

BUNDLED WIND POWER PROJECT BY GIRIRAJ ENTERPRISES

Document Prepared By EKI Energy Services Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Project and its Implementation Status

The purpose of the project activity is to generate power using renewable energy source (wind energy) and sell the power generated to the state grid. The project activity generates electricity using wind. The generated electricity is exported to the regional grid system which is under the purview of the INDIAN electricity grid of India.

The wind power generated from the Project will be displacing the electricity generated from grid connected power stations feeding into Indian grid (Indian Electricity Grid). Since, the 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 (CO₂) only.

The proposed project activity involves the installation of Wind Power Projects. The total installed capacity of the project is 112.5 MW; which involves operation of Wind Turbine Generators (WTGs) in Madhya Pradesh and Gujarat states of India. The details of the project is given below:

Sr No.	Project Type	Project Capacity (in MW)	Owner of Project	Project Location	State
1	Wind	30 MW	Giriraj Enterprises	Hatuniya Site, Mandsaur	Madhya Pradesh
2	Wind	22.5 MW	Giriraj Enterprises	Dewas Site, Dewas	Madhya Pradesh
3	Wind	21 MW	Giriraj Enterprises	Dhar Site, Dhar	Madhya Pradesh
4	Wind	13.5 MW	Giriraj Enterprises	Vejalpar Site, Morbi	Gujarat
5	Wind	10.5 MW	Giriraj Enterprises	Vejalpar Site, Morbi	Gujarat
6	Wind	15 MW	Giriraj Enterprises	Khareda, Morbi	Gujarat

The power produced displaces an equivalent amount of power from the grid, which is fed mainly by fossil fuel fired power plants. Hence, it results in reduction of GHG emissions. Average annual GHG emission reductions from the project activity will be 218,910 tonnes of CO₂ and total GHG emission reductions for the chosen 10 year crediting period will be 2,189,100 tonnes of CO₂.

The commissioning details for each project activity is as below.

22.5 MW Dewas Site

Feeder 1 having 7 WTGs of 1.5 MW each and Feeder 2 having 8 WTGs pf 1.5 MW each.

Feeder 1	COD	Feeder 2	COD
TK01	30-05-2016	TK07	31-05-2016
TK02	30-05-2016	TK12	31-05-2016
TK05	30-05-2016	TK13	31-05-2016

TK06	30-05-2016	TK14	31-05-2016
TK08	30-05-2016	TK15	31-05-2016
TK09	30-05-2016	TK16	31-05-2016
TK10	30-05-2016	TK17	31-05-2016
		TK04	30-05-2016

21 MW Dhar Site

One Feeder having 5 WTGs of 1.5 MW each and another Feeder having 9 WTGs of 1.5 MW each.

7.5 MW Feeder	COD	13.5 MW Feeder	COD
TIR04	31-03-2016	TIR03	31-03-2016
TIR05	31-03-2016	TIR06	31-03-2016
TIR07	31-03-2016	TIR12	31-03-2016
TIR09	31-03-2016	TIR13	31-03-2016
TIR10	31-03-2016	TIR14	31-03-2016
		ADD02	31-03-2016
		ADD03	31-03-2016
		ADD04	31-03-2016
		ADD05	31-03-2016

30 MW Hatuniya Site

One Feeder having 10 WTGs (RH3-01 TO RH3-10) of 1.5 MW each and another Feeder having 10 WTGs (RH4-01 TO RH4-10) of 1.5 MW each.

15 MW Feeder	COD
RH3-01 to RH3-10	31-03-2015

15 MW Feeder	COD
RH4-01 to RH4-10	31-03-2015

Gujarat state 3 projects are yet to be commissioned.

The Project activity is a new facility (Greenfield) and the purpose of the project activity is to generate energy electricity by the utilization of renewable wind technology and further selling the generated energy to the Indian Grid. In this process there is no consumption of any fossil fuel and hence the project does not lead to any greenhouse gas emissions. Thus, electricity would be generated through sustainable means without causing any negative impact on the environment.

In the Pre- project scenario the entire 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.

For Current monitoring period, the total GHG emission reductions achieved are 147,600 t CO₂.

1.2 Sectoral Scope and Project Type

The project activity falls under the following Sectoral scope and Project Type:

Sectoral Scope: 01 - Energy industries (renewable / non-renewable sources)

Project Type : I - Renewable Energy Projects

Methodology : ACM0002: Grid-connected electricity generation from renewable sources - Version 17.0¹

The project is not a grouped project activity.

1.3 Project Proponent

Organization name	Giriraj Enterprises
Contact person	Mr. Prafulla Khinvasara
Title	CEO- Renewable Power Projects
Address	Malpani House, New Nagar Road, Tal- Sangamner, Dist – Ahmednagar, Maharashtra, India
Telephone	-
Email	-

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultant
Contact person	Mr. Manish Dabkara
Title	MD & CEO
Address	Office No. 201, EnKing Embassy, Plot No. 48, Scheme No. 78, Part II, Vijay Nagar INDORE – 452010, India.
Telephone	+91-731-4289086
Email	manish@enkingint.org

1.5 Project Start Date

Project Start Date: 31-March-2015.

The project start date is the date of earliest commissioning date of WTG. The individual project activities details are mentioned below:

¹ <http://cdm.unfccc.int/methodologies/DB/8W400U6E7LFHHYH2C4JR1RJWWO4PVN>

S. No.	Project Owner	Machine ID	DOC ²	Village	Taluka	District	State
1	Giriraj Enterprises	KUM-01	31-03-2017 (expected)	Kumbhariya	Morbi	Morbi	Gujarat
2		KUM-02					
3		KUM-03					
4		KUM-04					
5		KUM-05					
6		KUM-06					
7		KUM-07					
8	Giriraj Enterprises	PVKH 13	31-03-2017 (expected)	Khakhrechi	Maliya	Morbi	Gujarat
9		PVKH 19					
10		PVKH 20					
11		PVKH 21					
12		PVKH 25					
13		PVKH 27					
14		PVKH 02					
15		PVKH 17					
16		PVKH 38					
17	Giriraj Enterprises	PVS 02	31-03-2017 (expected)	Mathak	Halwad	Surendran agar	Gujarat
18		PVS 05		Mathak	Halwad	Surendran agar	
19		PVS 13		Mathak	Halwad	Surendran agar	
20		PVS 20		Mathak	Halwad	Surendran agar	
21		PVS 21		Sarambhada	Halwad	Surendran agar	
22		PVS 26		Sarambhada	Halwad	Surendran agar	
23		PVS 27		Sarambhada	Halwad	Surendran agar	
24		PVS 30		Mathak	Halwad	Surendran agar	
25		PVS 32		Khakhrechi	Maliya	Morbi	
26		RK-26		Khakhrechi	Maliya	Morbi	
27	Giriraj Enterprises	RH3- 01	31-03-2015	Ratikhedi,	Mandsaur	Mandsaur	Madhya Pradesh
28		RH3- 02		Bholiya,	Mandsaur	Mandsaur	
29		RH3- 03		Ratikhedi,	Mandsaur	Mandsaur	
30		RH3- 04		Ratikhedi,	Mandsaur	Mandsaur	
31		RH3- 05		Ratikhedi,	Mandsaur	Mandsaur	
32		RH3- 06		Kankarwa,	Jaora,	Ratlam	
33		RH3- 07		Bholiya,	Mandsaur	Mandsaur	
34		RH3- 08		Kankarwa,	Jaora,	Ratlam	

² Date Of commissioning. Please refer section 1.1 of VCS PD for DOC of each WTG.

35		RH3- 09		Bholiya,	Mandsaur	Mandsaur	
36		RH3- 10		Bholiya,	Mandsaur	Mandsaur	
37		RH4- 01		Jogikheda,	Mandsaur	Mandsaur	
38		RH4- 02		Ratikhedi,	Mandsaur	Mandsaur	
39		RH4- 03		Kuchdod,	Mandsaur	Mandsaur	
40		RH4- 04		Khajuri Anjana	Mandsaur	Mandsaur	
41		RH4- 05		Ratikhedi,	Mandsaur	Mandsaur	
42		RH4- 06		Khajuri Anjana	Mandsaur	Mandsaur	
43		RH4- 07		Khajuri Anjana	Mandsaur	Mandsaur	
44		RH4- 08		Khajuri Anjana	Mandsaur	Mandsaur	
45		RH4- 09		Khajuri Anjana	Mandsaur	Mandsaur	
46		RH4- 10		Kuchdod,	Mandsaur	Mandsaur	
47	Giriraj Enterprises	TK- 01	30-05-2016 and 31-05-2016	Bhoj Pura,	Tonk Khurd	Dewas	Madhya Pradesh
48		TK- 04		Bhoj Pura,			
49		TK- 05		Bhoj Pura,			
50		TK- 06		Bhoj Pura,			
51		TK- 07		Bhoj Pura,			
52		TK- 08		Bhoj Pura,			
53		TK- 09		Devli,			
54		TK- 10		Devli,			
55		TK- 12		Ranayal Kala			
56		TK- 14		Ranayal Kala			
57		TK- 02		Bhoj Pura,			
58		TK- 13		Ranayal Kala			
59		TK- 15		Sankely,			
60		TK- 16		Sankely,			
61		TK- 17		Sankely,			
62	Giriraj Enterprises	TIR- 04	31-03-2016	Labrawada,	Dhar	Dhar	Madhya Pradesh
63		TIR- 05		Navgaon,			
64		TIR- 07		Kalukhedi,			
65		TIR- 09		Kalukhedi,			
66		TIR- 10		Chikliya,			
67		TIR- 03		Navgaon,			
68		TIR- 06		Navgaon,			
69		TIR- 12		Navgaon,			
70		TIR- 13		Navgaon,			
71		TIR- 14		Navgaon,			
72		ADD- 02		Navgaon,			
73		ADD- 03		Navgaon,			
74		ADD- 04		Navgaon,			

75		ADD- 05		Khilchipura,			
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1.6 Project Crediting Period

Crediting Period Start date: 31-March-2015

Crediting Period End date: 30-March-2025

The project activity adopts renewable crediting period of 10 years period which can be renewed for maximum 2 times.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

The project is a large scale project that involves setting up of 112.5 MW of wind power project.

Project Scale	
Project	✓
Large project	

As the Estimated GHG emission reductions or removals per year is 218,910 (tCO₂e) which is less than 300,000 tonnes of CO₂e per year, thus the project falls in the category of Project

The site wise emission reduction calculations are as below

Investor Name	Capacity (MW)	PLF	Net Generation	Baseline Emission factor	Baseline emissions	Project emissions	Leakage Emissions	Emission reductions
			(MWh/year)	(tCO ₂ /MWh)	(tCO ₂ e/ year)	(tCO ₂ e/ year)	(tCO ₂ e/ year)	(tCO ₂ e/ year)
Giriraj Enterprises	30	20.00%	52,560	0.9777	51,387	0	0	51,387
Giriraj Enterprises	22.5	23.00%	45,333	0.9777	44,322	0	0	44,322
Giriraj Enterprises	21	23.00%	42,311	0.9777	41,367	0	0	41,367
Giriraj Enterprises	13.5	24.50%	28,974	0.9777	28,327	0	0	28,327
Giriraj Enterprises	10.5	24.50%	22,535	0.9777	22,032	0	0	22,032
Giriraj Enterprises	15	24.50%	32,193	0.9777	31,475	0	0	31,475
Total	112.5		2,23,906		2,18,910	0	0	2,18,910
In Ten Years								21,89,100

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 1	218,910
Year 2	218,910
Year 3	218,910
Year 4	218,910
Year 5	218,910
Year 6	218,910
Year 7	218,910
Year 8	218,910
Year 9	218,910
Year 10	218,910
Total estimated ERs	2,189,100
Total number of crediting years	10 years
Average annual ERs	218,910

1.8 Description of the Project Activity

The proposed project activity involves the installation of Wind Power Projects in different location of India. The total installed capacity of the project is 112.5 MW; which involves operation 75 WTGs of 1.5 MW capacity of wind projects located in Gujarat and Madhya Pradesh.

The Project activity is a new facility (Greenfield) and the electricity generated by the Project will be exported to the Indian electricity grid. The Project 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 the VCS benefits for the Project.

