

51 MW WIND POWER PROJECT AT CHITRADURGA

(VCS Project ID 706 – Renewal of Crediting Period)

Document Prepared By (M/s. NSL Renewable Power Private Limited)

Project Title	51 MW Wind Power Project at Chitradurga
Version	03
Date of Issue	05-02-2019
Monitoring Period	06-June-2018 to 30-September-2018 (Inclusive of both the dates)
Prepared By	M/s. NSL Renewable Power Private Limited
Contact	M/s. NSL Renewable Power Private Limited NSL ICON, 4th Floor, Road No.12, Banjara Hills, Hyderabad, Andhra Pradesh, Pin code - 500 034 Contact number: +91 40 3051 4444 Email: rajnikant.a@nslpower.com

Table of Contents

1	Project Details.....	3
1.1	Summary Description of the Project and its Implementation Status	3
1.2	Sectoral Scope and Project Type	4
1.3	Project Proponent	4
1.4	Other Entities Involved in the Project	4
1.5	Project Start Date.....	4
1.6	Project Crediting Period.....	4
1.7	Project Scale and Estimated GHG Emission Reductions or Removals.....	5
1.8	Description of the Project Activity	5
1.9	Project Location	9
1.10	Conditions Prior to Project Initiation	11
1.11	Compliance with Laws, Statutes and Other Regulatory Frameworks.....	11
1.12	Ownership and Other Programs	11
1.12.1	Project Ownership	11
1.12.2	Emissions Trading Programs and Other Binding Limits	11
1.12.3	Other Forms of Environmental Credit	11
1.12.4	Participation under Other GHG Programs.....	12
1.12.5	Projects Rejected by Other GHG Programs.....	12
1.13	Additional Information Relevant to the Project	12
2	Application of Methodology.....	13
2.1	Title and Reference of Methodology.....	13
2.2	Applicability of Methodology.....	13
2.3	Project Boundary.....	17
2.4	Baseline Scenario	18
2.5	Additionality	19
2.6	Methodology Deviations	20
3	ESTIMATED GHG Emission Reductions and Removals	20
3.1	Baseline Emissions.....	20
3.2	Project Emissions.....	26
3.3	Leakage	26
3.4	Estimated Net GHG Emission Reductions and Removals.....	27
4	Monitoring	28
4.1	Data and Parameters Available at Validation	28
4.2	Data and Parameters Monitored.....	29
4.3	Monitoring Plan	31
5	Safeguards.....	35
5.1	No Net Harm.....	35
5.2	Environmental Impact	35
5.3	Local Stakeholder Consultation	35
5.4	Public Comments	35
6	ACHIEVED GHG Emission Reductions and Removals	35
6.1	Data and Parameters Monitored.....	35
6.2	Baseline Emissions.....	36
6.3	Project Emissions.....	36
6.4	Leakage	36
6.5	Net GHG Emission Reductions and Removals	36
	APPENDIX 1: <Meter calibration details>	37
	APPENDIX 2: <Baseline Emission Factor>.....	38

1 PROJECT DETAILS

1.1 Summary Description of the Project and its Implementation Status

The project activity titled “51 MW Wind Power Project at Chitradurga” is registered under Voluntary Carbon Standard (VCS) with reference number 706. The project details can be referred from the below web link: http://www.vcsprojectdatabase.org/#/project_details/706.

The main purpose of the project activity is to generate electricity by using renewable wind resources which is an environmental friendly power generation technology. The project activity replaces anthropogenic emissions of greenhouse gases (GHG's) into the atmosphere by displacing the equivalent amount of electricity generation through the operation of existing fuel mix in the grid comprising mainly fossil fuel based power plants and future capacity expansions connected to the grid.

Pre-project scenario: No project activity

The Indian grid is dominated by conventional fossil fuel based sources of energy. In the absence of the project activity 50.4 MW of electricity would have been generated from grid connected conventional power plants.

Project Scenario: Implementation of Project

The project activity involves installation and operation of Wind Turbine Generators (WTGs) of total capacity 50.4 MW at Bhimasamudra site Chikkandavadi and Kallavanagathihalli village, Chitradurga District of Karnataka in India. The project activity has been connected to Indian Grid (previously it was as Southern Grid¹) through locally available sub-stations owned and maintained by the state electricity utility.

