03/2017 to 31/12/2018 (inclusive of first & last date) and the GHG emission reductions calculated are 221,026 tCO_2

1.2 Sectoral Scope and Project Type

Sectoral Scope: 1 Energy Industries (Renewable/Non-Renewable Sources)

Methodology applied is ACM 0002 of version 19.0

The project is not a grouped project, it consists of 3 independent wind power projects by 2 project developers with combined capacity of 95.5 MW.

1.3 Project Proponent

Organization name	Green Infra Wind Energy Limited
Contact person	Mayank Tyagi
Title	Manager
Address	5th floor, Tower C, Building No. 8, DLF Cybercity, Gurgaon – 122002 Haryana, India
Telephone	0124-3896972
Email	-

1.4 Other Entities Involved in the Project

Organization name	Kosher Climate India Private Limited
Contact person	Vamsi Krishna
Title	Global Business Head
Address	#109, 2nd Floor, 27th Main, HSR Layout, Bangalore- 560102
Telephone	080-25720814
Email	vamsi@kosherclimate.com

1.5 Project Start Date

The project start date for this project is said to be 02/03/2017. This is the day on which the first machine was commissioned.

1.6 Project Crediting Period

02/03/2017 to 01/03/2027 and then for another period of 20 Years (10 years, renewable twice)

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	√ (Yes)
Large project	--

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 1	191,006
Year 2	191,006
Year 3	191,006
Year 4	191,006
Year 5	191,006
Year 6	191,006
Year 7	191,006
Year 8	191,006
Year 9	191,006
Year 10	191,006

Total estimated ERs	1,910,060
Total number of crediting years	10
Average annual ERs	191,006

1.8 Description of the Project Activity

The project activity envisages implementation of a 95.5 MW wind power project consisting of 56 Wind Turbine Generators (WTGs) of individual capacities 1.5MW & 2.0 MW (Refer section 1.1).

The electricity generated by the project will be exported to the INDIAN 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. The project proponent plans to avail VERs benefits for the project.

The project activity is in line with the sustainable development priorities of the country. The electricity generated from the wind farm will be exported to the INDIAN grid and sold to the state electricity utility, thereby marginally contributing to reducing the energy demand supply gap in the Country.

The life time of the Project is 25 years.

Technology

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 project activity is the installation of an environmentally safe and sound technology since there are no GHG emissions associated with the electricity generation.

The technical specifications of the WTGs have been provided as below

1) Project 1":INOX's wind energy technology by implementing DF100 model 2000kW WTGs

INOX DF100	
Power	
Rated power:	2,000.0 kW
Flexible power ratings:	-
Cut-in wind speed:	3.0 m/s
Rated wind speed:	11.0 m/s
Cut-out wind speed:	20.0 m/s
Survival wind speed:	52.5 m/s
Wind zone (DIBt):	-
Wind class (IEC):	IIIb
Rotor	
Diameter:	100.0 m
Swept area:	7,894.0 m²
Number of blades:	3
Rotor speed, max:	15.7 U/min
Tipspeed:	82 m/s

Type:	-
Material:	Epoxy glass fibre
Manufacturer:	-
Power density 1:	253.4 W/m²
Power density 2:	3.9 m²/kW
Gear box	
Type:	spur/planetary
Stages:	3
Ratio:	0.121527778
Manufacturer:	-
Generator	
Type:	doubly fed induction
Number:	1
Speed, max:	1,800.0 U/min
Voltage:	690.0 V
Grid connection:	IGBT
Grid frequency:	50.0 Hz
Hersteller:	-
Tower	
Hub height:	80/92 m
Type:	steel tube
Shape:	conical
Corrosion protection:	painted
Manufacturer:	-

2) "Project 2": INOX's wind energy technology by implementing DF113 model 2000kW WTGs

INOX DF113	
Power	
Rated power:	2,000.0 kW
Flexible power ratings:	-
Cut-in wind speed:	3.0 m/s
Rated wind speed:	11.0 m/s
Cut-out wind speed:	20.0 m/s
Survival wind speed:	52.5 m/s
Wind zone (DIBt):	-
Wind class (IEC):	IIIb
Rotor	
Diameter:	113.0 m
Swept area:	7,894.0 m²
Number of blades:	3
Rotor speed, max:	15.7 U/min
Tipspeed:	82 m/s
Type:	-
Material:	Epoxy glass fibre
Manufacturer:	-
Power density 1:	253.4 W/m²
Power density 2:	3.9 m²/kW
Gear box	

Type:	spur/planetary
Stages:	3
Ratio:	0.121527778
Manufacturer:	-
Generator	
Type:	doubly fed induction
Number:	1
Speed, max:	1,800.0 U/min
Voltage:	690.0 V
Grid connection:	IGBT
Grid frequency:	50.0 Hz
Hersteller:	-
Tower	
Hub height:	80/92 m
Type:	steel tube
Shape:	conical
Corrosion protection:	painted
Manufacturer:	-

3) "Project 3":ReGen's wind energy technology by implementing V87 model 1500kW WTGs.

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	87
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

Emission Reductions from anthropogenic sources:

The wind power generated from the project site will be displacing the electricity generated from thermal power stations feeding into INDIAN grid and will be replacing the usage of fossil fuels for meeting the power demand in the region. Since wind power is Green House Gas (GHG) emissions free, the power generated will prevent the anthropogenic GHG emissions generated by the fossil fuel based thermal power stations comprising coal, diesel, furnace oil and gas. The estimation of GHG reductions by this project is limited to carbon dioxide (CO_2) only.

1.9 Project Location

The project activity is located in three states of India. The table provides details of location of each project:

Project	Project Promoters	Capacity	Location
Project 1	Green Infra Wind Energy Limited	22 MW	Amreli/Rajkot, Gujarat
Project 2	Green Infra Wind Energy Limited	24MW	Surendra Nagar, Gujarat
Project 3	Green Infra Wind Solutions Limited	49.5MW	Kurnool, Andhra Pradesh

Project 1: The below table provides details of location of individual WTGs (Latitude and Longitude in UTM format) of the project

No	WTG No	Village	Taluka	District	Latitude	Longitude
1	RJ9T094	Kalasar	Jasdan	Rajkot	739035	2446752
2	RJ9T099	Lilapur	Jasdan	Rajkot	735820	2445863
3	RJ9T076	Godladhar	Jasdan	Rajkot	742071	2440770
4	RJ9T096	Kalasar	Jasdan	Rajkot	739190	2447508
5	RJ9T078	Godladhar	Jasdan	Rajkot	739854	2440463
6	RJ9T095	Kalasar	Jasdan	Rajkot	739199	2447187
7	RJ9T39	Hirana	Lathi	Amreli	751083	2417994
8	RJ9T13	Miya Khijadiya	Babra	Amreli	726104	2422345
9	RJ8T073	Sukavada	Babra	Amreli	734113	2428733
10	RJ9T40	Hirana	Lathi	Amreli	752563	2417609
11	RJ-9T-075	Ambaradi	Jasdan	Rajkot	745034	2438121

Project 2: The below table provides details of location of individual WTGs (Latitude and Longitude in UTM format) of the project

No	WTG No	Village	Taluka	District	Latitude	Longitude
1	SDLT33	Jepur (Ranipat)	Muli	Surendranager	728758	2515365
2	SDLT30	Jepur (Ranipat)	Muli	Surendranager	728242	2513784
3	SDLT-168	Vadadhra	Muli	Surendranager	736214	2518195
4	SDLT-169	Vadadhra	Muli	Surendranager	735589	2518442
5	SDLT-170	Vadadhra	Muli	Surendranager	735379	2519002
6	SDLT-38	Jepur (Ranipat)	Muli	Surendranager	726902	2515469
7	SDLT-99	Asundrali	Muli	Surendranager	735775	2509040
8	SDLT98	Asundrali	Muli	Surendranager	735515	2509279
9	SDLT171	Vadadhra	Muli	Surendranager	734427	2519294
10	SDLT172	Vadadhra	Muli	Surendranager	735133	2517811
11	SDLT95	Palasa	Muli	Surendranager	739672	2504620
12	SDLT96	Palasa	Muli	Surendranager	739272	2505043

Project 3: The below table provides details of location of individual WTGs (Latitude and Longitude in UTM format) of the project