In the Pre- project scenario the entire electricity, delivered to the grid by the project activity, would have otherwise been generated by the operation of grid-connected power plants which is mainly dominated by fossil fuels or by the addition of new generation sources.

The project shall result in replacing anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 218,910 tCO₂e per year, thereon displacing 223,906 MWh/year amount of electricity from the grid.

Wind Power Project Technology Details –

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. Wind power generation technology is 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 a total of 75 WTG's of ReGen Power Tech make. The commissioning details of the project activity has been mentioned in section 1.5.

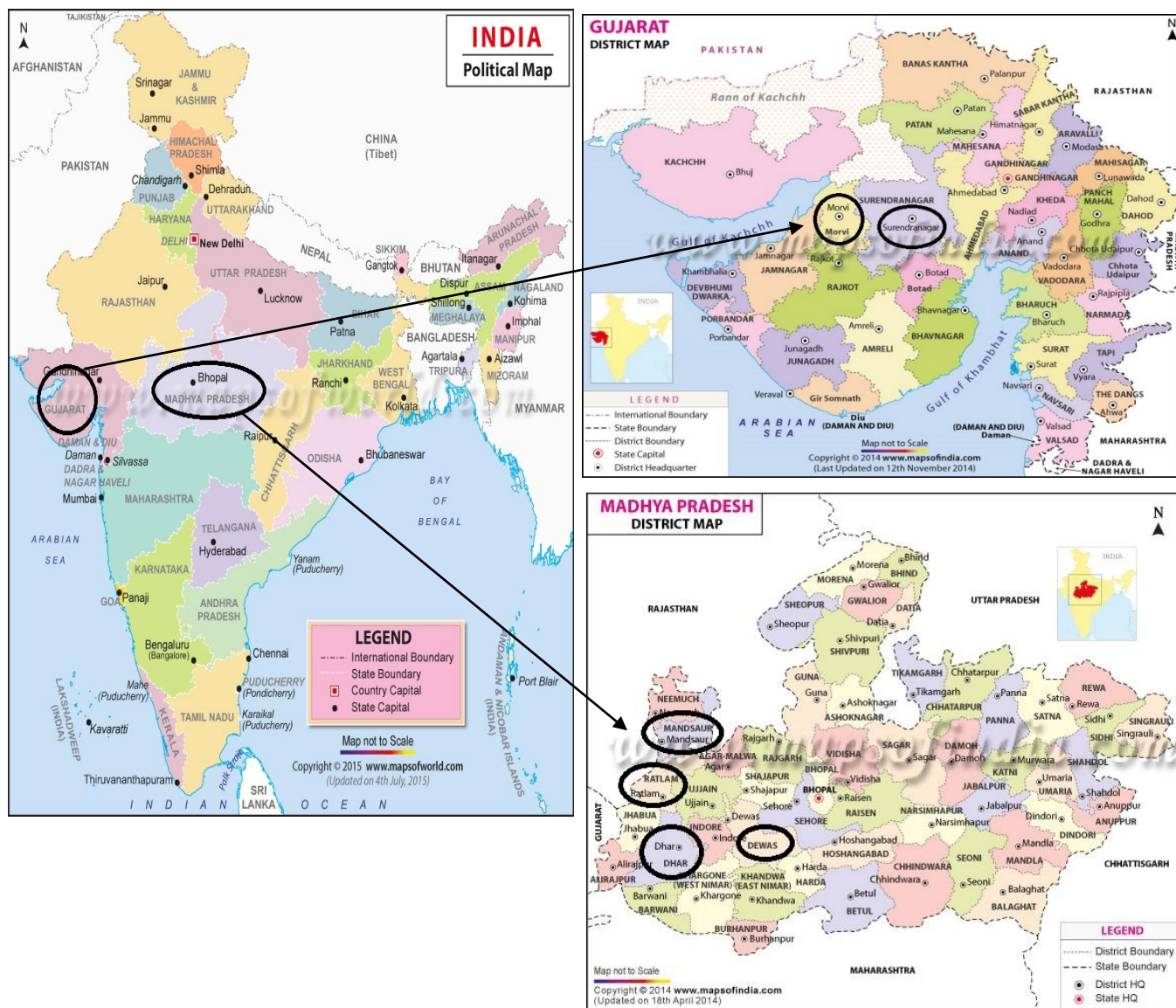
Technical details for Hetero Wind Power VENSYS 87, 1500 KW Machine³

³ <http://www.regenpowertech.com/104/technical-data>

Particulars	Details
Make	ReGen Powertech
Rated power	1500 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	22 m/s
Survival wind speed	52.5 m/s
Generator	Variable Speed Multi Pole Synchronous
Rotor Diameter	87 m
Swept area	5942 m ²
Speed Range	9 to 17.3 rpm
Hub Height	85 m
Design	Tubular, Four Sections
Foundation Type	Floating
Control of Output	Pitch Regulation
Speed Control	Variable, micro controller based
Low Voltage Ride Through (LVRT)	3 seconds
Primary Brake system	Aerodynamic
Pitch System	Electromechanical
Remote Monitoring	VPN
Wind Turbine type class	GL III B
Design Lifetime	25 years

1.9 Project Location

The project location has been highlighted in the geographical map shown below.



The Geo Coordinates of the project location has been mentioned in the table below

S. No.	Project Owner	Machine ID	Village	Taluka	District	State	Latitude (E)	Longitude (N)
1	Giriraj Enterprises	KUM-01	Kumbhariya	Morbi	Morbi	Gujarat	69.9365	25.58948
2		KUM-02					69.8985	25.60019
3		KUM-03					69.9474	25.59780
4		KUM-04					70.1758	25.59589
5		KUM-05					69.9339	25.59378
6		KUM-06					70.1340	25.59779
7		KUM-07					70.1231	25.58663
8	Giriraj Enterprises	PVKH 13	Khakhrechi	Maliya	Morbi	Gujarat	69.3009	25.53266
9		PVKH 19					69.3048	25.54355

10		PVKH 20					69.2523	25.54411
11		PVKH 21					69.2409	25.53983
12		PVKH 25					69.2614	25.53407
13		PVKH 27					69.3476	25.54227
14		PVKH 02					69.4447	25.53243
15		PVKH 17					69.4547	25.54575
16		PVKH 38					69.4170	25.52573
17	Giriraj Enterprises	PVS 02	Mathak	Halwad	Surendran agar	Gujarat	71.2197	25.28765
18		PVS 05	Mathak	Halwad	Surendran agar		71.2872	25.28310
19		PVS 13	Mathak	Halwad	Surendran agar		71.1350	25.28847
20		PVS 20	Mathak	Halwad	Surendran agar		71.0387	25.27098
21		PVS 21	Sarambhada	Halwad	Surendran agar		70.9977	25.26584
22		PVS 26	Sarambhada	Halwad	Surendran agar		71.2981	25.28608
23		PVS 27	Sarambhada	Halwad	Surendran agar		71.0969	25.30374
24		PVS 30	Mathak	Halwad	Surendran agar		71.4905	25.32532
25		PVS 32	Khakhrechi	Maliya	Morbi		70.9607	25.29893
26		RK-26	Khakhrechi	Maliya	Morbi		71.0366	25.35480
27	Giriraj Enterprises	RH3- 01	Ratikhedi,	Mandsaur	Mandsaur	Madhya Pradesh	52.3764	26.43033
28		RH3- 02	Bholiya,	Mandsaur	Mandsaur		52.3477	26.41056
29		RH3- 03	Ratikhedi,	Mandsaur	Mandsaur		52.3533	26.41810
30		RH3- 04	Ratikhedi,	Mandsaur	Mandsaur		52.4264	26.42727
31		RH3- 05	Ratikhedi,	Mandsaur	Mandsaur		52.4002	26.42882
32		RH3- 06	Kankarwa,	Jaora,	Ratlam		52.3370	26.38765
33		RH3- 07	Bholiya,	Mandsaur	Mandsaur		52.3813	26.40538
34		RH3- 08	Kankarwa,	Jaora,	Ratlam		52.3597	26.38602
35		RH3- 09	Bholiya,	Mandsaur	Mandsaur		52.2697	26.39655
36		RH3- 10	Bholiya,	Mandsaur	Mandsaur		52.2643	26.39391
37		RH4- 01	Jogikheda,	Mandsaur	Mandsaur		52.2088	26.46373
38		RH4- 02	Ratikhedi,	Mandsaur	Mandsaur		52.3049	26.44447
39		RH4- 03	Kuchdod,	Mandsaur	Mandsaur		52.5373	26.44086
40		RH4- 04	Khajuri Anjana	Mandsaur	Mandsaur		52.2685	26.45832
41		RH4- 05	Ratikhedi,	Mandsaur	Mandsaur		52.3139	26.44176
42		RH4- 06	Khajuri Anjana	Mandsaur	Mandsaur		52.2723	26.46131
43		RH4- 07	Khajuri Anjana	Mandsaur	Mandsaur		52.4288	26.45976
44		RH4- 08	Khajuri Anjana	Mandsaur	Mandsaur		52.2879	26.45594

45		RH4- 09	Khajuri Anjana	Mandsaur	Mandsaur		52.5030	26.44464
46		RH4- 10	Kuchdod,	Mandsaur	Mandsaur		52.5036	26.44203
47	Giriraj Enterprises	TK- 01	Bhoj Pura,	Tonk Khurd	Dewas	Madhya Pradesh	62.9228	25.53322
48		TK- 04	Bhoj Pura,				62.9155	25.54282
49		TK- 05	Bhoj Pura,				62.9081	25.54671
50		TK- 06	Bhoj Pura,				62.9102	25.54932
51		TK- 07	Bhoj Pura,				62.9137	25.55192
52		TK- 08	Bhoj Pura,				62.9178	25.55451
53		TK- 09	Devli,				62.9136	25.55707
54		TK- 10	Devli,				62.9277	25.56086
55		TK- 12	Ranayal Kala				62.9854	25.56459
56		TK- 14	Ranayal Kala				62.8999	25.57338
57		TK- 02	Bhoj Pura,				62.8799	25.53509
58		TK- 13	Ranayal Kala				62.9868	25.57111
59		TK- 15	Sankely,				63.0723	25.56867
60		TK- 16	Sankely,				62.9840	25.57682
61		TK- 17	Sankely,				62.9670	25.58029
62	Giriraj Enterprises	TIR- 04	Labrawada,	Dhar	Dhar	Madhya Pradesh	52.7202	25.03040
63		TIR- 05	Navgaon,				52.7923	25.03759
64		TIR- 07	Kalukhedi,				52.7697	25.03901
65		TIR- 09	Kalukhedi,				52.7500	25.04083
66		TIR- 10	Chikliya,				52.7009	25.02709
67		TIR- 03	Navgaon,				52.7877	25.02937
68		TIR- 06	Navgaon,				52.7959	25.03251
69		TIR- 12	Navgaon,				52.9144	25.04921
70		TIR- 13	Navgaon,				52.9931	25.04916
71		TIR- 14	Navgaon,				52.8132	25.02737
72		ADD- 02	Navgaon,				52.9037	25.02651
73		ADD- 03	Navgaon,				52.9212	25.03782
74		ADD- 04	Navgaon,				52.9215	25.04110
75		ADD- 05	Khilchipura,				53.0295	25.04681

1.10 Conditions Prior to Project Initiation

The project is a Greenfield wind power project and does not involve generation of GHG emissions for the purpose of their subsequent reduction, removal or destruction. For this project activity, the baseline scenario is the same as conditions existing prior to project initiation. Please refer section 2.4 of VCS PD for baseline scenario for the project activity.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Project has received necessary approvals for development and commissioning for each WTG from the state Nodal agencies and is in compliance to the local laws and regulations.

The PPA, Commissioning Certificates are the project ownership documents which are executed only when the project activity compliance laws and regulatory requirements. Land purchase was initiated only after obtaining the required approvals for the project activity.