Nuziveedu Seeds Limited had made an application for conversion to private company under section 31(1) of the companies act and received approval from central government for name change as “Nuziveedu Seeds Private Limited” on 26/06/2008. In continuation to that, on 16/06/2010, the central government approved for the name change as “NSL Renewable Power Private Limited” (hereafter referred as NSL) in line with section 21 of the companies act. “On 10/12/2007, NSL had released purchase order to RPPL for 34 nos WTGs (1.5 MW each) for a capacity of 51 MW. RPPL had supplied 9 WTGs on time out of this 34 WTGs. From the balance 25 nos of WTGs, RPPL could supply only 19 WTGs and informed NSL on 12/09/2009 that the balance 6 WTGs could be supplied only later (after June 2010). So, considering the delay in supply of WTGs from RPPL, NSL decided to replace Regen make of 6 nos WTGs with 4 nos of WTGs of Suzlon make each having capacity of 2.1 MW. Based on this, NSL released new purchase order to Suzlon Energy Limited (SEL) for 4 no WTGs. Hence the current capacity amounts to 50.4 MW which is lower than the capacity mentioned in the title. However, the PP is also developing the project under CDM and received HCA with the same title. PP is still using the same title for consistency between their CDM and VCS project.

¹ As per CEA database version 13 (released in June 2018). In previous years before April 2016, the Indian electricity system was divided into two grids, the NEWNE and Southern Grid. These are now integrated as a single “Indian Grid” covering all the states. Thus, the project activity earlier was considered under Southern Grid which is now referred as Indian Grid.

The Project WTGs are currently operational and had successfully completed 10 years of crediting period under VCS (end date of first crediting period was 05/06/2018). Currently, project is developed under Renewal of Crediting Period for another 10 years, starting from 06/06/2018. It is estimated that project will generate an annual avg. of 135,084 MWh of clean electricity which will correspond to an annual avg. of 127,993 tCO_{2e}, thus a total of 1,279,930 tCO_{2e} emission reductions over a period of 10 years of 2nd crediting period.

The first machine under the project activity was commissioned on 06/06/2008 and last machine under the project activity was commissioned on 30 September 2011. The expected operational lifetime of the project is 20 years.

The monitoring period covered under this document is from: 06/06/2018 – 30/09/2018, which would fall under the 2nd Crediting Period of the project, being submitted along with this verification as a “Joint Project Description & Monitoring Report”. The electricity generated from the project activity in this current monitoring period corresponds to emission reductions of 47,875 tCO_{2e} in this monitoring period.

1.2 Sectoral Scope and Project Type

Sectoral scope : 01, Energy Industries (renewable- /non-renewable sources)

Project Type : I, Renewable energy projects

The project is not a grouped project activity.

1.3 Project Proponent

Organization name	M/s. NSL Renewable Power Private Limited
Contact person	Mr. A. Rajnikant
Title	Head – Wind Projects & Operations
Address	NSL ICON, 4th Floor, Road No.12, Banjara Hills, Hyderabad - 500034, Andhra Pradesh
Telephone	+91 - 40 - 3051 4444
Email	rajnikant.a@nslpower.com

1.4 Other Entities Involved in the Project

Not Applicable.

1.5 Project Start Date

06/06/2008 – The date of commissioning of the first WTG (HK 3).

1.6 Project Crediting Period

As per VCS Standard (v3.6, 19 Oct 2016), section 3.8.1 the crediting period (for non-AFOLU projects and ALM projects) will be renewed twice for the duration of ten year each. The first crediting period of the project activity was considered from 6-Jun-2008 to 05-Jun-2018. Hence, the project has been applied for Renewal Crediting period for a period of 10 years.

The renewal crediting period under VCS is as follows:

Type of crediting period : Renewal
 Start date of 2nd crediting period : 06 June 2018
 End date of 2nd crediting period : 05 June 2028

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	X
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
06/06/2018 – 05/06/2019	1,27,993
06/06/2019 – 05/06/2020	1,27,993
06/06/2020 – 05/06/2021	1,27,993
06/06/2021 – 05/06/2022	1,27,993
06/06/2022 – 05/06/2023	1,27,993
06/06/2023 – 05/06/2024	1,27,993
06/06/2024 – 05/06/2025	1,27,993
06/06/2025 – 05/06/2026	1,27,993
06/06/2026 – 05/06/2027	1,27,993
06/06/2027 – 05/06/2028	1,27,993
Total estimated ERs	12,79,930
Total number of crediting years	10
Average annual ERs	1,27,993

1.8 Description of the Project Activity

As given in section 1.1, the project activity has an aggregate installed capacity of 50.4 MW (28 numbers of 1.5 MW WTGs and 4 numbers of 2.1 MW WTGs). All the WTG's are located in the state of Karnataka.