No	WTG No	Village	Taluka	District	Latitude	Longitude
1	GISKK-01	Gundlakonda	Pattikonda	Kurnool	780740	1717081
2	GISKK-02	Gundlakonda	Pattikonda	Kurnool	780775	1717340
3	GISKK-03	Gundlakonda	Pattikonda	Kurnool	780343	1717660
4	GISKK-04	Gundlakonda	Pattikonda	Kurnool	778362	1718372
5	GISKK-05	Kunkanuru	Pattikonda	Kurnool	779465	1718496
6	GISKK-06	Kunkanuru	Pattikonda	Kurnool	779104	1720791
7	GISKK-07	Jilledubudakala	Pattikonda	Kurnool	781853	1718609
8	GISKK-08	Gundlakonda	Pattikonda	Kurnool	779439	1718757
9	GISKK-09	Devanakonda	Pattikonda	Kurnool	778321	1718745
10	GISKK-10	Jilledubudakala	Pattikonda	Kurnool	784238	1719336
11	GISKK-11	Jilledubudakala	Pattikonda	Kurnool	781987	1720331
12	GISKK-12	Kunkanuru	Pattikonda	Kurnool	779386	1719013
13	GISKK-13	Kunkanuru	Pattikonda	Kurnool	779206	1719309
14	GISKK-14	Jilledubudakala	Pattikonda	Kurnool	784062	1719788
15	GISKK-15	Jilledubudakala	Pattikonda	Kurnool	781967	1720622
16	GISKK-16	Jilledubudakala	Pattikonda	Kurnool	781816	1718898
17	GISKK-17	Kunkanuru	Pattikonda	Kurnool	779107	1719615
18	GISKK-18	Jilledubudakala	Pattikonda	Kurnool	784055	1720113
19	GISKK-19	Jilledubudakala	Pattikonda	Kurnool	781655	1719259
20	GISKK-20	Kunkanuru	Pattikonda	Kurnool	779046	1719884
21	GISKK-21	Jilledubudakala	Pattikonda	Kurnool	781310	1720052
22	GISKK-22	Kunkanuru	Pattikonda	Kurnool	778883	1720090
23	GISKK-23	Kunkanuru	Pattikonda	Kurnool	778564	1729322

24	GISKK-24	Jilledubudakala	Pattikonda	Kurnool	781317	1719789
25	GISKK-25	Jilledubudakala	Pattikonda	Kurnool	784341	1721601
26	GISKK-26	Jilledubudakala	Pattikonda	Kurnool	782355	1719803
27	GISKK-27	Jilledubudakala	Pattikonda	Kurnool	781941	1720844
28	GISKK-28	Jilledubudakala	Pattikonda	Kurnool	783067	1720789
29	GISKK-29	Kappatralla	Pattikonda	Kurnool	781913	1723561
30	GISKK-30	Kappatralla	Pattikonda	Kurnool	781754	1723914
31	GISKK-31	Jilledubudakala	Pattikonda	Kurnool	783869	1722069
32	GISKK-32	Jilledubudakala	Pattikonda	Kurnool	782309	1722999
33	GISKK-33	Kappatralla	Pattikonda	Kurnool	782234	1723331

1.10 Conditions Prior to Project Initiation

The project is Greenfield project. There was no project installed prior to commissioning of this project. The project activity is set up to produce clean power from the Wind Turbine Generators (WTGs). The project activity involves supply, erection, commissioning and operation of 56 machines of rated capacity 1.5 MW & 2MW each totalling an installed capacity of 95.5 MW.

The project does not generate any GHG emissions and hence it can be said that the project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal or destruction.

In the absence of the project activity the equivalent amount of electricity sold to grid would have been generated by grid connected power plants (which is predominantly based on fossil fuels) and by the addition of new generation sources.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Indian Electricity Act, 2003[1], does not restrict the choice of fuel for power generation. Moreover, it does not mandate electricity generation from wind projects, although there are specific state policies to promote the utilisation of renewable sources of energy, so as to cut dependence on coal, which is the mainstay fuel for power generation in India. Hence no national or sectoral policies prevent the implementation of either the baseline or the project activity. Given that the project activity is generation of electricity using wind energy and exporting the same to the grid system, which is also fed by other fuel sources such as fossil and non-fossil types. Emission reductions due to the project activity are considered to be equivalent to the emissions avoided in the baseline scenario by displacing the grid electricity. Emission reductions are related to the electricity exported by the project and the actual generation mix in the grid system.

[1] http://www.cea.nic.in/reports/electricity_act2003.pdf

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The project activity comprises of 56 WTGs each owned by “Project Participants” commissioning certificates will be available for verification.

1.12.2 Emissions Trading Programs and Other Binding Limits

Not Applicable. The project activity has applied for registration under VCS programme only and hence GHG emission reductions and removals generated by the project will not be used for compliance under such programs or mechanisms. Further it is clarified that GHG emissions from Project activity are not included in any other emissions trading program or any other mechanism that includes GHG allowance trading.

1.12.3 Other Forms of Environmental Credit

Not Applicable.

1.12.4 Participation under Other GHG Programs

The project is not seeking registration under any other GHG programs.

1.12.5 Projects Rejected by Other GHG Programs

No, the project activity is not rejected by other GHG programs

1.13 Additional Information Relevant to the Project

Eligibility Criteria

Not Applicable.

Leakage Management

Not Applicable.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Sustainable Development

Social wellbeing: The project helps in generating employment opportunities during the construction and operation phases. The project activity leads to development in infrastructure in the region like development of roads and also may promote locals business with improved power generation. The project proponent will contribute 2% of net revenue realised from sale of VERs towards community development initiatives.

Economic wellbeing: The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits. The project activity will also help to reduce the demand supply gap in the state.

Environmental Wellbeing: The project activity will generate power using zero emissions wind based power generation which helps to reduce GHG emissions and specific pollutants like SOx, NOx, and SPM associated with the conventional thermal power generation facilities.

Technological wellbeing: The successful operation of project activity would lead to promotion of wind based power generation and would encourage other entrepreneurs to participate in similar projects.

Further Information

Not applicable as, there are no information that may have a bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The methodology applied for the project is Approved Large Scale Consolidated Methodology: ACM0002 "Grid-connected electricity generation from renewable sources" (Version 19.0, EB100)[2]

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

- Methodological Tool: Tool to calculate the emission factor for an electricity system - Version 7.0, EB 100, Annex 6[3].
- Methodological Tool: Tool for the demonstration and assessment of additionality - Version 07.0.0, EB 70 Annex 8[4].

2.2 Applicability of Methodology

The following steps will show the applicability of the project under this methodology.

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 (e) involve a replacement of (an) existing plant(s)/unit(s)	The proposed project activity is a Green field, Indian grid connected renewable power plant. Therefore, it confirms to the said criteria

[2] http://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD

[3] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf/history_view

[4] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf

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 between the start of this minimum historical reference period and the implementation of the project activity	The proposed project activity is the installation of a new wind power plant/unit. Therefore, the said criteria is not applicable
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: (a) Demonstrate that water flow from upstream power plants/units spill directly to the	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criterion is not applicable

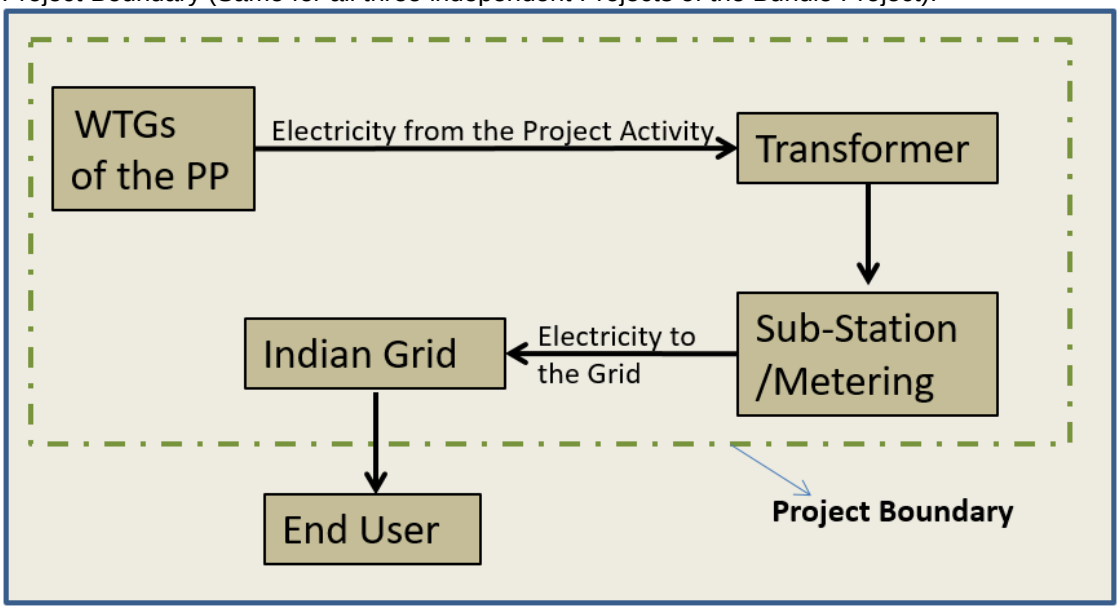
downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or (b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability 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 green field wind power plant. Therefore, the said criterion is not applicable.
In addition, the above applicability conditions the applicability conditions of tool (Tool to calculate the emission factor for an electricity system) referred in the methodology ACM0002, version 19.0 has been referred here under:	
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 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	Since the project activity is grid connected, this condition is applicable and the emission factor has been calculated accordingly.