Apart from above, as per Central pollution Control Board directions No. B-29012/ESS (CPA) /2015-16 dated 07/03/2016, the wind projects having capacity less than 25 MW, the category of industries has been changes from Green to White. As per this re-categorisation exercise," There shall be no necessity of obtaining the Consent to Operate" for White category of industries. An intimation to concerned SPCB / PCC shall suffice". As per this rule, No necessity of consent for non-polluting industries.

http://cpcb.nic.in/upload/Latest/Latest_118_Final_Directions.pdf

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The Project is owned by Individual investors hence it possess right of use of ER credits. The Ownership is demonstrated through the following documents.

- 1) Commissioning certificates for WTGs in the name of PP issued by respective state electricity board.
- 2) Power Purchase Agreement with respective State Electricity Board for sale of electricity by the PP

1.12.2 Emissions Trading Programs and Other Binding Limits

Net GHG emission reductions or removals generated by the Project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions in any Emission Trading program or other binding limits.

1.12.3 Other Forms of Environmental Credit

The Project has no intend to generate any other form of GHG-related environmental credit for GHG emission reductions or removals other than CDM or VCS. It is going to be registered under VCS program to avail pre CDM credits. If any PP is availing REC benefits, the PP will claim either VCU or REC and there will not be any double accounting for the same monitoring period.

1.12.4 Participation under Other GHG Programs

The Project is not registered in other GHG programs. For current monitoring period, there is no any claim of GHG emission reductions with other GHG program.

1.12.5 Projects Rejected by Other GHG Programs

The Project is not rejected by other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

This is not a grouped project activity. Thus, this section is not applicable for this project.

Leakage Management

Not applicable to the project activity.

Commercially Sensitive Information

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

Sustainable Development

Contribution to sustainable development:

Ministry of Environment and Forests, has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. The project contributes to sustainable development using the following ways.

- **Social well-being:** The project would help in generating employment opportunities during the construction and operation phases. The project activity will lead to development in infrastructure in the region like development of roads and also may promote business with improved power generation.
- **Economic well-being:** 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.

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

- **Technological well-being:** 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
- **Environmental well-being:** Wind being a renewable source of energy, it reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. Due to its zero emission the Project activity also helps in avoiding significant amount of GHG emissions.

Further Information

Till now no legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and/or temporal 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

Methodology: ACM0002: Grid-connected electricity generation from renewable sources ---
Version 17.0, Sectoral Scope: 01,

<https://cdm.unfccc.int/methodologies/DB/8W400U6E7LFHHYH2C4JR1RJWWO4PVN>

The project activity also takes reference from following Tools from the tools prescribed by applied methodology:

1. Tool for the demonstration and assessment of additionality --- Version 07.0.0, EB 70, Annex 8

<https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-01-v7.0.0.pdf>

2. Tool to calculate the emission factor for an electricity system --- Version 05.0, EB 87, Annex 09 <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v5.0.pdf>

2.2 Applicability of Methodology

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

Applicability Criterion	Project Case
1. This methodology is applicable to grid-connected renewable energy power generation project activities that: a. Install a Greenfield power plant; b. Involve a capacity addition to (an) existing plant(s); c. Involve a retrofit of (an) existing operating plants/units; d. Involve a rehabilitation of (an) existing plant(s)/unit(s); or e. Involve a replacement of (an) existing plant(s)/unit(s).	The project activity is installation of a new grid connected wind power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant) and hence this criterion is applicable.
2. 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 proposed project activity is an installation of a new grid connected wind power plant. Hence this condition is met.
3. In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable
4. In case of hydro power plants, one of the following conditions shall apply: a. The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or b. The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable

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, calculated using equation (3), is greater than 4 W/m²; or d. The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m², all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/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/m² shall be: a) Lower than or equal to 15 MW; and b) Less than 10 per cent of the total installed capacity of integrated hydro power project.	
5. In the case of integrated hydro power projects, project proponent shall: • Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or • Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable
6. The methodology is not applicable to: • Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this	The proposed project activity is the installation of a wind power plant/unit. Therefore, the said criteria is not applicable

case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants/units.	
7. 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 project activity involves a new grid connected wind power plant and not a retrofits, replacement or capacity additions and therefore this criterion is not applicable to the project activity.
8. In addition, the applicability conditions included in the tools referred to below apply.	The project applies the following tools and is in compliance to the same; • "Tool to calculate the emission factor for an electricity system"; • "Tool for the demonstration and assessment of additionality";

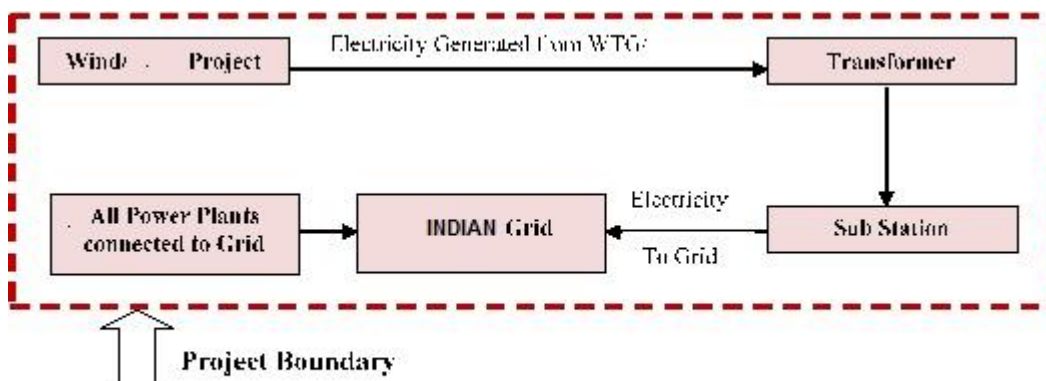
2.3 Project Boundary

As per the para 20 of the applicable methodology ACM0002 (Version 17.0.0) "*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*".

Therefore, the project boundary includes all the WTGs along with the WTGs of the other project proponents connected to the sub-station, which is further connected to the network of the Indian grid, i.e. the project boundary also includes the Indian grid. Thus, the project boundary further includes all the power plants physically connected to the Indian grid

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	Greenfield Wind energy generation system	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.

Project Boundary Diagram:



2.4 Baseline Scenario

As per para 23 of ACM0002 version 17.0; If the project activity is the installation of a Greenfield power plant

“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”.

2.5 Additionality

In line with VCS Standard version 3.6, the additionality of the Project activity is ascertained in line with the applicable guidance from the UNFCCC. The demonstration of additionality for the proposed Project activity is being carried out in accordance with the additionality tool provided by the UNFCCC i.e. “Tool for demonstration and assessment of Additionality” Version 07.0.0,. The tool provides a step-wise approach to demonstrate additionality which is displayed below:

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

No, this project activity is not first-of-its-kind project. The additionality of the project activity has demonstrated by using the investment barrier and the same has been discussed in the following steps.

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

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

Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed VCS project activity.

Alternative 1: The proposed project activity not undertaken as a VCS project activity.

The PP could proceed with the implementation of the project without Carbon credit benefits. The electricity produced from the renewable energy project would have been sold to the grid. This is in compliance with all applicable legal and regulatory requirements and can be a part of the baseline.

However, the Project activity is not feasible without revenues from sale of Carbon Credits. This argument has been discussed in step 2 of the Additionality section.

Alternative 2: No proposed project activity and equivalent amount of energy would have been produced by the grid electricity system through its currently running power plants and by new capacity addition to the grid i.e. Continuation of the present situation.

The PP would have continued without investment in Project activity with usual business activities. The grid would continue with the fossil fuel based power projects and this would result in GHG emissions. Hence, the new capacity add-on from a fossil fuel based power plant is appropriate, realistic & credible baseline alternative for the project activity.

Outcome of Sub-step 1a: All the realistic alternatives for the project activity have been enlisted above.

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

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

The relevant national laws and regulations pertaining to generation of energy in India are:

- Electricity Act 2003
- National Electricity Policy 2005
- Tariff Policy 2006

The Project activity conforms to all the applicable laws and regulations in India:

- Power generation using wind energy is not a legal requirement or a mandatory option.
- There are state and sectoral policies, framed primarily to encourage wind power projects.

These policies have also been drafted realizing the extent of risks involved in the projects and to attract private investments.

- The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation.
- There is no legal requirement on the choice of a particular technology for power generation.

Outcome of Sub-step 1b: Hence, both the alternatives enlisted above are found to comply with the mandatory laws and regulations taking into account the enforcement of the legislations in the region or country and EB decisions on national and/or sectoral policies and regulations. However, Alternative 2 has been selected as the appropriate baseline alternative for this project activity.

Step 2: Investment analysis

Determine whether the proposed project activity is economically or financially less attractive than at least one other alternative, identified in step 1, without the revenue from the sale of emission reductions credits. To conduct the investment analysis, use the following sub-steps:

Sub-step 2a: Determine appropriate analysis method

The Project activity envisages to export the power to Indian grid and the revenues from the sale would be generated in accordance with the terms and tariffs established in the Power Purchase Agreement (PPA). Thus, simple cost analysis cannot be used as the analysis method as the sale of the units of generated electricity shall result in a revenue stream during the operations of the Project activity.

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

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

The investment analysis using Benchmark analysis approach (Option III) has been chosen. Further, this method illustrates the evaluation of the Project by the PP before the decision to undertake the project was taken and management approval granted.

Choice of Financial Indicator:

According to the “Tool for demonstration and assessment of Additionality”, *the financial indicator can be based either on (1) project IRR or (2) equity IRR. There is no general preference between the approaches (1) or (2). The benchmark chosen for analysis shall be fully consistent with the choice of approach.* Therefore in accordance with the guidance, the relevant financial indicator for project activity has been chosen as post tax equity IRR.

Choice of Benchmark:

As per para 9 of methodological Tool “Investment Analysis” Version 07 (EB92 Annex 5), the value for cost of equity is selected from Appendix as per para 11 of tool. However for few bundles Appendix A of Annex 05 of EB 62 and for few bundles Appendix of Annex 12 of EB85 was available to PP at the time of decision made. The default value of Return on Equity for Group-1 projects in India is 11.75% and 11.10% for Annex 05 of EB 62 and Annex 12 of EB85 respectively. This default value was available to PP at the time of decision made, hence this default value is taken for Benchmark analysis. As per paragraph 7 of Appendix A of Annex 05 of EB 62 and para 17 of EB92 Annex 5 of the above mentioned document, *“In situations where an investment analysis is carried out in nominal terms, project participants can convert the real term values provided in the table below to nominal values by adding the inflation rate. The inflation rate shall be obtained from the **inflation forecast of the central bank of the host country for the duration of the crediting period**. If this information is not available, the target inflation rate of the central bank shall be used. If this information is also not available, then the average forecasted inflation rate for the host country published by the IMF (International Monetary Fund World Economic Outlook) or the World Bank for the next five years after the start of the project activity shall be used”.*

Default Value Benchmark Calculations:

As mentioned in Appendix A in EB62 Annex 5 and latest Clarification from UNFCCC in EB 73 (Applicability of the “Guidelines on the assessment of investment analysis” version 01.0), and as per Appendix of Annex 12 of EB85, default value benchmark applicable and valid for each bundle is presented below:

Appendix A in EB62 Annex 5 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = 11.75%

Appendix EB85 Annex 12 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = 11.10%

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

$$\text{Nominal Benchmark}^4 = \{(1 + \text{Real Benchmark}) * (1 + \text{Inflation rate})\} - 1$$

Where:

- Default value for Real Benchmark = 11.75% or 11.10% (as per Appendix of Annex 5, EB 62 or Appendix of EB85 Annex 12)
- Inflation Rate forecast by Reserve Bank of India (RBI) (i.e. Central Bank of India) for India

Dewas 22.5 MW project activity

Default Value			
As per EB85, Annex 12 Dated: 24 July 2015			
Equity IRR Calculation as per Default Value in EB 85 Annex 12			
Benchmark			15.10%
Benchmark Calculations	Value	Sources Link	Document Date
Default Value for India as per UNFCCC guidelines	11.10%	As per EB 85 Annex 12	15-07-2011
Inflation forecast (WPI Mean) as per RBI for 10yrs	3.60%	https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=16696	29-09-2015
Benchmark (with 10yrs Forecast)	15.10%	Calculated	
Benchmark	15.10%	Calculated	