The commissioning details of the WTGs are given in the table below:

Sl. No	WTG Number	WTG Capacity (MW)	Commissioning date
1	HK 1	1.5	29/09/2008
2	HK 2	1.5	01/07/2008
3	HK 3	1.5	06/06/2008
4	HK 4	1.5	09/09/2008
5	HK 5	1.5	09/09/2008
6	HK 6	1.5	29/09/2008

7	HK 7	1.5	08/12/2009
8	HK 8	1.5	08/12/2009
9	HK 9	1.5	08/12/2009
10	HK 10	1.5	15/12/2009
11	HK 11	1.5	15/12/2009
12	HK 12	1.5	21/01/2010
13	HK 13	1.5	15/12/2009
14	HK 14	1.5	21/01/2010
15	HK 15	1.5	15/12/2009
16	HK 16	1.5	30/09/2011
17	HK 17	1.5	30/09/2011
18	HK 18	1.5	30/09/2011
19	HK 19	2.1	30/09/2011
20	HK 20	2.1	30/09/2011
21	HK 21	2.1	30/09/2011
22	HK 22	1.5	21/01/2010
23	HK 23	1.5	21/01/2010
24	HK 24	1.5	30/09/2011
25	HK 25	1.5	30/09/2011
26	HK 26	2.1	30/09/2011
27	HK 27	1.5	30/09/2011
28	HK 29	1.5	30/09/2011
29	HK 30	1.5	30/09/2011
30	HK 31	1.5	30/09/2011
31	HK 32	1.5	30/09/2011
32	HK 33	1.5	30/09/2011

Project activity involves the installation of 28 number of 1.5 MW Wind Turbine Generators (WTG) of Regen Powertech and 4 number of 2.1 MW WTG of Suzlon.

Technology description of Regen WEG: The technology to be employed for the generation of power is a Wind Electric Generator (WEG) of 1500 KW capacity (28 Numbers). The WEG is a Vensys 77 with hub height of 85 m. The WEG is of Regen Powertech make and is a gearless type construction technology coupled with synchronous generator with permanent magnet excitation.

The salient features of V-77 are as follows:

Gearless Design:

- Simple design with basic components
- Totally grid independent
- Slow & variable speed reduces wear and tear
- Reduces the cost of frequent replacement of bearings
- Significant reduction in fatigue loads
- Enhances lifetime and eliminates the unhidden maintenance costs

Variable speed operation:

- Eliminates the necessity of grid frequency dependent operation/speed
- Maintains optimum tip speed ratio and thus optimum energy capture
- Use of permanent magnets for excitation needs no power from the grid to run the machine
- Generator Design
- The generator is variable speed and starts generating even at low speed and starts exporting power immediately with no import of power, resulting in higher concentrations
- The controller maintains nearly unity power factor and thus even weak grid is strengthened and stabilized
- REGEN WEG sustains against the weakest grid but also acts as a dynamic grid improviser by virtue of its electronic continuous active pitch regulation and double stage power converter.

Pitch Mechanism:

- REGEN deploys three independent pitch mechanisms with AC electric motors for pitch regulation
- Close synchronism of blade angles results in uniform aero-lift forces for all the three blades
- Gain in productivity with REGEN pitch regulation may contribute to the tune of 8 to 10%
- Gain in dynamic stability
- Increased life of major components like blade, generator, tower etc.