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.	
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, a 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 bio fuels is zero	The project activity is a grid connected wind power project and therefore, this criterion is not applicable for the project activity

2.3 Project Boundary

Source		GHGs	Included?	Justification/Explanation
Baseline	CO2 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
Project	For dry or flash steam geothermal power plants, emissions of CH4 and CO2 from noncondensable gases contained in geothermal steam	CO_2	No	Main emission source
		CH_4	No	Main emission source
		N_2O	No	Minor emission source
	For binary geothermal power plants, fugitive emissions of CH4 and CO2 from noncondensable gases contained in geothermal steam	CO_2	No	Main emission source
		CH_4	No	Main emission source
		N_2O	No	Minor emission source
	For binary geothermal power plants, fugitive emissions of hydrocarbons such as n-butane and isopentane (working fluid) contained in the heat exchangers	Low GWP hc/ refrige-rant	No	Main emission source
	CO2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
	For hydro power plants, emissions of CH4 from the reservoir	CO_2	No	Minor emission source
		CH_4	No	Main emission source
		N_2O	No	Minor emission source

Project Boundary (Same for all three independent Projects of the Bundle Project):



2.4 Baseline Scenario

As per the approved consolidated Methodology ACM0002 (Version 19.0, EB 100, Annex 6) para 22:

"If the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system", Version 7.0, EB 100, Annex 4.

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 to the electricity grid by the operation of grid-connected power plants (mainly by fossil fuel fired plants) and by the addition of new generation sources, as reflected in the combined margin (CM) calculations.

Hence, the baseline for the project activity is the equivalent amount of power from the Indian grid.

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

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

Parameter	Value	Nomenclature	Source
$EF_{grid,CM,y}$	0.9475 tCO_2/MWh	Combined margin CO_2 emission factor for the	Calculated as the weighted average of the operating margin (0.75) & build margin (0.25) values, sourced from Baseline CO_2 Emission

		project electricity system in year y	Database, Version 13.0 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,OM,y}$	0.9726 tCO_2/MWh	Operating margin CO_2emission factor for the project electricity system in year y	Calculated as the last 3 year (2014-15, 2015-16 & 2016-17) generation-weighted average, sourced from Baseline CO_2Emission Database, Version 13.0, published by Central Electricity Authority (CEA), Government of India
$EF_{grid,BM,y}$	0.8723 tCO_2/MWh	Build margin CO_2emission factor for the project electricity system in year y	Baseline CO_2 Emission Database, Version 13.0, published by Central Electricity Authority (CEA), Government of India

The baseline case is in compliance with all applicable legal and regulatory requirements references.

2.5 Additionality

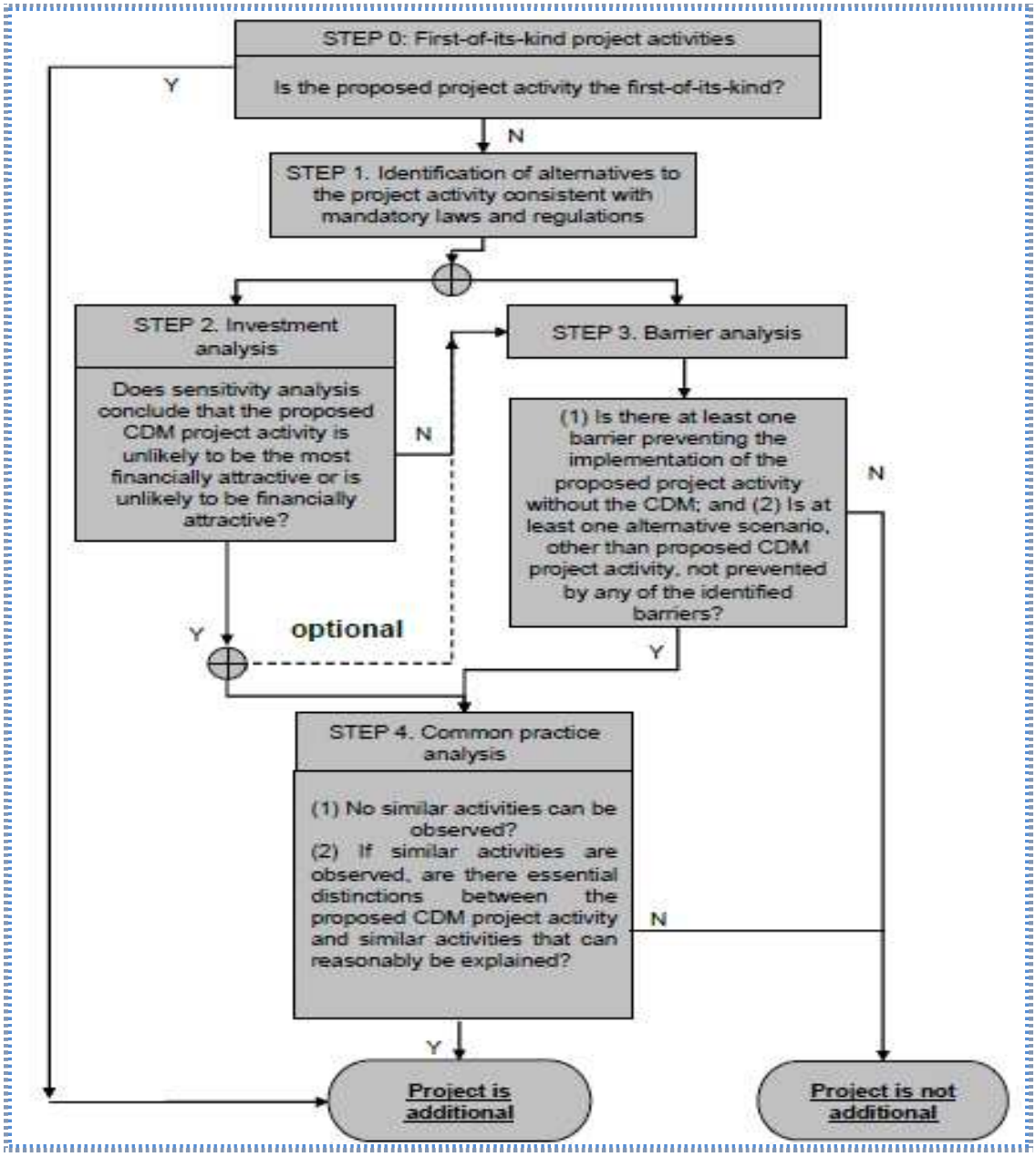
The table below is only applicable if the proposed project activity is a type of project activity which is deemed automatically additional, as defined by the applied approved methodology or standardized baseline.

Specify the methodology or standardized baseline that establishes automatic additionality for the proposed project activity (including the version number and the specific paragraph, if applicable).	NA
Describe how the proposed project activity meets the criteria for automatic additionality in the relevant methodology or standardized baselines.	NA

The proposed project generates power using wind energy which is a renewable, zero emission source of energy. Baseline considerations for the project are based on approved consolidated baseline methodology ACM0002 (Version 19.0).

The project follows section 5.3.2 which requires the project proponent to determine the additionality based on "Tool for the demonstration and assessment of additionality", Version 07.0.0.

The step-wise approach to establish additionality of the project activity has been followed, details of which are provided in the following paragraphs:



As per the applied methodology requirement, Additionality of the project activity is demonstrated using the Methodological tool "Tool for the demonstration and assessment of additionality" Version 07.0.0. The tool defines the following steps:

Sub 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 as implementation of wind power project in the State is not first of its kind.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations
As per the applied ACM 0002 version 19.0; Para 22, *if the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity delivered to the grid by the project*

activity would have otherwise been generated by the operation of grid connected power plant and by the addition of new generation sources.
As the baseline scenario is prescribed by applied methodology, hence no further analysis is carried out to identify alternatives.

Step 2: Investment Analysis
As per para 29 of "Tool for the demonstration and assessment of additionality" v7.0.0, it is determined that the proposed project activity is not an economically attractive or financially feasible option.
To conduct the investment analysis, Methodological tool: Investment analysis, version 6.0, EB 85 Annex 12 has been referred.

Sub-step 2a: Determine appropriate analysis method
As per "Tool for the demonstration and assessment of additionality" (version 07.0.0), for financial analysis of the project, the following three options are available:

Option I: Simple Cost Analysis
Option II: Investment Comparison Analysis
Option III: Benchmark Analysis

The project will generate revenues from sale of electricity, therefore Option I is not applicable in line with para 32 of the Methodological tool: "Tool for the demonstration and assessment of additionality", version 7.0. Same applies to the Option II which is applied in case there are alternatives to the project activity as per para 42 of the "Tool for the demonstration and assessment of additionality", version 7.0.

Since, identified baseline for the proposed project activity is continuation of current practice (i.e. equivalent amount of energy would be generated by grid electricity system through its currently operating power plants and by new capacity addition) and which is outside the direct control of the project participant, hence benchmark analysis (option III), where the returns on investment in the project activity are compared to benchmark returns that are available to any investors in the country is selected as the most appropriate method.

Sub-step 2b: Option III. Apply benchmark analysis
As per Para 16 of EB85, Annex 12 states that Required/expected returns on equity are appropriate benchmarks for equity IRR. The project participant has chosen benchmark analysis to demonstrate the additionality of the project. The project is promoted by limited company and hence the return on equity and the risks associated with the investments for their shareholder is of primary concern. Hence, in order to analyze the financial viability of the project activity, the prime financial indicator that has been used is the post-tax equity IRR of the project activity.

Selection of Appropriate Benchmark
The benchmark has been considered in accordance with Guidance 18 and 19 of EB85, Annex 12, "The values in the table in the Appendix may also be used, as a simple default option".