Dhar 21 MW project activity

Default Value			
As per EB85, Annex 12 Dated: 24 July 2015			
Equity IRR Calculation as per Default Value in EB 85 Annex 12			
Benchmark			15.10%
Benchmark Calculations	Value	Sources Link	Document Date

⁴ As per Pg. 320 of Corporate Finance, Second Edition of Aswath Damodaran

Default Value for India as per UNFCCC guidelines	11.10%	As per EB 85 Annex 12	15-07-2011
Inflation forecast (WPI Mean) as per RBI for 10yrs	3.60%	https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=16696	29-09-2015
Benchmark (with 10yrs Forecast)	15.10%	Calculated	
Benchmark	15.10%	Calculated	

Hatuniya 30 MW project Activity

Default Value			
As per EB62, Annex 05 Dated: 15 July 2011			
Equity IRR Calculation as per Default Value in EB 62 Annex 5			
Benchmark			17.11%
Benchmark Calculations	Value	Sources Link	Document Date
Default Value for India as per UNFCCC guidelines	11.75%	As per EB 62 Annex 5	15-07-2011
Inflation forecast (WPI Mean) as per RBI for 10yrs	4.80%	https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=16049	30-09-2014
Benchmark (with 10yrs Forecast)	17.11%	Calculated	
Benchmark	17.11%	Calculated	

Khareda 15 MW project Activity

Default Value			
As per EB85, Annex 12 Dated: 24 July 2015			
Equity IRR Calculation as per Default Value in EB 85 Annex 12			
Benchmark			15.43%
Benchmark Calculations	Value	Sources Link	Document Date
Default Value for India as per UNFCCC guidelines	11.10%	As per EB 85 Annex 12	24-07-2015
Inflation forecast (WPI Mean) as per RBI for 10yrs	3.90%	https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=17119	09-08-2016
Benchmark (with 10yrs Forecast)	15.43%	Calculated	
Benchmark	15.43%	Calculated	

Vejalpar 10.5 MW project Activity

Default Value			
As per EB85, Annex 12 Dated: 24 July 2015			
Equity IRR Calculation as per Default Value in EB 85 Annex 12			
Benchmark			15.43%
Benchmark Calculations	Value	Sources Link	Document Date
Default Value for India as per UNFCCC guidelines	11.10%	As per EB 85 Annex 12	24-07-2015
Inflation forecast (WPI Mean) as per RBI for 10yrs	3.90%	https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=17119	09-08-2016
Benchmark (with 10yrs Forecast)	15.43%	Calculated	
Benchmark	15.43%	Calculated	

Vejalpar 13.5 MW project Activity

Default Value			
As per EB85, Annex 12 Dated: 24 July 2015			
Equity IRR Calculation as per Default Value in EB 85 Annex 12			
Benchmark			15.43%
Benchmark Calculations	Value	Sources Link	Document Date
Default Value for India as per UNFCCC guidelines	11.10%	As per EB 85 Annex 12	24-07-2015
Inflation forecast (WPI Mean) as per RBI for 10yrs	3.90%	https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=17119	09-08-2016
Benchmark (with 10yrs Forecast)	15.43%	Calculated	
Benchmark	15.43%	Calculated	

Input values for 30 MW Wind Project at Hatuniya Site, Madhya Pradesh

Cost of the Project Activity

Investor Name	Giriraj Enterprises (Hatunia site)
Project Location	Hatuniya, Madhya Pradesh
State	Madhya Pradesh
Project Capacity (MW)	30
Date of Commissioning	31-Mar-2015

Life of Plant in years	25
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Offer Letter
2-Sep-14

in INR MN

Items	Cost	Tax	Cost + Tax
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Supply of WTG Comprehensive cost	1,900.00	-	1,900.00
Erection & Commissioning	120.00	-	120.00
Land and Site Development	80.00	-	80.00
Total Cost of Project	2,100.00	-	2,100.00

O&M Expenses	32.00	3.96	35.96
6% Escalation, starting from 3rd Yr.			

Assumptions and values considered for Financial Analysis are as follows

Details of the project		Source
State where the project is situated	Madhya Pradesh	
Total Capacity (MW)	30.00	
Expected Date of Commissioning	31-Mar-15	Assumption
Life of the plant (Yrs.) ⁵	25	WTG manufacturer specifications and as per MPERC Tariff Order dated 31-03-2016
Generation of electricity		
PLF (%)	20.00%	As per Third Party PLF Report dated 20/09/2014
Annual generation (kWh)	5,25,60,000	Calculated Value
Tariff rate (INR/kWh)	5.92	As per PPA signed
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	35.96	Offer letter
O & M free for (Yr.)	1.00	Offer letter
Escalation in the operational expenses (%)	6.00%	Offer letter
Administrative expenses (INR MN)	2.00	Administration and Miscellaneous expenses

⁵ <http://www.mperc.nic.in/310316-Wind-tariff-SMP-74-15.pdf>

Escalation in Administrative expenses	5.00%	Escalation for Admin Expenses
Insurance (INR Mn.) ⁶	10.50	As per CERC order
Financial parameters		
TOTAL COST (INR Mn.)	2,100.00	Offer letter
Loan Amount (INR Mn.)	1,470.00	Assumption
Equity Investment (INR Mn.)	630.00	Calculated Value
Term loan		
Loan Amount (INR Mn.) ⁷	1,470.00	assumption 70% loan and 30% equity
Interest rate (%) ⁸	14.50%	Bank of Baroda BPLR from 09/02/2013 onwards
Loan Tenure (Qtr.)	40	Assumption
Moratorium Period (Qtr.)	2	Assumption
Repayment Period (Qtr.)	38	Calculated Value
Repayment instalments value (INR Mn.)	38.684	Calculated Value
1st instalment from (Qtr. end)	30-Sep-15	Considered from the next Quarter End
Book Depreciation (SLM Method)		
Land	80.00	
Gross Depreciable Value (INR Mn.)	2,020.00	Calculated Value
Salvage Value (%) ⁹	10.00%	Page 15 of CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012
Salvage value (INR Mn.)	202.00	Calculated Value
Net Depreciable Value (INR Mn.)	1,818.00	Calculated Value
Residual Value (INR Mn.)	202.00	Calculated Value
IT Depreciation		
IT Depreciation (%) ¹⁰	80%	IT act
Income Tax		

⁶ <http://www.cercind.gov.in/2016/orders/SO17.pdf>

⁷ <http://www.mperc.nic.in/310316-Wind-tariff-SMP-74-15.pdf>

⁸ <http://www.bankruna.com/basedata.htm> As being a part of Malpani Group, Malpani group avails term loan facilities for its various renewable energy projects from Bank of Baroda only.

⁹ http://www.cercind.gov.in/2012/regulation/CERC_RE-Tariff-Regualtions_6_2_2012.pdf

¹⁰ http://www.taxafin.com/Income_Tax/Tax_Rates/Depreciation_Rates.html

Financial Year	FY 2014-15	
Income tax rate (%) ¹¹	30.00%	As Per Income Tax Rule, Pg 29 Para E(I)
Corporate Tax (%) ¹²	33.00%	As Per IT rule
Service Tax (%) ¹³	12.00%	As Per Income Tax Rule, Pg 14
Surcharge (%) ¹⁴	10.00%	As Per Income Tax Rule, Pg 29 Para E(I)
Education cess (%) ¹⁵	3.00%	As Per Income Tax Rule, Pg 5, 11 and 12
Final Tax rates		
Income tax rate (%)	33.33%	Calculated Value
Corporate Tax (%)	36.66%	Calculated Value
Service Tax (%)	12.36%	Calculated Value

Investor Name - Giriraj Enterprises (Hatunia site)	Equity IRR without CDM	Benchmark (Equity IRR)
	11.79%	17.11%

Input values for 21 MW Wind Project at Dhar Site, Madhya Pradesh

Cost of the Project Activity

Investor Name	Giriraj Enterprises (Dhar site)
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Project Location	Dhar, Madhya Pradesh
State	Madhya Pradesh
Project Capacity (MW)	21
Date of Commissioning	31-Mar-2016

¹¹ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

¹² <https://www.bankbazaar.com/tax/corporate-tax.html>

¹³ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

¹⁴ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

¹⁵ <http://indiabudget.nic.in/ub2015-16/fb/bill.pdf>

Life of Plant in years	25
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Offer Letter
20-Oct-15

in INR MN

Items	Cost	Tax	Cost + Tax
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Supply of WTG Comprehensive cost	1,330.00	-	1,330.00
Erection & Commissioning	84.00	-	84.00
Land and Site Development	56.00	-	56.00
Total Cost of Project	1,470.00	-	1,470.00

O&M Expenses	22.40	2.77	25.17
6% Escalation, starting from 3rd Yr.			

Assumptions and values considered for Financial Analysis are as follows

Details of the project		Source
State where the project is situated	Madhya Pradesh	
Total Capacity (MW)	21.00	
Expected Date of Commissioning	31-Mar-16	Assumption
Life of the plant (Yrs.) ¹⁶	25	WTG manufacturer specifications and as per MPERC Tariff Order dated 31-03-2016
Generation of electricity		
PLF (%) ¹⁷	23.00%	As per MPERC Tariff Order dated 31-03-2016
Annual generation (kWh)	423,10,800	Calculated Value
Tariff rate (INR/kWh) ¹⁸	4.78	As per MPERC Tariff Order dated 31-03-2016
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	25.17	Offer letter
O & M free for (Yr.)	1.00	Offer letter
Escalation in the operational expenses (%)	6.00%	Offer letter

¹⁶ <http://www.mperc.nic.in/310316-Wind-tariff-SMP-74-15.pdf>

¹⁷ <http://www.mperc.nic.in/310316-Wind-tariff-SMP-74-15.pdf>

¹⁸ <http://www.mperc.nic.in/310316-Wind-tariff-SMP-74-15.pdf>

Administrative expenses (INR MN)	2.00	Administration and Miscellaneous expenses
Escalation in Administrative expenses	5.00%	Escalation for Admin Expenses
Insurance (INR Mn.) ¹⁹	7.35	As per CERC order
Financial parameters		
TOTAL COST (INR Mn.)	1,470.00	Offer letter
Loan Amount (INR Mn.)	1,029.00	Assumption
Equity Investment (INR Mn.)	441.00	Calculated Value
Term loan		
Loan Amount (INR Mn.) ²⁰	1,029.00	assumption 70% loan and 30% equity
Interest rate (%) ²¹	14.15%	Bank of Baroda BPLR from 13/07/2015 onwards
Loan Tenure (Qtr.)	40	Assumption
Moratorium Period (Qtr.)	2	Assumption
Repayment Period (Qtr.)	38	Calculated Value
Repayment instalments value (INR Mn.)	27.079	Calculated Value
1st instalment from (Qtr. end)	30-Sep-16	Considered from the next Quarter End
Book Depreciation (SLM Method)		
Land	56.00	
Gross Depreciable Value (INR Mn.)	1,414.00	Calculated Value
Salvage Value (%) ²²	10.00%	Page 15 of CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012
Salvage value (INR Mn.)	141.40	Calculated Value
Net Depreciable Value (INR Mn.)	1,272.60	Calculated Value
Residual Value (INR Mn.)	141.40	Calculated Value
IT Depreciation		

¹⁹ <http://www.cercind.gov.in/2016/orders/SO17.pdf>

²⁰ <http://www.mperc.nic.in/310316-Wind-tariff-SMP-74-15.pdf>

²¹ <http://www.bankruna.com/basedata.htm> As being a part of Malpani Group, Malpani group avails term loan facilities for its various renewable energy projects from Bank of Baroda only.