Three Independent Braking Systems:

- Adopts the Aerodynamic braking system
- System backed by ULTRA-Capacitors which are maintenance free

Lighting Protection for Blades:

- REGEN has “Integrated Lighting Protection” system through the blades

Steel Tubular Towers

- Highly robust and also flexible reducing the stresses
- Safe operation and maintenance

Technology description of Suzlon WEG: The technical specifications of 4 numbers of 2.1MW WEG of Suzlon make is provided below:

ROTOR

Diameter	:	88m
No. of Rotor Blade	:	3
Orientation	:	Upwind/Horizontal axis
Rotational Direction	:	Clockwise
Rotor Blade Material	:	GRP
Swept area	:	6082m ²
Hub Height	:	80m
Regulation	:	Pitch regulated

OPERATIONAL DATA

Cut in wind speed	:	4m/s
Rated wind speed	:	14m/s
Cut off wind speed	:	25m/s

GEAR BOX

Type	:	Integrated 3 stage 1 planetary & 2 helical
Gear ratio	:	1:98.8
Manufacturer	:	Winergy/Hansen
Nominal Power	:	2310KW

GENERATOR

Type	:	Asynchronous 4 pole
Rotation speed	:	1511 RPM
Rated output	:	2100KW
Rated voltage	:	690 V
Frequency	:	50 Hz
Insulation	:	Class "H"
Enclosure Class	:	IP 54
Cooling system	:	Air cooled
Slip control	:	Macro slip providing slip upto 16.7%

OPERATING BRAKES

Aerodynamic brake	:	3 independent systems with blade pitching
Mechanical brake	:	Hydraulic disc brakes

YAW DRIVE

Method of operation	:	Active electrical yaw motors
Bearing type	:	Polyamide slide

1.9 Project Location

The project site is located at Bhimasamudra site, Chikkandavadi and Kallavanagathihalli village, Chitradurga District of Karnataka in India. Chitradurga is approximately around 200 KM from Bangalore, capital of Karnataka state. The physical location is provided below:

WTG HT SC No	Location No	Village	District	State	Latitude	Longitude
1	HK 1	Chikkandavadi	Chitradurga	Karnataka	N14 11 02.7	E76 12 32.2
2	HK 2	Chikkandavadi	Chitradurga	Karnataka	N14 10 49.7	E76 12 25.7
3	HK 3	Chikkandavadi	Chitradurga	Karnataka	N14 10 42.1	E76 12 26.8
4	HK 4	Chikkandavadi	Chitradurga	Karnataka	N14 10 33.7	E76 12 26.6
5	HK 5	Chikkandavadi	Chitradurga	Karnataka	N14 10 23.2	E76 12 26.0
6	HK 6	Chikkandavadi	Chitradurga	Karnataka	N14 10 08.8	E76 12 25.6
7	HK 7	Chikkandavadi	Chitradurga	Karnataka	N14 10 00.7	E76 12 25.0
8	HK 8	Chikkandavadi	Chitradurga	Karnataka	N14 09 53.1	E76 12 23.3
9	HK 9	Chikkandavadi	Chitradurga	Karnataka	N14 09 45.3	E76 12 22.1
10	HK 10	Kallavanagathihalli	Chitradurga	Karnataka	N14 13 10.6	E76 08 43.7
11	HK 11	Kallavanagathihalli	Chitradurga	Karnataka	N14 12 43.4	E76 08 39.2
12	HK 12	Kallavanagathihalli	Chitradurga	Karnataka	N14 12 23.7	E76 08 57.4
13	HK 13	Kallavanagathihalli	Chitradurga	Karnataka	N14 12 18.9	E76 09 02.5
14	HK 14	Kallavanagathihalli	Chitradurga	Karnataka	N14 12 12.5	E76 09 07.5

Geographical location map of project activity

1.10 Conditions Prior to Project Initiation

The project is a green field project activity harnessing clean energy from wind. The project activity replaces anthropogenic emissions of greenhouse gases (GHGs) from the atmosphere, by displacing the equivalent amount of electricity generation through the operation of existing fuel mix in the grid comprising mainly fossil fuel based power plants.

The power generated by the operation of wind turbines is emission free. In the absence of the project activity the equivalent amount of electricity would have been generated from the connected/ new power plants to the regional grid, which are/will be predominantly based on fossil fuels.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activity is compliant to the relevant local laws and regulations and is not prohibited by any of the national/state level sectoral policies.