Methodology deployed for arriving at a suitable value of Benchmark using Default Value has been described below:

- As the proposed project activity generates power utilizing wind energy, Group 1 as per para 5a of Appendix of EB85, Annex 12 has been identified as a suitable category.
- The investment analysis has been carried out in Nominal terms. Accordingly, Default value as given in table under the Appendix, EB85, Annex 12 has been adjusted by adding suitable forecasted inflation rate taken from RBI (Central Bank, India).
- In case of inflation data from RBI, Benchmark has been calculated based on WPI median inflation rate. As per Para 17 of EB85, Annex 12, the inflation forecast should be for the duration of the

crediting period. However, since RBI provides forecast inflation only for 5 & 10 years, the project investor has calculated benchmark using 5 year & 10 Years forecast and the most conservative value is considered as Benchmark for the project activity.

The decision-making date for all the 3 independent projects in the bundle is same and the hence applicable inflation rate is same along with resultant benchmark.

The benchmark has been computed in the following manner:

Default Value Benchmark:

The cost of equity is determined by selecting the values provided in the table of the Appendix, i.e. Default values for cost of equity (expected return on equity) in the 'Methodological tool: Investment analysis'.

The Required return on equity (benchmark) was computed in the following manner:

Nominal Benchmark[5] = {(1+Real Benchmark)*(1+Inflation rate)}-1

Where:
Default value for Real Benchmark = 11.10% (as per Appendix of EB85, Annex 12)
Inflation Rate forecast for by Reserve Bank of India (RBI) (i.e. Central Bank of India) for India.

Benchmark estimation:
The Cost of Equity has been considered using the "Methodological tool: Investment analysis" available at the time of decision making as well as the latest available value. As a conservative approach, the minimum value of benchmark has been considered as calculated using these 2 approaches.
Table under Appendix in EB85, Annex 12 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = **11.10%**[6]

Thus, minimum cost of equity considered for calculation of Benchmark = 11.10%

Inflation Forecast for India as per RBI website[7] and corresponding benchmark values:

Project Promoters' Name	Inflation Forecast		Benchmark	
	5 Years	10 Years	5 Years	10 Years
Project Participants	5.00%	4.80%	16.66%	16.43%

As a conservative approach, benchmark of **16.43%** has been selected for this project activity.

Sub-step 2c: Calculation and comparison of financial indicators
The period considered for Post Tax Equity IRR calculations is 25 years, which corresponds to the operational lifetime of the project activity.

Depreciation, and other non-cash items related to the project activity, which have been deducted in estimating gross profits on which tax is calculated, is added back to net profits for the purpose of calculating the financial indicator.

[5] As per Pg. 320 of Corporate Finance, Second Edition of Aswath Damodaran

[6] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v7.0.pdf

[7] https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=16217

Post Tax Equity IRR for the WTGs under proposed project activity against the benchmark values are shown in table below. Thus, it is evident that the project is not financially attractive as the equity IRR is less below the benchmark value.

Project 1 Post tax Equity IRR	11.71%
Project 2 Post tax Equity IRR	11.80%
Project 3 Post tax Equity IRR	10.63%
Benchmark Value	16.43%

Sensitivity Analysis

The robustness of the conclusion drawn above, namely that the project is not financially attractive, has been tested by subjecting critical assumptions to reasonable variation. As required by EB85, Annex 12 , only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation. PP has identified the total revenue from the project activity is dependent on the Tariff, Plant Load Factor, Project Cost and O&M Costs constitute more than 20% of the project costs. These factors have been subjected to a 10% variation on either side and the results of the sensitivity analysis indicate that even after applying such variation the EIRR does not cross the benchmark.

Project 1 (22 MW):

Factors	-10%	Normal	10%	% Variation to reach benchmark	Value required to reach benchmark
Tariff	9.11%	11.71%	14.36%	17.51%	4.924 INR/kWh
PLF	9.01%	11.71%	14.48%	16.75%	29.19%
Project Cost	14.97%	11.71%	9.21%	-13.67%	1274.23 INR (Mn)
O&M Cost	11.98%	11.71%	11.44%	NA	NA

An analysis has been done to identify the percentage variation at which the financial indicators will equal/breach the benchmark and the probability of its occurrence. Based on sensitivity analysis it can be concluded that the proposed project activity is additional with reasonable variation in values and is not likely to reach the benchmark value. The occurrence of these events is unlikely for the following reasons:

a) **Tariff:** The Tariff rate of electricity used for investment analysis i.e. 4.19 INR/kWh is sourced from the DPR estimate applicable at the time of investment decision. Furthermore, the project will breach the benchmark value at a tariff variation of 17.51%. However, the electricity tariffs are fixed for the lifetime of the project activity and PPA has already been signed for the tariff rate of 4.19 INR/kwh; hence this is not a likely scenario.

b) **PLF:** The PLF value considered is based on Third Party PLF report i.e. 25% and the IRR breach the benchmark value at a PLF variation of more than 16.75%. The increase in PLF value to breach the benchmark is highly unlikely as the normative PLF for the state of Gujarat published by state electricity regulatory commission recommends PLF as 24.5%[8]

[8] http://www.gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf

and equity IRR at normative PLF values are less than the benchmark value and given the analysis above its highly unlikely that PLF will increase above breaching value.

c) **Project Cost:** The project cost considered for investment analysis i.e. 1476.00 million INR. The cost is sourced from DPR which is based on the negotiations with Supplier. A variation of -13.67% is required for IRR to breach benchmark which is not possible as the project is already commissioned. The actual cost incurred in commissioning of the project is realized at 1386.00 million INR which is within the sensitivity applied.

d) **O&M Costs:** The sensitivity analysis reveals that O&M will breach the benchmark at negative values and is hypothetical case. Since the O&M cost is subject to escalation (as evidence by the O&M agreement) and also subject to inflationary pressure, any reduction in the O&M costs is highly unlikely. The O&M contract has been executed exactly at the same estimated value referred in the IRR spread sheet INR 1.50 Mn/WTG from the 3rd year.

Project 2 (24 MW):

Factors	-10%	Normal	10%	% Variation to reach benchmark	Value required to reach benchmark
Tariff	9.19%	11.80%	14.47%	17.07%	4.905 INR/kWh
PLF	9.06%	11.80%	14.59%	16.31%	28.50%
Project Cost	15.08%	11.80%	9.28%	-13.38%	1361.41 INR (Mn)
O&M Cost	12.07%	11.80%	11.44%	NA	NA

An analysis has been done to identify the percentage variation at which the financial indicators will equal/breach the benchmark and the probability of its occurrence. Based on sensitivity analysis it can be concluded that the proposed project activity is additional with reasonable variation in values and is not likely to reach the benchmark value. The occurrence of these events is unlikely for the following reasons:

e) **Tariff:** The Tariff rate of electricity used for investment analysis i.e. 4.19 INR/kWh is sourced from the DPR estimate applicable at the time of investment decision. Furthermore, the project will breach the benchmark value at a tariff variation of 17.07%. However, the electricity tariffs are fixed for the lifetime of the project activity and PPA has already been signed for the tariff rate of 4.19 INR/kwh; hence this is not a likely scenario.

f) **PLF:** The PLF value considered is based on Third Party PLF report i.e. 24.5% and the IRR breach the benchmark value at a PLF variation of 16.31%. The increase in PLF value to breach the benchmark is highly unlikely as the normative PLF for the state of Gujarat published by state electricity regulatory commission recommends PLF as 24.5%[9] and equity IRR at normative PLF values are less than the benchmark value and given the analysis above its highly unlikely that PLF will increase above breaching value.

g) **Project Cost:** The project cost considered for investment analysis i.e. 1571.70 million INR. The cost is sourced from DPR which is based on the negotiations with Supplier. A variation of -13.38% is required for IRR to breach benchmark which is not possible as the project is already commissioned. The actual cost incurred in commissioning of the project is realized at 1526.65 million INR which is within the sensitivity applied.

[9] http://www.gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf

h) **O&M Costs:** The sensitivity analysis reveals that O&M will breach the benchmark at negative values and is hypothetical case. Since the O&M cost is subject to escalation (as evidence by the O&M agreement) and also subject to inflationary pressure, any reduction in the O&M costs is highly unlikely. The O&M contract has been executed exactly at the same estimated value referred in the IRR spread sheet INR 1.50 Mn/WTG from the 3rd year.