²² http://www.cercind.gov.in/2012/regulation/CERC_RE-Tariff-Regualtions_6_2_2012.pdf

IT Depreciation (%) ²³	80%	IT Act
Income Tax		
Financial Year	FY 2015-16	
Income tax rate (%) ²⁴	30.00%	As Per Income Tax Rule, Pg 29 Para E(I)
Corporate Tax (%) ²⁵	33.00%	As Per IT rule
Service Tax (%) ²⁶	12.00%	As Per Income Tax Rule, Pg 14
Surcharge (%) ²⁷	10.00%	As Per Income Tax Rule, Pg 29 Para E(I)
Education cess (%) ²⁸	3.00%	As Per Income Tax Rule, Pg 5, 11 and 12
Final Tax rates		
Income tax rate (%)	33.33%	Calculated Value
Corporate Tax (%)	36.66%	Calculated Value
Service Tax (%)	12.36%	Calculated Value

Result -

Investor Name - Giriraj Enterprises (Dhar site)	Equity IRR without CDM	Benchmark (Equity IRR)
	9.23%	15.10%

Input values for 22.5 MW Wind Project at Dewas Site, Madhya Pradesh

Cost of the Project Activity

Investor Name	Giriraj Enterprises (Dewas site)
Project Location	Dewas, Madhya Pradesh
State	Madhya Pradesh

²³ http://www.taxafin.com/Income_Tax/Tax_Rates/Depreciation_Rates.html

²⁴ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

²⁵ <https://www.bankbazaar.com/tax/corporate-tax.html>

²⁶ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

²⁷ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

²⁸ <http://indiabudget.nic.in/ub2015-16/fb/bill.pdf>

Project Capacity (MW)	22.5
Expected Date of Commissioning	30-May-2016
Life of Plant in years	25

Offer Letter
20-Oct-15

in INR MN

Items	Cost	Tax	Cost + Tax
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Supply of WTG Comprehensive cost	1,425.00	-	1,425.00
Erection & Commissioning	90.00	-	90.00
Land and Site Development	60.00	-	60.00
Total Cost of Project	1,575.00	-	1,575.00

O&M Expenses	24.00	2.97	26.97
6% Escalation, starting from 3rd Yr.			

Assumptions and values considered for Financial Analysis are as follows

Details of the project		Source
State where the project is situated	Madhya Pradesh	
Total Capacity (MW)	22.50	
Expected Date of Commissioning	30-May-16	Assumption
Life of the plant (Yrs.) ²⁹	25	WTG manufacturer specifications and as per MPERC Tariff Order dated 31-03-2016
Generation of electricity		
PLF (%) ³⁰	23.00%	As per MPERC Tariff Order dated 31-03-2016
Annual generation (kWh)	453,33,000	Calculated Value
Tariff rate (INR/kWh)	4.78	As per PPA signed
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	26.97	Offer letter
O & M free for (Yr.)	1.00	Offer letter
Escalation in the operational expenses (%)	6.00%	Offer letter

²⁹ <http://www.mperc.nic.in/310316-Wind-tariff-SMP-74-15.pdf>

³⁰ <http://www.mperc.nic.in/310316-Wind-tariff-SMP-74-15.pdf>

Administrative expenses (INR MN)	2.00	Administration and Miscellaneous expenses
Escalation in Administrative expenses	5.00%	Escalation for Admin Expenses
Insurance (INR Mn.) ³¹	7.88	As per CERC order
Financial parameters		
TOTAL COST (INR Mn.)	1,575.00	Offer letter
Loan Amount (INR Mn.)	1,102.50	Assumption
Equity Investment (INR Mn.)	472.50	Calculated Value
Term loan		
Loan Amount (INR Mn.) ³²	1,102.50	assumption 70% loan and 30% equity
Interest rate (%) ³³	14.15%	Bank of Baroda BPLR from 13/07/2015 onwards
Loan Tenure (Qtr.)	40	Assumption
Moratorium Period (Qtr.)	2	Assumption
Repayment Period (Qtr.)	38	Calculated Value
Repayment instalments value (INR Mn.)	29.013	Calculated Value
1st instalment from (Qtr. end)	31-Dec-16	Considered from the next Quarter End
Book Depreciation (SLM Method)		
Land	60.00	
Gross Depreciable Value (INR Mn.)	1,515.00	Calculated Value
Salvage Value (%) ³⁴	10.00%	Page 15 of CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012
Salvage value (INR Mn.)	151.50	Calculated Value
Net Depreciable Value (INR Mn.)	1,363.50	Calculated Value
Residual Value (INR Mn.)	151.50	Calculated Value
IT Depreciation		

³¹ <http://www.cercind.gov.in/2016/orders/SO17.pdf>

³² <http://www.mperc.nic.in/310316-Wind-tariff-SMP-74-15.pdf>

³³ <http://www.bankruna.com/basedata.htm> As being a part of Malpani Group, Malpani group avails term loan facilities for its various renewable energy projects from Bank of Baroda only.

³⁴ http://www.cercind.gov.in/2012/regulation/CERC_RE-Tariff-Regualtions_6_2_2012.pdf

IT Depreciation (%) ³⁵	80%	IT act
Income Tax		
Financial Year	FY 2016-17	
Income tax rate (%) ³⁶	30.00%	As Per Income Tax Rule, Pg 29 Para E(I)
Corporate Tax (%) ³⁷	33.00%	As Per IT rule
Service Tax (%) ³⁸	12.00%	As Per Income Tax Rule, Pg 14
Surcharge (%) ³⁹	10.00%	As Per Income Tax Rule, Pg 29 Para E(I)
Education cess (%) ⁴⁰	3.00%	As Per Income Tax Rule, Pg 5, 11 and 12
Final Tax rates		
Income tax rate (%)	33.33%	Calculated Value
Corporate Tax (%)	36.66%	Calculated Value
Service Tax (%)	12.36%	Calculated Value

Result -

Investor Name - Giriraj Enterprises (Dewas site)	Equity IRR without CDM	Benchmark (Equity IRR)
	8.60%	15.10%

Input values for 10 MW Wind Project at Khareda Site, Gujarat

Cost of the Project Activity

Investor Name	Giriraj Enterprises (Khareda site)
Project Location	Khareda Site, Gujarat
State	Gujarat

³⁵ http://www.taxafin.com/Income_Tax/Tax_Rates/Depreciation_Rates.html

³⁶ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

³⁷ <https://www.bankbazaar.com/tax/corporate-tax.html>

³⁸ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

³⁹ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁴⁰ <http://indiabudget.nic.in/ub2015-16/fb/bill.pdf>

Project Capacity (MW)	15
Expected Date of Commissioning	31-Mar-2017
Life of Plant in years	25

Offer Letter
16-Aug-16

in INR MN

Items	Cost	Tax	Cost + Tax
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Supply of WTG Comprehensive cost	950.00	-	950.00
Erection & Commissioning	80.00	-	80.00
Land and Site Development	20.00	-	20.00
Total Cost of Project	1,050.00	-	1,050.00

O&M Expenses	16.00	1.98	17.98
6% Escalation, starting from 3rd Yr.			

Assumptions and values considered for Financial Analysis are as follows

Details of the project		Source
State where the project is situated	Gujarat	
Total Capacity (MW)	15.00	
Expected Date of Commissioning	31-Mar-17	Assumption
Life of the plant (Yrs.) ⁴¹	25	WTG manufacturer specifications and as per GERC Tariff Order 2016
Generation of electricity		
PLF (%) ⁴²	24.50%	As per GERC Tariff Order 2016
Annual generation (kWh)	321,93,000	Calculated Value
Tariff rate (INR/kWh) ⁴³	4.19	As per GERC Tariff Order 2016
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	17.98	Offer letter
O & M free for (Yr.)	1.00	Offer letter
Escalation in the operational expenses (%)	6.00%	Offer letter

⁴¹ <http://gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁴² <http://gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁴³ <http://gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

Administrative expenses (INR MN)	2.00	Administration and Miscellaneous expenses
Escalation in Administrative expenses	5.00%	Escalation for Admin Expenses
Insurance (INR Mn.) ⁴⁴	5.25	As per CERC order
Financial parameters		
TOTAL COST (INR Mn.)	1,050.00	Offer letter
Loan Amount (INR Mn.)	735.00	Assumption
Equity Investment (INR Mn.)	315.00	Calculated Value
Term loan		
Loan Amount (INR Mn.) ⁴⁵	735.00	assumption 70% loan and 30% equity
Interest rate (%) ⁴⁶	14.15%	Bank of Baroda BPLR from 13/07/2015 onwards
Loan Tenure (Qtr.)	40	Assumption
Moratorium Period (Qtr.)	2	Assumption
Repayment Period (Qtr.)	38	Calculated Value
Repayment instalments value (INR Mn.)	19.342	Calculated Value
1st instalment from (Qtr. end)	30-Sep-17	Considered from the next Quarter End
Book Depreciation (SLM Method)		
Land	20.00	
Gross Depreciable Value (INR Mn.)	1,030.00	Calculated Value
Salvage Value (%) ⁴⁷	10.00%	Page 15 of CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012
Salvage value (INR Mn.)	103.00	Calculated Value
Net Depreciable Value (INR Mn.)	927.00	Calculated Value
Residual Value (INR Mn.)	103.00	Calculated Value
IT Depreciation		

⁴⁴ <http://www.cercind.gov.in/2016/orders/SO17.pdf>

⁴⁵ <http://gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁴⁶ <http://www.bankruna.com/basedata.htm> As being a part of Malpani Group, Malpani group avails term loan facilities for its various renewable energy projects from Bank of Baroda only.

⁴⁷ http://www.cercind.gov.in/2012/regulation/CERC_RE-Tariff-Regualtions_6_2_2012.pdf

IT Depreciation (%) ⁴⁸	80%	IT Act
Income Tax		
Financial Year	FY 2016-17	
Income tax rate (%) ⁴⁹	30.00%	As Per Income Tax Rule, Pg 29 Para E(I)
Corporate Tax (%) ⁵⁰	33.00%	As Per IT rule
Service Tax (%) ⁵¹	12.00%	As Per Income Tax Rule, Pg 14
Surcharge (%) ⁵²	10.00%	As Per Income Tax Rule, Pg 29 Para E(I)
Education cess (%) ⁵³	3.00%	As Per Income Tax Rule, Pg 5, 11 and 12
Final Tax rates		
Income tax rate (%)	33.33%	Calculated Value
Corporate Tax (%)	36.66%	Calculated Value
Service Tax (%)	12.36%	Calculated Value

Result -

Investor Name - Giriraj Enterprises (Khareda site)	Equity IRR without CDM	Benchmark (Equity IRR)
	6.81%	15.43%

Input values for 10.5 MW Wind Project at Vejalpar Site, Gujarat

Cost of the Project Activity

Investor Name	Giriraj Enterprises (Vejalpar site)
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⁴⁸ <http://taxadda.com/companies-act-2013/depreciation-rates-as-per-companies-act-2013/>

⁴⁹ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁵⁰ <https://www.bankbazaar.com/tax/corporate-tax.html>

⁵¹ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁵² <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁵³ <http://indiabudget.nic.in/ub2015-16/fb/bill.pdf>

Project Location	Gujarat
State	Gujarat
Project Capacity (MW)	10.5
Expected Date of Commissioning	31-Mar-2017
Life of Plant in years	25

Offer Letter

16-Aug-16

in INR MN

Items	Cost	Tax	Cost + Tax
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Supply of WTG Comprehensive cost	665.00	-	665.00
Erection & Commissioning	56.00	-	56.00
Land and Site Development	14.00	-	14.00
Total Cost of Project	735.00	-	735.00

O&M Expenses	11.20	1.38	12.58
6% Escalation, starting from 3rd Yr.			