Renewable energy projects are not mandated in India by any enforced law or other regulatory framework. However, for guidance on voluntary wind energy based electricity generation, there are policies introduced/incentives declared by the state governments. These policies have been considered for the project activity and are available at <https://www.karnataka.gov.in/kerc/Pages/home.aspx>, http://kredinfo.in/Index_eng.aspx;

For the implementation of the project, the project proponent has obtained land lease deeds/sale deeds and has secured KERC (Karnataka Electricity Regulatory commission) & KREDL (Karnataka Renewable Energy Development Ltd), KPTCL/BESCOM clearances for infrastructure development and commissioning of the WTG in the state of Karnataka.

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The Project is owned by M/s. NSL Renewable Power Private Limited, hence it possess right of use of ER credits. The ownership of the project is referred to the section 8.1. of the registered VCS PD. Also, the project had been successfully commissioned and is currently operational under valid Power Purchase Agreement (PPA). Both commissioning certificates and PPAs are submitted as a proof project ownership.

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

Emission Trading Programs and other Binding Limits:

The project participant confirmed that net GHG emission reductions or removals generated during this monitoring period have not been used for any compliance under any programs or mechanisms.

Other forms of Environmental Credit:

The Project participant confirmed that the project activity has not sought or received another form of GHG related environmental credit, including renewable energy certificates during this monitoring period.

1.12.4 Participation under Other GHG Programs

The project participant confirmed that the project is not registered under any other programs. Project activity is only registered with VCS mechanism and has been availing VCUs without any double accounting of emission reductions.

The VCS project ID is VCS-706.

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. PP would like to confirm that all information related to Baseline and Additionality of the project had been demonstrated in the registered VCSPD.

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 leads 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

Not Applicable.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The baseline methodology applied for this project activity is as follows:

Type	:	I – Renewable Energy Projects
Category	:	ACM0002. Consolidated baseline methodology for grid connected electricity generation from renewable sources”.
Version	:	19, EB 62.
Reference	:	https://cdm.unfccc.int/methodologies/DB/VJ19AX539D9MLOPXN2AY9UR1N4IYGD
Tools referred	:	Version 7 of “Tool for the demonstration and assessment of additionality” Version 7 of “Tool to calculate the emission factor of an electricity system”
Tool	:	Version 3.0.1 of “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period”

2.2 Applicability of Methodology

The project activity involves generation of grid connected electricity from the renewable wind power generation project and a Greenfield project activity. The project activity is having 50.4 MW installed capacity; therefore falls in large scale project activity and eligible under large scale methodology ACM0002 Version 19. The project status is corresponding to the methodology ACM0002 Version 19 and applicability of methodology is discussed below:

S. No	Applicability Criteria	Justification
1.	This methodology is applicable to grid-connected renewable energy power generation project activities that: a. Install a Greenfield power plant;	The project activity is a grid connected Greenfield power plant; therefore satisfy this applicability criterion 1a.

	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).	
2.	The methodology is applicable under the following conditions: a. 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; b. 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 project activity is a grid connected Greenfield 50.4 MW wind power plant; therefore satisfy this applicability criterion 2a.
3.	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 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	The project activity is a grid connected Greenfield 50.4 MW wind power plant; therefore this applicability criterion is not applicable to the project activity.

	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.	
4.	In the case of integrated hydro power projects, project proponent shall: a. Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or b. Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability 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 project activity is a grid connected Greenfield 50.4 MW wind power plant; therefore this applicability criterion is not applicable to the project activity.
5.	The methodology is not applicable to: a. Project activities that involve switching from fossil	The project activity is a grid connected Greenfield 50.4 MW wind power plant;

	fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; b. Biomass fired power plants/units.	therefore this applicability criterion is not applicable to the project activity.
6.	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 is a grid connected Greenfield 50.4 MW wind power plant; therefore this applicability criterion is not applicable to the project activity.

From the above table, it is evident that the project activity meets all the applicability conditions of the approved large scale methodology ACM0002 (version 19).

Tool to calculate the emission factor for an electricity system - Version 07.0:

Applicability Criterion	Project Case
This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	The project is a grid connected wind power project and thus the tool is applicable.
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option II.a and option II.b. If option II.a is chosen, the conditions specified in "Appendix 2: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	Steps involved in calculation of Emission Factor are included in section B.3.1 of the JPD as per the requirement of the tool.
In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	Project is located in non-Annex I country and hence the tool is applicable.

Under this tool, the value applied to the CO₂ emission factor of bio fuels is zero.