Project 3 (49.5 MW):

Factors	-10%	Normal	10%	% Variation to reach benchmark	Value required to reach benchmark
Tariff	8.99%	11.63%	14.32%	17.58%	5.691 INR/kWh
PLF	8.81%	11.63%	14.43%	16.86%	26.88%
Project Cost	14.88%	11.63%	9.13%	-13.89%	3003.17 INR (Mn)
O&M Cost	11.94%	11.63%	11.32%	NA	NA

An analysis has been done to identify the percentage variation at which the financial indicators will equal/breach the benchmark and the probability of its occurrence. Based on sensitivity analysis it can be concluded that the proposed project activity is additional with reasonable variation in values and is not likely to reach the benchmark value. The occurrence of these events is unlikely for the following reasons:

i) **Tariff:** The Tariff rate of electricity used for investment analysis i.e. 4.84 INR/kWh is sourced from the DPR estimate applicable at the time of investment decision. Furthermore, the project will breach the benchmark value at a tariff variation of 17.58%. However, the electricity tariffs are fixed for the lifetime of the project activity and PPA has already been signed for the tariff rate of 4.84 INR/kwh; hence this is not a likely scenario.

j) **PLF:** The PLF value considered is based on Third Party PLF report i.e. 23.00% and the IRR breach the benchmark value at a PLF variation of more than 16.86%. The increase in PLF value to breach the benchmark is highly unlikely as the normative PLF for the state of Andhra Pradesh published by state electricity regulatory commission is 23.5%[10] and equity IRR at normative PLF values are less than the benchmark value and given the analysis above its highly unlikely that PLF will increase above breaching value.

k) **Project Cost:** The project cost considered for investment analysis i.e. 3487.60 million INR. The cost is sourced from DPR which is based on the negotiations with Supplier. A variation of -13.89% is required for IRR to breach benchmark which is not possible as the project is already commissioned. The actual cost incurred in commissioning of the project is realized at 3393.66 million INR which is within the sensitivity applied.

l) **O&M Costs:** The sensitivity analysis reveals that O&M will breach the benchmark at negative values and is hypothetical case. Since the O&M cost is subject to escalation (as evidence by the O&M agreement) and also subject to inflationary pressure, any reduction in the O&M costs is highly unlikely. The O&M contract has been executed exactly at the same estimated value referred in the IRR spread sheet INR 1.35 Mn/WTG from the 3rd year.

[10] http://aperc.gov.in/admin/upload/15135773708995996225a375b9a21708.pdf

The sensitivity analysis proves that varying the parameters does not lead to a Post Tax Equity IRR without carbon credits revenue, which will cross the benchmark value.

The carbon revenue from the project activity would provide significant amount of returns from the sale of the Emission Reductions accrued from the project activity and in turn increase the financial attractiveness of the project activity and hence make the project activity more financially viable.

Step 3: Barrier analysis
Barrier analysis has not been used.

Step 4: Common practice analysis
Stepwise approach for common practice analysis has been carried out as per Methodological tool "Common Practice", version 03.1 EB84, Annex 7:

(a) The projects are located in the applicable geographical area;
(b) The projects apply the same measure as the proposed project activity;
(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;
(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

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

Project 1: The capacity of the project activity is 22 MW and hence the output range as per the guideline is selected to be 15 MW to 33 MW.

Project 2: The capacity of the project activity is 24 MW and hence the output range as per the guideline is selected to be 15 MW to 36 MW.

Project 3: The capacity of the project activity is 49.50 MW and hence the output range as per the guideline is selected to be 24.75 MW to 74.25 MW.

Step (2): Identification of the similar projects (CDM and non-CDM) is carried out as per sub-steps of Step (2) as follows:

a) As the project is located in India, therefore, the applicable geographical area is India and projects in the host country India have been chosen for analysis.
b) The projects applying same measure (i.e, only renewable energy through wind) are selected as the proposed project activity is wind power project.
Therefore, all projects applying same measure (b) as the proposed project activity are candidates for similar projects.
c) The energy source used by the project activity is wind. Hence, only wind energy projects have been considered for analysis.
d) The project activity produces electricity; therefore, all power plants that produce electricity are candidates for similar projects.
e) The capacity range of the projects is within the applicable capacity range for the chosen projects (Project 1: 15 MW to 33 MW, Project 2: 15 MW to 36 MW, Project3: 24.75 MW to 74.25 MW)

f) The decision making date for all the project is same on 01st September 2016. As Kyoto Protocol was ratified by India on 26/08/2002 [11], therefore projects which had started commercial operation between 26/08/2001 to project's start date, have been identified.

Project 1;
Numbers of Similar projects identified, which fulfil above-mentioned conditions are
N_{wind} = 60

Project 2;
Numbers of Similar projects identified, which fulfil above-mentioned conditions are
N_{wind} = 64

Project 3;
Numbers of Similar projects identified, which fulfil above-mentioned conditions are
N_{wind} = 38

The projects considered for analysis are sourced from "Directory - Indian Wind Power published by CECL".

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}.*

CDM project activities, which have got registered, submitted for registration or are under validation have been excluded in this step. The list of the power plants identified is provided to the DOE. After excluding the registered, submitted for registration and under validation projects the total number of projects,

Project 1;
N_{all} = 12

Project 2;
N_{all} = 13

Project 3;
N_{all} = 7

N_{all} = 7

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}.*

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

The policies/tariff for each state is regulated by the State Electricity Regulatory Commission of the respective states. The Project 1 & Project 2 are located in the state of Gujarat of India where the policy applicable for the wind projects is regulated by Gujarat Electricity Regulatory Commission.

Project 3 in the state of Andhra Pradesh of India where the policy applicable for the wind projects is regulated by Andhra Pradesh Electricity Regulatory Commission.

[11] http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php

Therefore, it can be assumed that the policies and tariff are different in different states and hence projects installed in other states have been considered in N_{diff}. The identified projects in N_{all} (step 3) located in states other than project's home state and are regulated by the respective State Electricity Regulatory Commissions (SERCs). Therefore, these projects come under different investment climate and have been considered under N_{diff}.

Project 1;
N_{diff} = 10

Project 2;
N_{diff} = 11

Project 3;
N_{all} = 6

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.*

Project 1:
Calculate **$F = 1-N_{diff}/N_{all}$**
F = 1-(10/12) = **0.167**
N_{all} - N_{diff} = 12 - 10 = 2

Outcome of Step 5:

As,
i. F = 0.167; is less than 0.2
ii. N_{all}-N_{diff} = 2; is not more than 3

Project 2:
Calculate **$F = 1-N_{diff}/N_{all}$**
F = 1-(11/13) = **0.154**
N_{all} - N_{diff} = 13 - 11 = 2

Outcome of Step 5:

As,
i. F = 0.154; is less than 0.2
ii. N_{all}-N_{diff} = 2; is not more than 3

Project 3:
Calculate **$F = 1-N_{diff}/N_{all}$**
F = 1-(6/7) = **0.143**
N_{all} - N_{diff} = 7 - 6 = 1

Outcome of Step 5:

As,
iii. F = 0.143; is less than 0.2
iv. N_{all}-N_{diff} = 1; is not more than 3

The proposed project activities are not a "common practice" within a sector in the applicable geographical area.

Chronology:
The below table represents the chronology of the project activity:

Events related to project implementation	VCS relevant events	Project 1	Project 2	Project 3
Completion of DPR		31/08/2016	31/08/2016	31/08/2016
Board decision for investment & securing carbon credits	Investment decision	01/09/2016	01/09/2016	01/09/2016
Placement of the Purchase Orders	Projects' Start date	23/11/2016	07/10/2016	03/09/2016
VCS Compliance	Stakeholder' Meeting	18/12/2016	20/12/2016	23/12/2016
Commissioning of Project	Start Date	02/03/2017	31/03/2017	30/03/2017
VCS Compliance	Engaging VCS Consultant	21/02/2018	21/02/2018	21/02/2018

2.6 Methodology Deviations

There is no methodology deviation.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

The baseline emission is calculated in line with para 42 of ACM0002, Version 19.0, using equation below

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

Where,

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

AS per para 44 of ACM0002, version 19.0, when the project activity is installation of Greenfield power plant, then:

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

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)

3.2 Project Emissions

The project activity involves in harnessing wind power. As per the approved consolidated Methodology ACM0002 (Version 19.0, EB 100, Annex 6) para 34:

"For most renewable energy 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:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$ *Equation (1)*

Where;	
PE_y	*Project emissions in year y (t CO2e/yr)*
$PE_{FF,y}$	*Project emissions from fossil fuel consumption in year y (t CO2/yr)*
$PE_{GP,y}$	*Project emissions from the operation of dry, flash steam or binary geothermal power plants in year y (t CO2e/yr)*
$PE_{HP,y}$	*Project emissions from water reservoirs of hydro power plants in year y (t CO2e/yr)"*

As the project activity is the installation of a new grid-connected Wind power plant/ unit and does not involve any project emissions from fossil fuel, operation of dry, flash steam or binary geothermal power plants, and from water reservoirs of hydro power plants. Therefore $PE_{FF,y}$, $PE_{GP,y}$, $PE_{HP,y}$ are equal to zero and thus, $PE_y = 0$.

So the emissions from the project are zero.

3.3 Leakage

As per applied methodology no source of leakage emissions identified under proposed project activity.