Assumptions and values considered for Financial Analysis are as follows

Details of the project		Source
State where the project is situated	Gujarat	
Total Capacity (MW)	10.50	
Expected Date of Commissioning	31-Mar-17	Assumption
Life of the plant (Yrs.) ⁵⁴	25	WTG manufacturer specifications and as per GERC Tariff Order 2016
Generation of electricity		
PLF (%) ⁵⁵	24.50%	As per GERC Tariff Order 2016
Annual generation (kWh)	225,35,100	Calculated Value
Tariff rate (INR/kWh) ⁵⁶	4.19	As per GERC Tariff Order 2016
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	12.56	Offer letter

⁵⁴ <http://gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁵⁵ <http://gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁵⁶ <http://gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

O & M free for (Yr.)	1.00	Offer letter
Escalation in the operational expenses (%)	6.00%	Offer letter
Administrative expenses (INR MN)	2.00	Administration and Miscellaneous expenses
Escalation in Administrative expenses	5.00%	Escalation for Admin Expenses
Insurance (INR Mn.) ⁵⁷	3.68	As per CERC order
Financial parameters		
TOTAL COST (INR Mn.)	735.00	Offer letter
Loan Amount (INR Mn.)	514.50	Assumption
Equity Investment (INR Mn.)	220.50	Calculated Value
Term loan		
Loan Amount (INR Mn.) ⁵⁸	514.50	assumption 70% loan and 30% equity
Interest rate (%) ⁵⁹	14.15%	Bank of Baroda BPLR from 13/07/2015 onwards
Loan Tenure (Qtr.)	40	Assumption
Moratorium Period (Qtr.)	2	Assumption
Repayment Period (Qtr.)	38	Calculated Value
Repayment instalments value (INR Mn.)	13.539	Calculated Value
1st instalment from (Qtr. end)	30-Sep-17	Considered from the next Quarter End
Book Depreciation (SLM Method)		
Gross Depreciable Value (INR Mn.)	735.00	Calculated Value
Salvage Value (%) ⁶⁰	10.00%	Page 15 of CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012
Salvage value (INR Mn.)	73.50	Calculated Value
Net Depreciable Value (INR Mn.)	661.50	Calculated Value
Residual Value (INR Mn.)	73.50	Calculated Value
IT Depreciation		

⁵⁷ <http://www.cercind.gov.in/2016/orders/SO17.pdf>

⁵⁸ <http://gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁵⁹ <http://www.bankruna.com/basedata.htm> As being a part of Malpani Group, Malpani group avails term loan facilities for its various renewable energy projects from Bank of Baroda only.

⁶⁰ http://www.cercind.gov.in/2012/regulation/CERC_RE-Tariff-Regualtions_6_2_2012.pdf

IT Depreciation (%) ⁶¹	80%	IT Act
Income Tax		
Financial Year	FY 2016-17	
Income tax rate (%) ⁶²	30.00%	As Per Income Tax Rule, Pg 29 Para E(I)
Corporate Tax (%) ⁶³	33.00%	As Per IT rule
Service Tax (%) ⁶⁴	12.00%	As Per Income Tax Rule, Pg 14
Surcharge (%) ⁶⁵	10.00%	As Per Income Tax Rule, Pg 29 Para E(I)
Education cess (%) ⁶⁶	3.00%	As Per Income Tax Rule, Pg 5, 11 and 12
Final Tax rates		
Income tax rate (%)	33.99%	Calculated Value
Corporate Tax (%)	37.39%	Calculated Value
Service Tax (%)	12.36%	Calculated Value

Result -

Investor Name - Giriraj Enterprises (Vejalpar site)	Equity IRR without CDM	Benchmark (Equity IRR)
	6.66%	15.43%

Input values for 13.5 MW Wind Project at Vejalpar Site, Gujarat

Cost of the Project Activity

Investor Name	Giriraj Enterprises (Vejalpar site)
Project Location	Gujarat
State	Gujarat

⁶¹ http://www.taxafin.com/Income_Tax/Tax_Rates/Depreciation_Rates.html

⁶² <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁶³ <https://www.bankbazaar.com/tax/corporate-tax.html>

⁶⁴ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁶⁵ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁶⁶ <http://indiabudget.nic.in/ub2015-16/fb/bill.pdf>

Project Capacity (MW)	13.5
Expected Date of Commissioning	31-Mar-2017
Life of Plant in years	25

Offer Letter
16-Sep-16

in INR MN

Items	Cost	Tax	Cost + Tax
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Supply of WTG Comprehensive cost	855.00	-	855.00
Erection & Commissioning	72.00	-	72.00
Land and Site Development	18.00	-	18.00
Total Cost of Project	945.00	-	945.00

O&M Expenses	14.40	1.78	16.18
6% Escalation, starting from 3rd Yr.			

Assumptions and values considered for Financial Analysis are as follows

Details of the project		Source
State where the project is situated	Gujarat	
Total Capacity (MW)	13.50	
Expected Date of Commissioning	31-Mar-17	Assumption
Life of the plant (Yrs.) ⁶⁷	25	WTG manufacturer specifications and as per GERC Tariff Order 2016
Generation of electricity		
PLF (%) ⁶⁸	24.50%	As per GERC Tariff Order 2016
Annual generation (kWh)	289,73,700	Calculated Value
Tariff rate (INR/kWh) ⁶⁹	4.19	As per GERC Tariff Order 2016
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	16.15	Offer letter
O & M free for (Yr.)	1.00	Offer letter
Escalation in the operational expenses (%)	6.00%	Offer letter

⁶⁷ <http://gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁶⁸ <http://gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁶⁹ <http://gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

Administrative expenses (INR MN)	2.00	Administration and Miscellaneous expenses
Escalation in Administrative expenses	5.00%	Escalation for Admin Expenses
Insurance (INR Mn.) ⁷⁰	4.73	As per CERC order
Financial parameters		
TOTAL COST (INR Mn.)	945.00	Offer letter
Loan Amount (INR Mn.)	661.50	Assumption
Equity Investment (INR Mn.)	283.50	Calculated Value
Term loan		
Loan Amount (INR Mn.) ⁷¹	661.50	assumption 70% loan and 30% equity
Interest rate (%) ⁷²	14.15%	Bank of Baroda BPLR from 13/07/2015 onwards
Loan Tenure (Qtr.)	40	Assumption
Moratorium Period (Qtr.)	2	Assumption
Repayment Period (Qtr.)	38	Calculated Value
Repayment instalments value (INR Mn.)	17.408	Calculated Value
1st instalment from (Qtr. end)	30-Sep-17	Considered from the next Quarter End
Book Depreciation (SLM Method)		
Gross Depreciable Value (INR Mn.)	945.00	Calculated Value
Salvage Value (%) ⁷³	10.00%	Page 15 of CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2012
Salvage value (INR Mn.)	94.50	Calculated Value
Net Depreciable Value (INR Mn.)	850.50	Calculated Value
Residual Value (INR Mn.)	94.50	Calculated Value
IT Depreciation		
IT Depreciation (%) ⁷⁴	80%	IT Act

⁷⁰ <http://www.cercind.gov.in/2016/orders/SO17.pdf>

⁷¹ <http://gercin.org/uploaded/document/07c74229-5dc4-4406-89d3-25a82fa0931b.pdf>

⁷² <http://www.bankruna.com/basedata.htm> As being a part of Malpani Group, Malpani group avails term loan facilities for its various renewable energy projects from Bank of Baroda only.

⁷³ http://www.cercind.gov.in/2012/regulation/CERC_RE-Tariff-Regualtions_6_2_2012.pdf

⁷⁴ http://www.taxafin.com/Income_Tax/Tax_Rates/Depreciation_Rates.html

Income Tax		
Financial Year	FY 2016-17	
Income tax rate (%) ⁷⁵	30.00%	As Per Income Tax Rule, Pg 29 Para E(I)
Corporate Tax (%) ⁷⁶	33.00%	As Per IT rule
Service Tax (%) ⁷⁷	12.00%	As Per Income Tax Rule, Pg 14
Surcharge (%) ⁷⁸	10.00%	As Per Income Tax Rule, Pg 29 Para E(I)
Education cess (%) ⁷⁹	3.00%	As Per Income Tax Rule, Pg 5, 11 and 12
Final Tax rates		
Income tax rate (%)	33.99%	Calculated Value
Corporate Tax (%)	37.39%	Calculated Value
Service Tax (%)	12.36%	Calculated Value

Result -

Investor Name - Giriraj Enterprises (Vejalpar site)	Equity IRR without CDM	Benchmark (Equity IRR)
	6.92%	15.43%

Sub-step 2c: Sensitivity Analysis:

As per methodological Tool “Investment Analysis” Version 07, 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 and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets. Guidance also states, “All parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude”. The Annex also states, as a general point of departure, variations in the sensitivity analysis should at least cover a range of +10% and –10%, unless this is not deemed appropriate in the context of the specific project circumstances.

Since the project cost is already firmed up, the cost is not variable. The tariff is determined by PPA which is fixed for years mentioned as per the tariff order and hence it need not be subjected to variation. All other expenses are much less than 20% of the total cost. Hence, only PLF needs to be subjected to reasonable variation. Nevertheless, following factors have been subjected to sensitivity analysis:

⁷⁵ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁷⁶ <https://www.bankbazaar.com/tax/corporate-tax.html>

⁷⁷ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁷⁸ <http://indiabudget.nic.in/budget2015-2016/ub2015-16/fb/bill.pdf>

⁷⁹ <http://indiabudget.nic.in/ub2015-16/fb/bill.pdf>

- (a) PLF
- (b) O&M Cost
- (c) Project Cost
- (d) Tariff Rate

The sensitivity analysis for 30 MW Wind Project at Hatuniya site, Madhya Pradesh is as follows:

Variation %	-10%	Normal	10%	Breaching Value
PLF	8.06%	11.79%	15.47%	14.35%
O&M	12.38%	11.79%	11.18%	-91.80%
Project Cost	15.05%	11.79%	9.09%	-15.13%
Tariff Rate	8.06%	11.79%	15.47%	14.35%

The sensitivity analysis for 21 MW Wind Project at Dhar site, Madhya Pradesh is as follows:

Variation %	-10%	Normal	10%	Breaching Value
PLF	5.77%	9.23%	12.60%	17.30%
O&M	9.85%	9.23%	8.49%	-99.00%
Project Cost	12.12%	9.23%	6.72%	-17.85%
Tariff Rate	5.77%	9.23%	12.60%	17.30%

The sensitivity analysis for 22.5 MW Wind Project at Dewas site, Madhya Pradesh is as follows:

Variation %	-10%	Normal	10%	Breaching Value
PLF	5.51%	8.60%	11.89%	20.03%
O&M	9.29%	8.60%	8.00%	-120.30%
Project Cost	11.50%	8.60%	6.41%	-20.05%
Tariff Rate	5.51%	8.60%	11.89%	20.03%

The sensitivity analysis for 15 MW Wind Project at Khareda site, Gujarat is as follows:

Variation %	-10%	Normal	10%	Breaching Value
PLF	3.85%	6.81%	10.16%	26.03%
O&M	7.46%	6.81%	6.14%	-143.50%
Project Cost	9.67%	6.81%	4.81%	-25.07%
Tariff Rate	3.85%	6.81%	10.16%	26.03%

The sensitivity analysis for 10.5 MW Wind Project at Vejalpar site, Gujarat is as follows:

Variation %	-10%	Normal	10%	Breaching Value
PLF	3.65%	6.66%	10.07%	25.67%
O&M	7.32%	6.66%	5.97%	-142.30%
Project Cost	9.47%	6.66%	4.65%	-24.83%
Tariff Rate	3.65%	6.66%	10.07%	25.67%

The sensitivity analysis for 13.5 MW Wind Project at Vejalpar site, Gujarat is as follows:

Variation %	-10%	Normal	10%	Breaching Value
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PLF	3.91%	6.92%	10.37%	24.89%
O&M	7.58%	6.92%	6.24%	-137.70%
Project Cost	9.81%	6.92%	4.88%	-24.05%
Tariff Rate	3.93%	6.92%	10.37%	24.89%

It can be observed from above table that in various scenarios wherein there are changes in tariff, O&M cost, net saleable units and project's capital cost, the Equity IRR does not cross the benchmark. Thus, it can be concluded that revenue from sale of VCUs is important to alleviate this gap and hence the project has been considered to be additional.

	Probability to breach the benchmark
PLF	Not possible as the PLF has been reported as per the tariff order based on long term data and hence a PLF fluctuation of more than 10% is unlikely to happen. Also project activity remains additional by considering the PLF as per third party PLF report..
O&M	With the country experiencing 6.50% inflation on an average, the question of O&M coming down is ruled out. Moreover, the purchase orders provide for a 6% escalation in the cost every year.
Project Cost	The total project cost is not 10% lower than the considered at the time of decision making cost. Since the project cost is firm, there is no possibility of project cost going below this level. The actual reduction in project cost is around 6%. However, we have conducted sensitivity analysis for project cost being 10% less than that considered during decision making. Still, the IRR does not breach the Benchmark.
Tariff Rate	The tariff is determined by PPA which is fixed for years mentioned as per the State Electricity Board's tariff order. Hence, there is no probability to get variation for the same.

Step 3: Barrier analysis

Barrier analysis has not been used.

Step 4: Common practice Analysis

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

Common practice analysis has been carried out as per "Guidelines on Common Practice, version 02.0 EB69, Annex 8". In the context of the project activity, the following parameters are defined as per **Part I. Definitions** of the Guidelines on Common Practice:

1. Applicable Geographical Area (Para 1): The host country, i.e. India has been considered as the applicable geographical area for this project.
2. Measure (Para 2): The project activity reduces greenhouse gas emissions by generating electricity using renewable energy source-wind. Therefore, the project activity falls under the following measure:
 - (b) *Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies*

3. Output (Para 3): The project activity produces electricity. Therefore, electricity is considered as output of the project activity.
4. Different Technologies (Para 4): The project activity uses wind energy for producing electricity and hence as per Para 4(a), the technologies which use energy source/ fuel other than wind will be considered as the different technologies for the project activity

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

Range	Capacity	Unit
+50%	168.75	MW
Capacity of the proposed project activity	112.5	MW
-50%	56.25	MW

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

- (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.

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

- (a) Project is located at multiple states in India. Therefore, country has been chosen for analysis. The project involves single investor in state of Madhya Pradesh and Gujarat, thus projects developed by single investor in states of Gujarat and Madhya Pradesh are considered as similar projects.
- (b) The project activity is a green-field wind power project and uses measure (b) "Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies". 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 from 56.25 MW to 168.75 MW.
- (f) The start date of the project activity as per CDM definition is 13/11/2014. Therefore projects, which had started commercial operation before 13/11/2014 have been identified.

Numbers of Similar projects (CDM and non-CDM) identified, which fulfil above-mentioned conditioned are:

Particulars	No. of Projects	Source
N _{Wind}	2	Directory - Indian Wind Power published by CECL, Bhopal -2016

Sources:

Directory - Indian Wind Power published by CECL, Bhopal and refer CPA sheet

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}.

All the projects identified in step-2 are two and out of two, one project is availing VCS benefits, thus this project is excluded from the list of projects.

Thus N_{all} = 1

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 geographical scope of project activity is India. 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 different states of India 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}.

The one project identified is from Gujarat state (the state in which project activity WTGs are there), hence can not be considered as different technology. Thus there is no any different project form the list of similar projects.

As N_{all} = 1; thus 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.

Calculate $F=1-N_{diff}/N_{all} = 1$

As N_{all} =1 thus and N_{all}-N_{diff} = 1;

Outcome of Step 5:

As,

- F = 1;
- N_{all}-N_{diff} = 1 which is less than 3

Thus, the proposed project activity is not a “common practice” within a sector in the applicable geographical area.

2.6 Methodology Deviations

There is no methodology deviation

3 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

As per para 44 of ACM0002 version 17.0, Baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

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

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 VCS 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)

Calculation of $EG_{PJ,y}$

The methodology ACM 0002 (Version 17.0) has procedures for calculation of $EG_{PJ,y}$ for the following cases:

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

As the proposed project activity is Greenfield plant, option (a) as provided in the methodology ACM 0002 (Version 17.0) shall be applicable and is described below:

“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:

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

Where:

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

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

Calculation of EF_{grid, CM, y}

The methodology ACM0002 (Version 17.0) requires that the combined margin for the grid be calculated in accordance with the procedure provided in the latest version of *"Tool to calculate the emission factor for an electricity system"*.

CO₂ Baseline Database for the Indian Power Sector, Version 11.0, April 2016⁸⁰, published by Central Electricity Authority (CEA), Government of India has been used for the calculation of emission factor. This version is the latest available CEA database for the emission factor.

As per the "Tool to calculate the emission factor for an electricity system"⁸¹ Version 05.0, EB 87, Annex 9, the following steps have been followed.

- STEP 1: Identify the relevant electricity systems;
- STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional);
- STEP 3: Select a method to determine the operating margin (OM);
- STEP 4: Calculate the operating margin emission factor according to the selected method;
- STEP 5: Calculate the build margin (BM) emission factor;
- STEP 6: Calculate the combined margin (CM) emission factor.

STEP 1: Identify the relevant electricity power systems

The tool defines that *"for determining the electricity emission factors, identify the relevant electricity system. Similarly, identify any connected electricity systems"*. It also states that *"If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used"*. Keeping this into consideration, the Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern.

However since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this CO₂ Baseline Database. As of 31 December 2013, the Southern grid has also been synchronised with the NEWNE grid, hence forming one unified Indian Grid. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the Indian grid as per CM calculations will serve as the baseline for this project.

Table: Grid Classification

INDIAN GRID				
Northern	Eastern	Western	North-Eastern	Southern

⁸⁰ http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

⁸¹ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf>

Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Kerala
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryana	Orissa	Daman & Diu	Manipur	Tamil Nadu
Himachal Pradesh	West Bengal	Dadar & Nagar Haveli	Meghalaya	Andhra Pradesh
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Telangana
Punjab	Andaman & Nicobar	Maharashtra	Nagaland	
Rajasthan		Goa	Tripura	
Uttar Pradesh				
Uttarakhand				

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

Project participants have the option of choosing between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

The Project Participant has chosen only grid power plants in the calculation.

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

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods, which are described under Step 4:

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

The data required to calculate simple adjusted OM or Dispatch data analysis is not possible due to lack of availability of this activity data to the project developers. The choice of other two options for calculating the operating margin emission factor depends on the generation of electricity from low cost/must run sources. In the context of the methodology low cost/must run resources typically include hydro, geothermal, wind, low cost biomass, nuclear and solar generation.

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)

	2010-11	2011-12	2012-13	2013-14	2014-15
INDIAN	18.4%	19.6%	16.9%	18.6%	16.8%

Data Source: Central Electricity Authority (CEA) database Version 11, April 2016

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 Indian grid is less than 50% of the total

generation. Thus the average emission rate method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation.

The “Simple operating margin” has been calculated as per the weighted average emissions (in tCO₂/MWh) of all generating sources serving the system, excluding hydro, geo-thermal, wind, low-cost biomass, nuclear and solar generation;

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

- **Ex-ante option:** If the ex-ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required.

Or

- **Ex-post option:** If the ex-post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

PP has chosen ex-ante option for the calculation of OM with 3 years generation weighted average of the most recent years available at the time of submission of CDM-PDD to the DOE for validation.

OM determined at validation stage will be the same throughout the crediting period. There will be no requirement to monitor & recalculate the emission factor during the first crediting period.

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

The operating margin emission factor has been calculated using a 3 year data vintage:

Net Generation in Operating Margin (GWh) (excl. Imports)			
	2012-13	2013-14	2014-15
INDIAN Grid	7,01,976	7,25,037	8,10,011

Simple Operating Margin (tCO ₂ /MWh) (incl. Imports)			
	2012-13	2013-14	2014-15
INDIAN Grid	0.9922	1.0002	0.9903

Weighted Generation Operating Margin	
INDIAN Grid	0.9941

STEP 5: Calculate the build margin emission factor (EF_{BM,y})

Option 1 as described above is chosen to calculate the build margin emission factor for the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PDD and is fixed for the entire crediting period.

Build Margin (tCO₂/MWh) (not adjusted for imports)
--

	2014-15
INDIAN Grid	0.9285

(With sample group constituting most recent capacity additions to the grid comprising 20% of the system generation)

STEP 6: Calculate the combined margin (CM) emissions factor

Combined Margin – The combined margin is the weighted average of the simple operating Margin and the build margin. In particular, for intermittent and non- dispatchable generation types such as wind and solar photovoltaic, the Tool to calculate the emission factor for an electricity system⁸², Version 05.0.0, EB 87, Annex 9, allows to weigh the operating margin and Build margin at 75% and 25%, respectively.

The baseline emission factor is calculated using the combined margin approach as described in the following steps:

Calculation of Baseline Emission Factor EF_y

The baseline emission factor EF_y is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$EF_y = W_{OM} * EF_{OM,y} + W_{BM} * EF_{BM,y}$$

Where,

W_{OM}	75% weight of operating margin emissions factor (%)
W_{BM}	25% weight of build margin emissions factor (%)
$EF_{OM,y}$	calculated as described in Steps 3&4 above (tCO ₂ /MWh)
$EF_{BM,y}$	calculated as described in Steps 5 above (tCO ₂ /MWh)

$$\begin{aligned} \text{Baseline Emission factor (INDIAN Grid)} &= 0.75 * 0.9941 + 0.25 * 0.9285 \\ &= 0.9777 \text{ tCO}_2/\text{MWh} \end{aligned}$$

The site wise emission reduction calculations are as below

Investor Name	Capacity (MW)	PLF	Net Generation	Baseline Emission factor	Baseline emissions	Project emissions	Leakage Emissions	Emission reductions
			(MWh/year)	(tCO ₂ /MWh)	(tCO ₂ e/ year)	(tCO ₂ e/ year)	(tCO ₂ e/ year)	(tCO ₂ e/ year)
Giriraj Enterprises	30	20.00%	52,560	0.9777	51,387	0	0	51,387
Giriraj Enterprises	22.5	23.00%	45,333	0.9777	44,322	0	0	44,322
Giriraj Enterprises	21	23.00%	42,311	0.9777	41,367	0	0	41,367
Giriraj Enterprises	13.5	24.50%	28,974	0.9777	28,327	0	0	28,327
Giriraj Enterprises	10.5	24.50%	22,535	0.9777	22,032	0	0	22,032

⁸² <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf>

Giriraj Enterprises	15	24.50%	32,193	0.9777	31,475	0	0	31,475
Total	112.5		2,23,906		2,18,910	0	0	2,18,910
In Ten Years								21,89,100

Therefore, Baseline Emissions:

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

$$BE_y = 223,906 \times 0.9777 = 218,910 \text{ tCO}_2$$

3.2 Project Emissions

The project emission calculation as per para 35 of ACM0002 version 17,

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

Where:

PE_y	=	Project emissions in year y (t CO ₂ e/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year y (t CO 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 (t CO ₂ e/yr)
$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants in year y (t CO ₂ e/yr)

$PE_{FF,y} = 0$, As per para 37 of ACM0002 version 17, "For all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected"

$PE_{GP,y} = 0$, Not applicable for the wind power projects

$PE_{HP,y} = 0$, Not applicable for the wind power projects

Therefore, **$PE_y = 0$**

3.3 Leakage

As per para 60 of ACM0002 version 17, No leakage emissions need to be considered for the project activity.

3.4 Estimated Net GHG Emission Reductions and Removals

As per para 61 of ACM0002 version 16; Emission Reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER _y	=	Emission reductions in year y (t CO ₂ e/yr)
BE _y	=	Baseline emissions in year y (t CO ₂ /yr)
PE _y	=	Project emissions in year y (t CO ₂ e/yr)

Therefore, Net GHG Emission Reductions and Removals are calculated as follows:

$$ER_y = BE_y - PE_y$$

$$ER_y = 218,910 - 0$$

$$= 218,910 \text{ tCO}_2$$

Please refer section 3.1 of VCS PD for estimated ERs for each bundle.