Hence, $LE_y = 0$

3.4 Estimated Net GHG Emission Reductions and Removals

Emission reduction (ER_y):

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plant by renewable electricity. The emission reduction ER_y by the project activity during a given year y is the difference between Baseline emission and Project emission & Leakage emission. As er the applied methodology, leakage emissions are excluded for wind projects and hence the same is not used. The emission reduction is calculated in line with para 57 of ACM0002, Version 19, using equation below:

$ER_y = BE_y - PE_y$

Where,

ER_y = Emission Reduction in tCO_2/year

BE_y = Baseline emission in tCO_2/year
PE_y = Project emissions in tCO_2/year

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
Year 1	191,006	0	0	191,006
Year 2	191,006	0	0	191,006
Year 3	191,006	0	0	191,006
Year 4	191,006	0	0	191,006
Year 5	191,006	0	0	191,006
Year 6	191,006	0	0	191,006
Year 7	191,006	0	0	191,006
Year 8	191,006	0	0	191,006
Year 9	191,006	0	0	191,006
Year 10	191,006	0	0	191,006
Total	1,910,060	0	0	1,910,060

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	**$EF_{OM, y}$**
Data unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor of INDIAN Grid
Source of data	Central Electricity Authority:CO2 Emission Database CEA CO_2 Baseline database Version 13
Value applied:	0.9726
Justification of choice of data or description of measurement methods and procedures applied	Calculated in line with "*Tool to calculate the emission factor for an electricity system*" using data from Central Electricity Authority of India's (CEA) "*Baseline Carbon Dioxide Emission Database Version 13*". The value used is calculated ex-ante as generation based weighted average of last three years of the operating margin provided in the CEA database. Weighted average = $\sum_{i=1 \text{ to } n}$ (Net generation in operating margin in year i * Simple operating margin in year i)/$\sum_{i= 1 \text{ to } n}$ (Net generation in operating margin of year i)
Purpose of Data	Baseline Emission calculation

Comments	The operating margin emission factor is a 3-year generation-weighted average (2014-17). The operating Margin is calculated ex ante and fixed during the crediting period

Data / Parameter	$EF_{BM,y}$
Data unit	tCO_2/MWh
Description	Build margin CO2 emission factor of INDIAN grid
Source of data	Central Electricity Authority:CO2 Emission Database CEA CO_2 Baseline database Version 13
Value applied:	0.8723
Justification of choice of data or description of measurement methods and procedures applied	Calculated in line with "*Tool to calculate the emission factor for an electricity system*" using data from Central Electricity Authority of India's (CEA) "*Baseline Carbon Dioxide Emission Database Version 13*". The value is calculated ex-ante as most recent build margin provided by the CEA
Purpose of Data	Baseline Emission calculation
Comments	The Build Margin would be calculated ex ante and fixed during the crediting period. For ex ante calculation the most recent data (2016-17) available has been used and the build margin is thus calculated.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin CO2 emission factor of INDIAN grid
Source of data	Central Electricity Authority:CO2 Emission Database CEA CO_2 Baseline database Version 13
Value applied:	0.9475
Justification of choice of data or description of measurement methods and procedures applied	The date has been considered in accordance to the Tool to calculate emission factor of an electricity system. The tool guides to take 75% weightage of $EF_{grid,OMsimple,}$ & 25% weightage of $EF_{grid,BM,y}$.
Purpose of Data	Baseline Emission calculation
Comments	The combined margin would be calculated ex-ante and fixed for the entire crediting period and the combined margin thus calculated is 0.9475.

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$ [12]
Data unit	MWh/year
Description	Calculated (based on the measured values of electricity exported and imported)
Source of data	Project 1 & Project 2: Monthly "Certificate for Share of Electricity Generated by Wind Farm" issued by GETCO Project 3: JMR (Joint Meter Reading) issued by EB
Description of measurement methods and procedures to be applied	Project 1 & Project 2: Data Type: Measured & Calculated. Monitoring equipment: a) At WTG yard: Secure make Meters of accuracy class 0.2s. b) At substation: Secure make Meters accuracy class 0.2s. Archiving Policy: Paper & Electronic. The Net electricity supplied to the grid by the project activity will be calculated as a difference of electricity exported to the grid, electricity imported from the grid obtained from Monthly Meter reading reports provided by GETCO/ SLDC as per below equation: Calculation of $EG_{facility,y}$: Net Electricity = Export – Import The net electricity exported by the project activity is taken directly from the share certificate issued by GETCO on monthly basis. The apportioning procedure is performed by GEDA personnel on monthly basis and the **PP has no role in it**. Responsibility: a) At WTG yard: The O&M shift-in-charge shall be responsible for the regular recording of data. b) At substation: The representatives of the PP/GETCO/GEDA are responsible for taking monthly joint meter reading at the substation. Project 3: Data Type: Measured & Calculated. Monitoring equipment: Substation: All Secure make Meters accuracy class 0.2s. Archiving Policy: Paper & Electronic. Net electricity supplied will be calculated based on the difference between calculated values of "export" and "import" on the EB energy meter at the "evacuation point". . (Net Electricity = Export – Import) The Export and import are referred from JMR. Currently there is no Transmission Loss and in case of any changes in future monitoring periods, it will be deducted from

[12] If the project activity is the installation of a Greenfield power plant, then: $EGPJ,y = EGfacility,y$

<table>
<tr><td></td><td>Export value.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Measurement: Continuous
Recording: Monthly</td></tr>
<tr><td>Value applied:</td><td>Project 1: 64,885
Project 2: 65,286
Project 3: 103,113
Total: 233,284</td></tr>
<tr><td>Monitoring equipment</td><td>Energy meters of accuracy class 0.2s</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>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.
Calibration of electricity meters is carried out in-line with the Nation standard[13] which recommends at least once in 5 year calibration or whenever abnormal difference/inconsistency is observed between main meter and check meter.
Project 1:
Meter & Calibration Details:
<table>
<tr><th>Details</th><th>Line-1</th><th>Line-2</th></tr>
<tr><td>Meter Number</td><td>GJ-3057-A</td><td>GJ-3058-A</td></tr>
<tr><td>Make</td><td>Secure</td><td>Secure</td></tr>
<tr><td>Accuracy</td><td>0.2s</td><td>0.2s</td></tr>
<tr><td>Location</td><td>Substation</td><td>Substation</td></tr>
<tr><td>Last Calibration</td><td>20/02/2017</td><td>20/02/2017</td></tr>
<tr><td>Due date</td><td>19/02/2022</td><td>19/02/2022</td></tr>
</table>
Project 2:
Meter & Calibration Details:
<table>
<tr><th>Details</th><th>Line-1</th><th>Line-2</th></tr>
<tr><td>Meter Number</td><td>GJ3819A</td><td>GJ3820A</td></tr>
<tr><td>Make</td><td>Secure</td><td>Secure</td></tr>
<tr><td>Accuracy</td><td>0.2s</td><td>0.2s</td></tr>
<tr><td>Location</td><td>Substation</td><td>Substation</td></tr>
<tr><td>Last Calibration</td><td>25/02/2017</td><td>25/02/2017</td></tr>
<tr><td>Due date</td><td>24/02/2022</td><td>24/02/2022</td></tr>
</table>
Project 3:
Meter & Calibration Details:
<table>
<tr><th>Details</th><th>Main meter</th><th>Check meter</th></tr>
<tr><td>Meter Number</td><td>APX01475</td><td>APX01475</td></tr>
<tr><td>Make</td><td>L&T</td><td>L&T</td></tr>
<tr><td>Accuracy</td><td>0.2s</td><td>0.2s</td></tr>
</table></td></tr>
</table>

[13] (Page number 12 of) http://www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf

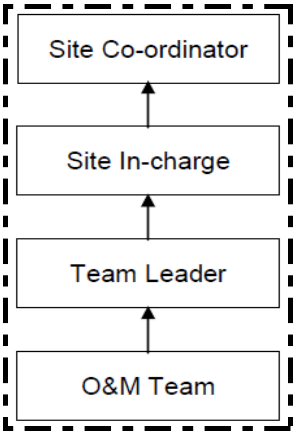
	Location	Substation	Substation
	Last Calibration	31/03/2017	31/03/2017
	Due date	30/03/2022	30/03/2022
	Calibration agency	SPDCAPL	SPDCAPL
Purpose of data	Calculation of baseline emissions		
Calculation method	-.		
Comments	-		

4.3 Monitoring Plan

All the three projects in the bundle have entered into agreement with the WTG Suppliers 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 site in charge of each project separately.

Monitoring roles and responsibilities:

The data for the project is compiled by the O&M Contractor and subsequently stored by the PP, the reporting and data flows as per the below mentioned flow chart starting from Site O&M team which monitors day to day operational data and monthly recording. The reporting responsibilities for the project are described as below;



The Site In-charge will be responsible for carrying out internal auditing and QA/QC. All the values from generation record will be checked with JMR and invoices for consistency. In case there are any non-conformances identified. The Site In-charge will investigate the error and revise the record to correct it. In any case where values have slightest of variation in different records the most conservative value will be taken in the project monitoring report.

Personal Training:

The training for operating and maintaining the plant will be provided to the O&M team whenever there would be necessity or any technological up gradation.

Emergency preparedness:

In case Main meter or Check meter is found to be outside the acceptable limits of accuracy or faulty or not functioning properly, it will be repaired, recalibrated or replaced as soon as possible. In the event that the Main meter is not in service as a result of maintenance, repairs or testing, the Check meter will be used for readings

Data recording & archiving: The project proponent shall maintain data both in electronic form and hard copies. The monitored data shall be archived till 2 years after the completion of crediting period.

Monitoring Process at project site

Project 1 & Project 2 (Same Procedure):

- Joint monthly meter reading shall be taken from pooling substation (PSS) meter by representative of GEDA/GETCO and O&M team/service provider (on behalf of individual wind mill owners). Let the total generation recorded for particular month is 'X' units in sub-station meter.
- Joint daily meter reading shall be taken at Local Meter (transformer yard meter of each WTG) by representative of GEDA/GETCO on a monthly basis. Let us assume total approved generation recorded for particular month is 'Y1' units.
- Similarly, joint meter reading for other wind farm owners connected to the sub-station shall also be taken. Let the generation of individual owner recorded for particular month are 'Y2, Y3, ...Yn' units.
- The GEDA/GETCO apportions 'X' to individual wind farm owners using following formula and issues monthly certificates. Net units calculated for billing = X * Yi / ΣYn
- For PP, net units calculated for billing = X * Y1 / ΣYn

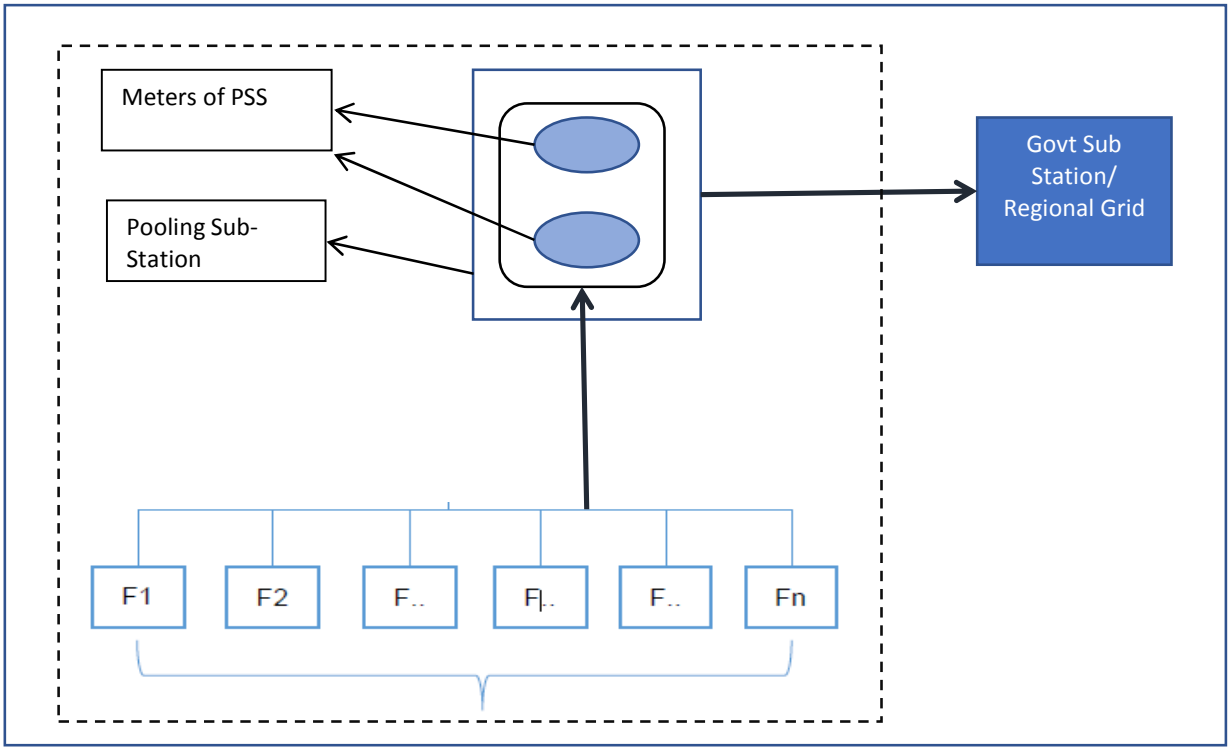
The net electricity generated by the project owners is being provided by GETCO in the share certificate of electricity generated. The value of the net electricity generated by the project activity has been taken directly by the project proponent from the share certificate provided by GETCO for calculation of emission reductions. The share certificate provides the value of export and import by the project.

Calculation of $EG_{facility,y}$:
Net Electricity = Export – Import

Hence, the net electricity supplied to the grid by the project activity is taken directly from the share certificate issued by GETCO on monthly basis by simply taking export & import. The apportioning procedure is performed by GEDA personnel on monthly basis and the **PP has no role in it**. Hence the PP does not has detailed apportioning available.

A schematic diagram indicating the metering system is provided below:

Metering System



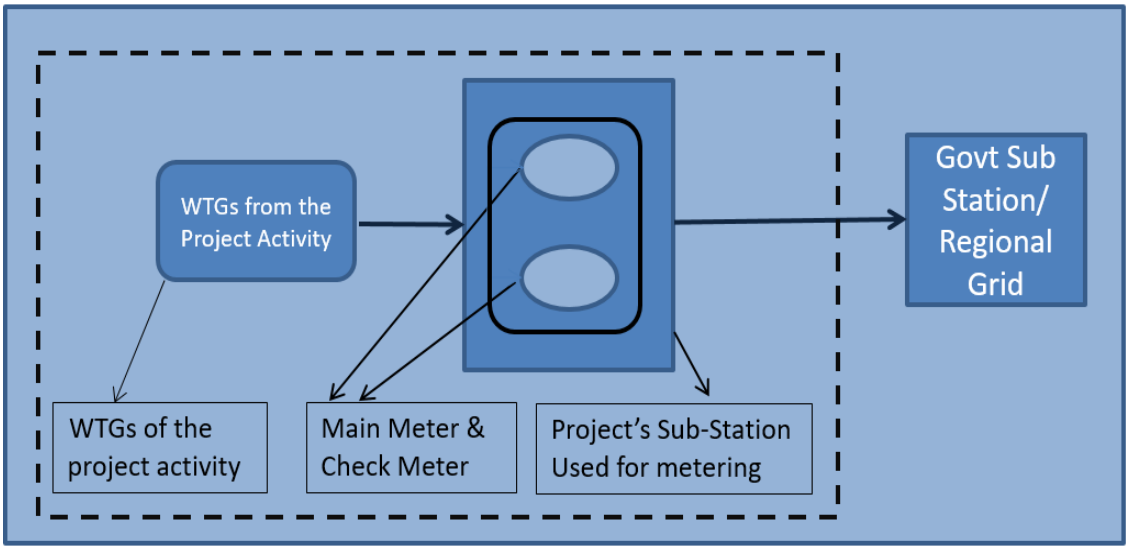
Project 3:
Joint monthly meter reading is taken at the Pooling substation (PSS) meters by representative of DISCOM and O&M team/service provider (on behalf of the project proponent). It must be noted here that the meter readings as mentioned above shall be calculated as the product of meter multiplication factor and the difference of the current and previous meter readings.

Currently, the PSS has only the project WTGs and hence there is no need to calculate transmission losses.
(Net Electricity = Export – Import)
However, in future if there are other WTGs connected to the same feeder in PSS with the project WTGs then O&M contractor shall be responsible for calculation of net electricity and arriving at transmission loss. In such a scenario:
(Net Electricity = Export – Import)

Based on the above procedure, the Monthly JMRs shall be provided to the project proponent.

A schematic diagram indicating the metering system is provided below:

Metering System



For all the projects in the bundle this is to be noted that the detail procedure of monitoring is illustrated here for the sake of understanding; for the preparation of subsequent monitoring report during periodic verifications, only the net electricity generation value shall be directly used for emission reduction calculation. No other parameters as explained above shall be used and presented in the monitoring report.

5 SAFEGUARDS

5.1 No Net Harm

There were no harm identified form the project and hence no mitigations measures are applicable.

5.2 Environmental Impact

In the applicable EIA notification i.e. S.O. 306714, dated 01/12/2009, Ministry of Environment & Forests (MoEF), Govt. of India, the wind projects are not included in the list of projects that has to get Prior Environmental Clearance (EC) either from State or Central Govt. authorities and hence no EIA study was conducted. The project does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India. However due weightage has been given to environmental aspects.

However, the PP has conducted a detailed ESIA (Environmental & Social Impact Assessment) study for the project activity and some of the significant impacts taken into consideration during the construction and operation of the wind farm are as follows:

1. Land Use: Due consideration has been taken in order to ensure that the land available for the setting up of the wind farm has no considerable alternative use. Furthermore, no forest land was used for the purpose. Stringent measures were followed in order to prevent any soil erosion during the construction phase.
2. Noise Pollution: Typically, the wind farms are located in isolated areas and thereby the noise impacts on the neighbouring population are reduced. Also during the construction phase, suitable

[14] http://moef.nic.in/downloads/rules-and-regulations/3067.pdf

noise prevention and reduction measures were employed in order to reduce the ill-effects of noise pollution on the construction labourers.
3. Water Pollution: There were no water bodies within 500 meters of any of the WTGs and hence there is no possibility of impact on water quality due to the project.
4. Air Pollution: The implementation of the project activity will reduce the dependence on fossil fuel generated power and thereby lead to the improvement in air quality during the operational phase.
5. Visual Impact: The social survey revealed that locals were aware about wind project and did not consider them to be of any visual or aesthetic disturbance.
6. Local Flora and Fauna: The land used for the purpose of setting up the wind farm was fallow/barren land and therefore did not require any destruction of local flora. The only vegetation in the vicinity was shrubs and weeds.

Hence it can be concluded that the proposed project activity does not have any major negative impacts.

Further, 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.