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
Year 1	218,910	0	0	218,910
Year 2	218,910	0	0	218,910
Year 3	218,910	0	0	218,910
Year 4	218,910	0	0	218,910
Year 5	218,910	0	0	218,910
Year 6	218,910	0	0	218,910
Year 7	218,910	0	0	218,910
Year 8	218,910	0	0	218,910
Year 9	218,910	0	0	218,910
Year 10	218,910	0	0	218,910
Total	2,189,100	0	0	2,189,100

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO ₂ /MWh
Description	Operating Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 11, April 2016 ⁸³
Value applied:	0.9941
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 05.0.0" as 3-year generation weighted average using data for the years 2012-2013, 2013-2014 & 2014-2015. The data are obtained from "CO ₂ Baseline Database for

⁸³ http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

	Indian Power Sector” version 11.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,BM,y}
Data unit	tCO ₂ /MWh
Description	Build Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 11, April 2016 ⁸⁴
Value applied:	0.9285
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per “Tool to calculate the emission factor for an electricity system, version 05.0.0” BM is calculated ex-ante based on the most recent information available at the time of submission of PDD and is fixed for the entire crediting period. The data is obtained from “CO ₂ Baseline Database for Indian Power Sector” version 11.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,CM,y}
Data unit	tCO ₂ /MWh
Description	Combined Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 11, April 2016 ⁸⁵
Value applied:	0.9777 (Indian Grid)
Justification of choice of data or description of measurement methods and procedures applied	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ Where: EF_{grid,BM,y} = Build margin CO₂ emission factor in year y (tCO₂/MWh) EF_{grid,OM,y} = Operating margin CO₂ emission factor in year y (tCO₂/MWh) W_{OM} = Weighting of operating margin emissions factor (%) = 75% W_{BM} = Weighting of build margin emissions factor (%) = 25%
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

4.2 Data and Parameters Monitored

Data / Parameter	EG _{PJ,y}
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project (Wind) plant/unit to the grid in year y

⁸⁴ http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

⁸⁵ http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

Source of data	Joint meter readings
Description of measurement methods and procedures to be applied	The value of net electricity generation supplied to the grid as per Joint Meter Reading Report forms the basis for calculation of the emission reductions; which can be cross checked from the invoice raised to DISCOM. Net electricity supplied to grid will be calculated as the difference of the measured values of “export” and “import” of electricity through the dedicated SEB energy meter installed at the delivery point (i.e. the connected substation). Net electricity generated and supplied by the project (Wind) plant/unit to the grid = Electricity Export to the grid - Electricity Import from the grid Monthly meter readings are taken from the main and check meter installed at the substation and certified by the representatives of SEB Officials and the representatives of the project proponent.
Frequency of monitoring/recording	Continuous monitoring, hourly measurement and at least monthly recording
Value applied:	223,906 MWh
Monitoring equipment	Monitoring: Tri vector meter will be used Data type: Measured Type of meter: Static type meter (Main & Check). Both are Bidirectional meters. Class of meter: 0.2s
QA/QC procedures to be applied	• The energy meter reading are taken on monthly basis • Energy meters will be calibrated once in a five year⁸⁶ and faulty meters will be duly replaced immediately. • All the energy meters are under the control of state utility and calibration of energy meters is also under the jurisdiction of state utility. • The Net electricity exported to the grid will be cross checked against the invoice raised by the PP towards the DISCOM
Purpose of data	Calculation of Baseline emissions
Calculation method	-
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.

4.3 Monitoring Plan

Aim of monitoring:

The monitoring methodology specified in the methodology requires that the project-monitoring plan to consist of monitoring of quantity of net electricity supplied to the grid in the year y. In order to monitor the mitigation of GHG due to the project activity, the total energy exported needs to be measured. The net energy supplied to grid by the project activity multiplied by emission factor for regional grid, would form the baseline for the project activity.

⁸⁶ As per CEA regulation

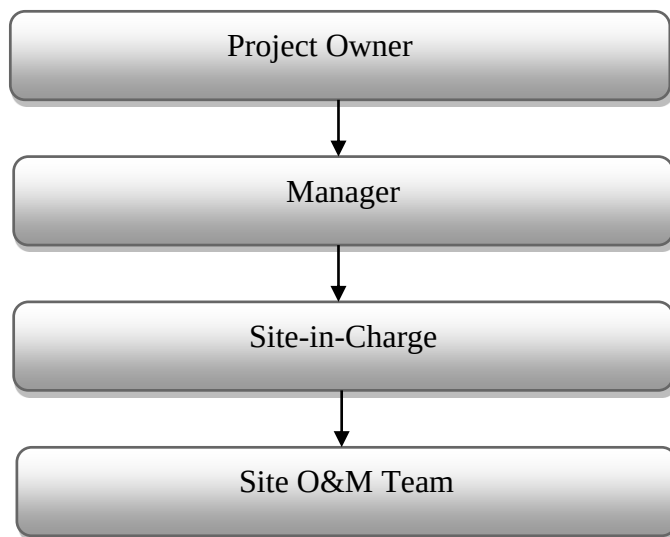
Since the baseline emission factor is based on an ex-ante determination, monitoring of this parameter is not required. The sole parameter for monitoring is the net electricity exported to the grid.

Monitoring roles and responsibilities

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

The monitoring plan is developed in accordance with the modalities and procedures for CDM/VCS project activities and is proposed for grid-connected wind power project being implemented in respective states in India. The monitoring plan, which will be implemented by the project proponent describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data rests with the project proponent. PP proposed the following structure for data monitoring, collection, data archiving and calibration of equipments for this project activity. The team comprises of the following members:



PP has assigned the responsibility of operation and maintenance of WTGs to respective EPC contractor of wind turbines for each sites.

Responsibilities of Head: Overall functioning and maintenance of the project activity.

Responsibilities of Plant In-charge: Responsibility for Maintains the data records, ensures completeness of data, and reliability of data (calibration of equipments).

Responsibilities of Shift In-charge: Responsibility for day to day data collection and maintains day to day log book for monitored data.

QA/QC procedures:

The energy meters at the feeders are maintained and owned by Discom. Neither the project proponent nor the site personnel have any control over it. The records will be cross-checked with the records of sold electricity to Discom/ third party. The meters are calibrated by Discom at-least once in five years.

Data Archiving:

Monthly data shall be archived electronically and in paper form and stored for the entire crediting period and two years thereafter.

Training and maintenance requirements:

Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the WTGs, it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that O&M team is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. Each and every site personnel is provided with proper training to meet the requirements of the Operations and maintenance. This ultimately leads to creativity in problem solving.

1.	Apportioning Ratio	=	$\frac{\text{Generation at WTG Controller}}{\text{Total Generation of All WTG Controller for the feeder}}$
2.	Electricity Import from WTG by the grid (EG_{import})	=	Import from Main/Check Meter * Apportioning Ratio
3.	Electricity Export to the WTGs by the grid (EG_{export})	=	Export from Main/Check Meter * Apportioning Ratio
4.	Net electricity generated by WTG	=	Electricity Import from WTG by the grid – Electricity Export to the WTGs by the grid

Above steps for calculation of EG_{import} and EG_{export} are carried out by Discom Officials & energy break-up sheet is issued by the respective electricity board Officials. Based on the break-up sheets Project investor raises invoice to DISCOM/ third party which forms the basis of cross-check for the net electricity generated. The Project investor has no role in the entire procedure of apportioning

Emergency Preparedness and Uncertainty Procedure:

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 calibration, the check meter will be used. In case both the main and check meter are found to be outside the acceptable limits of accuracy or faulty or not functioning properly, both the meters shall be calibrated immediately and the error percentage found in the main meter during its calibration shall be applied to its metered energy data for the entire period since its last calibration to obtain the corrected value of net electricity exported to the grid.

In case the dates of a particular monitoring period do not match with the dates of the billing cycle, the net electricity exported to the grid would be calculated from:

- Apportioning the net electricity exported to grid, as recorded in the consolidated Share Certificate / JMR Report / Credit Notes certified by the respective state discom, based on the

number of days in the monitoring period and the number of days for which Share Certificate / JMR Report / Credit Notes was prepared.

The calculated value after apportioning would be used for calculation of emission reductions during that period.

5 SAFEGUARDS

5.1 No Net Harm

The project does not involve any potential negative environmental and socio economic impacts and hence this criteria is not applicable to this project activity.

5.2 Environmental Impact

The project activity has no significant impact on the environment. Wind power projects are not included in the Schedule I of the EIA notification S.O.1533 (E) dated 14th September 2006⁸⁷ and thus an EIA is not required. Ministry of Environment & forests vide their OM J-11013/41/2006 - IA II (I) dated 13th May 2011 has re-affirmed this and exempted wind power plants from EIA and Environmental Consent requirement.

As per the Schedule 1 of the EIA notification dated 1/12/2009⁸⁸ and latest notification dated 24/12/2013⁸⁹, given by the Ministry of Environment and Forests under the Environment (Protection) Act 1986, the proposed Project activity does not fall under the list of activities requiring EIA as the environmental impacts for such project are not considered as significant by the host Party or PP.

5.3 Local Stakeholder Consultation

As the Sections 3.17.2-3.17.4 of VCS standard 3.6, the contract for validation is prior to the 19th April 2017, hence the local stake holder consultation is not mandatory.

5.4 Public Comments

Not applicable as for this project DOE contract is already signed on or before 19/04/2017 and project is under validation and verification.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	EG _{PJ,y}
Data unit	MWh

⁸⁷ <http://envfor.nic.in/legis/eia/so1533.pdf>

⁸⁸ <http://moef.nic.in/downloads/rules-and-regulations/3067.pdf>

⁸⁹ <http://envfor.nic.in/sites/default/files/ia-24122013.pdf>

Description	Quantity of net electricity generation supplied by the project (Wind) plant/unit to the grid in year y
Value applied:	150,967.36
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years. Please refer Appendix 1 for the meter details involved for current monitoring period.

6.2 Baseline Emissions

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

Where:

BE_y : Baseline emissions in year y (tCO₂e/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 VCS 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” (tCO₂e/MWh)

Parameter	Unit	Value
$EG_{PJ, y}$:	MWh	150,967.36
$EF_{grid, CM, y}$:	tCO ₂ e	0.9777
BE_y :	=	150,967.36*0.9777
	=	147,600

6.3 Project Emissions

$PE_{FF, y} = 0$, As per para 37 of ACM0002 version 17, “For all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected”

$$PR_{FF, y} = 0$$

6.4 Leakage

As per para 60 of ACM0002 version 17, No leakage emissions need to be considered for the project activity.

6.5 Net GHG Emission Reductions and Removals

$$ER_y = BE_y - PE_y$$

Where:

ER _y	=	Emission reductions in year y (t CO ₂ e/yr)
BE _y	=	Baseline emissions in year y (t CO ₂ /yr)
PE _y	=	Project emissions in year y (t CO ₂ e/yr)

Therefore, Net GHG Emission Reductions and Removals are calculated as follows:

$$ER_y = BE_y - PE_y$$

$$ER_y = 147,600 - 0$$

$$= 147,600 \text{ tCO}_2$$

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2015	38,815	0	0	38,815
2016	92,778	0	0	92,778
2017	16,007	0	0	16,007
Total	147,600	0	0	147,600

Appendix 1 – Meter Details for the current monitoring period

Since metering arrangement, monitoring practice, accuracy class, calibration interval is under control of state electricity board, the PP do not have calibration certificates available with them.

Being Green field project activity and commissioned within 2 years, all meters are used for monitoring purpose are pre calibrated before installation as per state electricity board regulations, thus installed pre calibrated meters have validity of calibration till 5 years of commissioning date. The current monitoring period is within 2 years of commissioning date, thus all meters initial calibration is valid for current monitoring period. The meters are tested by state electricity board during commissioning, thus all meters have valid calibration period during current monitoring period.

The below mentioned meter details are for current monitoring period, and the same will be changed in future.

The Energy Meters details used for commissioned project activity is as below.

22.5 MW Dewas Site

Feeder 1 having 7 WTGs of 1.5 MW each and Feeder 2 having 8 WTGs pf 1.5 MW each.

	Meter serial number	Accuracy class	Make
10.5 MW feeder	XD500621	0.2s	Secure
12 MW Feeder	XD500619	0.2s	Secure

21 MW Dhar Site

One Feeder having 5 WTGs of 1.5 MW each and another Feeder having 9 WTGs of 1.5 MW each.

	Meter serial number	Accuracy class	Make
13.5 MW Feeder	XD500605 Main & XD500606 Check	0.2s	Secure
7.5 MW feeder	XD500602 Main & XD500603 Check	0.2s	Secure

30 MW Hatuniya Site

One Feeder having 10 WTGs (RH3-01 TO RH3-10) of 1.5 MW each and another Feeder having 10 WTGs (RH4-01 TO RH4-10) of 1.5 MW each.

15 MW Feeder	Meter serial number	Accuracy class	Make
RH-3 Main Meter	XB589231	0.2s	Secure
RH-3 Check Meter	XC502290	0.2s	Secure
RH-4 Main Meter	XC502289	0.2s	Secure
RH-4 Check Meter	XC502293	0.2s	Secure

Gujarat state 3 projects are yet to be commissioned.