5.3 Local Stakeholder Consultation

The stakeholder consultation meeting was conducted during the social survey as a part of the ESIA study. The consultations were done by identifying the right stakeholders, including, local farmers, villagers, school teachers, government officials, panchayat officials, local NGOs**.**

The purpose of the consultation was to account for the views of the people impacted either directly or indirectly due to the project activity. The objective of the SHC meetings was to inform the stakeholders on the environmental and social impact of the project activity and to discuss their concerns regarding it.

Notices were put up in the local panchayats at least a week in advance of the consultations.

Post consultations the project proponent has also devised an Grievance mechanism to address any concerns of the villagers. A grievance Register with the details of site contact person, Head office HSE person are available at all the panchayat offices in the project location.

5.4 Public Comments

Comments: The project received positive comments from stakeholders; comments received from the stakeholders have been summarized below:

- The presence of the project has also ensured employment opportunities and infrastructure development in the project region.

- The project does not require any displacement of local population.
- The project has added to increased activity in local schools by means of donation of materials and furniture.

Consideration of Comments: The stakeholders expressed their views and welcomed the project activity. They also conveyed their best wishes to the success of the project activity. Since there were no negative comments received from the stakeholders, therefore, it was not necessary to take due account of any comments.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/year
Description	Calculated (based on the measured values of electricity exported and imported)
Value applied:	233,284
Comments	Net electricity supplied to the grid by the project activity is sourced from JMR and cross checked with invoices.

6.2 Baseline Emissions

As per description earlier under this document:

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

$EF_{grid,CM,y}$ is 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) (i.e, 0.9475 tCO2/MWh).
and;

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

Here,

$BE_y = 233{,}284$ MWh * 0.9475 tCO2/MWh

Net Electricity Project wise:

Net Electricity (kWh)				
Month	**Project 1**	**Project 2**	**Project 3**	**Total**
Mar-17	241591	1331	13400	256322
Apr-17	2028275	150179	2051300	4229754
May-17	3586168	770350	8468800	12825318
Jun-17	3077433	2464562	12198800	17740795
Jul-17	4501660	2481800	18913500	25896960
Aug-17	3959234	3801550	11214300	18975084

Sep-17	1505642	1992543	5843500	9341685
Oct-17	1749400	1973737	2501000	6224137
Nov-17	2069110	1920040	2219100	6208250
Dec-17	3892693	2633524	1404500	7930717
Jan-18	2078041	2520835	1749300	6348176
Feb-18	1546627	1566735	110600	3223962
Mar-18	2610736	3523805	0	6134541
Apr-18	3111678	4284059	0	7395737
May-18	4137882	5716047	0	9853929
Jun-18	6654909	6920899	0	13575808
Jul-18	5378312	6434463	199900	12012675
Aug-18	5931872	6930059	17488900	30350831
Sep-18	3157101	3811648	4398200	11366949
Oct-18	1330618	1192765	4785600	7308983
Nov-18	907598	1375714	4493400	6776712
Dec-18	1428054	2819704	5059400	9307158
Total	64884634	65286349	103113500	233284483

Monthly calculations of baseline emissions:

Month	**Net Electricity (kWh)**	**Grid Emission Factor** tCO_2/MWh	**Baseline Emissions (tCO_2)** $EG_{PJ,V}$ (MWh)/1000 x $EF_{grid,CM,y}$ (tCO_2/MWh)
Mar-17	2,56,322.0	0.9475	242
Apr-17	42,29,754.0	0.9475	4,007
May-17	1,28,25,318.0	0.9475	12,151
Jun-17	1,77,40,795.0	0.9475	16,809
Jul-17	2,58,96,960.0	0.9475	24,537
Aug-17	1,89,75,084.0	0.9475	17,978
Sep-17	93,41,685.0	0.9475	8,851
Oct-17	62,24,137.0	0.9475	5,897
Nov-17	62,08,250.0	0.9475	5,882
Dec-17	79,30,717.0	0.9475	7,514
Jan-18	63,48,176.0	0.9475	6,014
Feb-18	32,23,962.0	0.9475	3,054
Mar-18	61,34,541.0	0.9475	5,812
Apr-18	73,95,737.0	0.9475	7,007
May-18	98,53,929.0	0.9475	9,336
Jun-18	1,35,75,808.0	0.9475	12,863
Jul-18	1,20,12,675.0	0.9475	11,382
Aug-18	3,03,50,831.0	0.9475	28,757
Sep-18	1,13,66,949.0	0.9475	10,770

Oct-18	73,08,983.0	0.9475	6,925
Nov-18	67,76,712.0	0.9475	6,420
Dec-18	93,07,158.0	0.9475	8,818
Total	23,32,84,483.0	-	221,026

Key Reasons for Downtime during the Current Monitoring Period:

Reasons for Scheduled Maintenance: Manual stop for 6 monthly service of WTG, All voltage lines, Feeder line maintenance, GSS yard billing Bay maintenance, USS Yard maintenance, BOP equipment; Relay Testing & yearly Maintenance work etc

Reasons Unscheduled Maintenance: Power Line shutdown, Grid Failure, Feeder tripping, initialization fail, Transformer tripping, Overheating in the grid induction, Blade Position Error, accelerometer vibration issue, other inspection work and emergency maintenance of plant equipment.

Project 1: Downtime Details:

Month	WTG stoppage (Hrs)	Unscheduled Maintenance (Hours)	Scheduled Maintenance (Hours)
17-Mar	25.66	25.66	0
17-Apr	52.9	34.91	17.99
17-May	861.29	801.11	60.18
17-Jun	648.54	598.69	49.85
17-Jul	754.65	754.65	0
17-Aug	903.16	903.16	0
17-Sep	1488.99	1488.99	0
17-Oct	1612.02	1604.6	7.42
17-Nov	1913.9	1913.9	0
17-Dec	1374.24	1310.75	63.49
18-Jan	1720.39	1708.31	12.08
18-Feb	2616.58	2612.28	4.3
18-Mar	2077.39	2066.16	11.23
18-Apr	1600.91	1576.25	24.66
18-May	2642.02	2631.76	10.26
18-Jun	1332.87	1315.82	17.05
18-Jul	2489.36	2470.62	18.74
18-Aug	1172.7	1171.12	1.58
18-Sep	2092.77	2052.8	39.97
18-Oct	1581.67	1576.69	4.98
18-Nov	3349.57	3349.57	0
18-Dec	1038.88	1038.88	0
Total	**33350.46**	**33006.68**	**343.78**

Project 2: Downtime Details:

Month	WTG stoppage (Hrs)	Unscheduled Maintenance (Hours)	Scheduled Maintenance (Hours)
17-Mar	0	0	0
17-Apr	114.94	114.94	0
17-May	1880.8	1880.8	0
17-Jun	606.4	600.4	6
17-Jul	742.87	742.87	0
17-Aug	1223.68	1210.9	12.78
17-Sep	1970.2	1914.22	55.98
17-Oct	665.87	665.87	0
17-Nov	337.28	318.17	19.11
17-Dec	2863.71	2834.93	28.78
18-Jan	788.41	788.41	0
18-Feb	2096.73	2090.36	6.37
18-Mar	165.17	146.28	18.89
18-Apr	755.8	751.08	4.72
18-May	240.8	235.8	5
18-Jun	235.71	181.08	54.63
18-Jul	1096.64	1076.84	19.8
18-Aug	255.06	255.06	0
18-Sep	1161.86	1161.86	0
18-Oct	2005.78	2005.78	0
18-Nov	2199.98	2199.98	0
18-Dec	1693.61	1693.61	0
Total	**23101.3**	**22869.24**	**232.06**

Project 3: Downtime Details:

Month	WTG stoppage (Hrs)	Unscheduled Maintenance (Hours)	Scheduled Maintenance (Hours)
Mar-17	0	0	0
Apr-17	957.6	957.6	0
May-17	1151.8	1101.8	50
Jun-17	557.1	436.3	120.8
Jul-17	358	316.9	41.1
Aug-17	298.8	298.8	0
Sep-17	143.8	73.8	70
Oct-17	335.4	270.3	65.1
Nov-17	234.2	85.6	157.6

Dec-17	389.5	125.9	272.6
Jan-18	210.3	137.8	72.5
Feb-18	558.5	460.9	97.6
Mar-18	1466.5	394.8	1071.7
Apr-18	23760	0	0
May-18	24552	0	0
Jun-18	23760	0	0
Jul-18	24552	0	0
Aug-18	274	96.4	0
Sep-18	9236.83	1424.49	0
Oct-18	5532.37	1572.36	0
Nov-18	4543.76	916.51	27.26
Dec-18	3577.13	292.38	127.7
Total	126449.59	8962.64	2173.96

Note: For the months of April 2018 to July 2018 as there had been contractual issue with the O&M Contractor the WTGs were left un-operational.

6.3 Project Emissions

The project activity involves in harnessing wind power. So, the emissions from the project are zero.

6.4 Leakage

No leakage emissions have been considered and hence the leakage emission is zero.

6.5 Net GHG Emission Reductions and Removals

As per the applied methodology, emission reductions are calculated as follows:
$ER_y = BE_y - PE_y$

Where,
ER_y = Emission Reduction in tCO_2e/year
BE_y = Baseline emission in tCO_2/year
PE_y = Project emissions in tCO_2e/year

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
Year 2017	103,868	0	0	103,868
Year 2018	117,158	0	0	117,158
Total	221,026	0	0	221,026