The project is a Wind Power Project and there is no involvement of bio fuels.

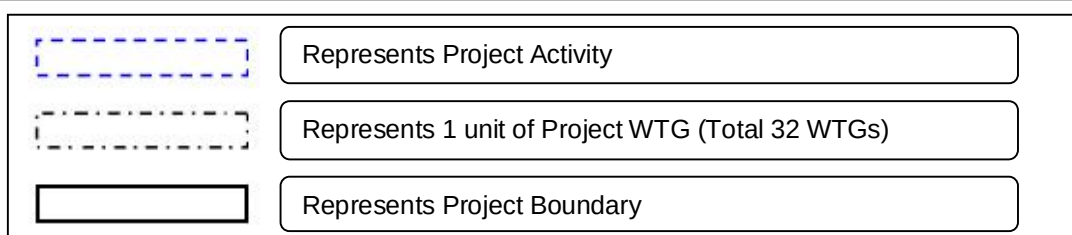
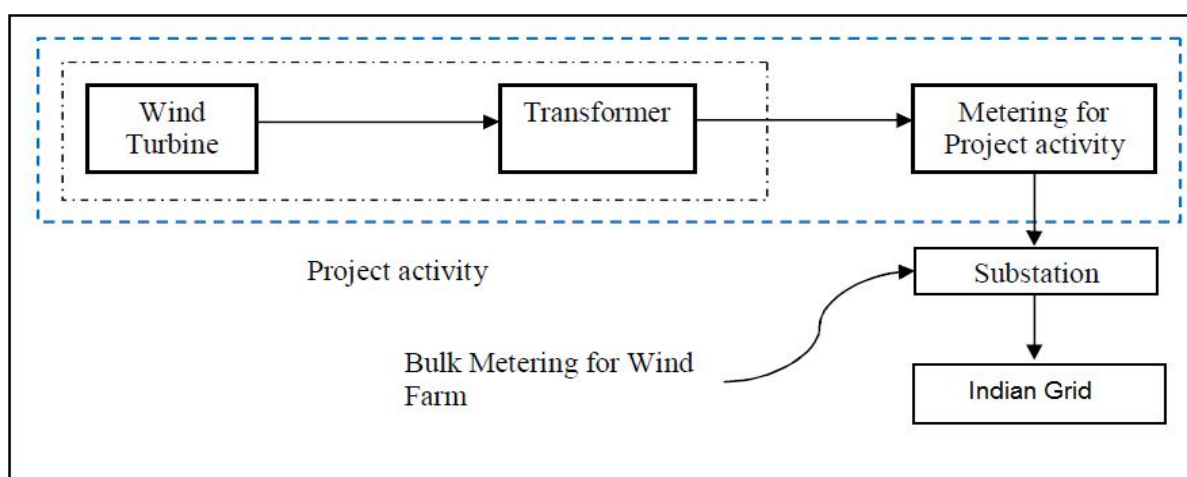
2.3 Project Boundary

The project is registered VCS project activity.

Emission sources included in or excluded from the project boundary are as follows:

Source		Gas	Included	Justification
BASELINE	CO ₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO ₂	YES	Main emission source
		CH ₄	NO	Minor emission source
		N ₂ O	NO	Minor emission source
PROJECT ACTIVITY	The project activity is a grid connected Greenfield 50.4 MW wind power plant	CO ₂	NO	Minor emission source
		CH ₄	NO	Minor emission source
		N ₂ O	NO	Minor emission source

The spatial extent of the project boundary includes the project power plant/unit and all power plants/units connected physically to the electricity system that the VCS project power plant is connected to. Therefore, the project boundary for the project activity has been considered by inclusion of project WTGs, all common metering point and interconnection to Grid. Also, the project boundary includes all other power plants attached to the grid as CO₂ emissions would have been emanated from the operation of fossil fuel based power plants in the grid in absence of the project activity.



Project activity involves the installation of 28 numbers of 1.5 MW Wind Turbine Generators (WTG) of Regen Powertech and 4 numbers of 2.1 MW WTG of Suzlon.

2.4 Baseline Scenario

Baseline scenario for the second crediting period has been assessed in line with the methodological tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period." Version 03.0.1.

This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 300 of Project Standard & 49 (a) of the modalities and procedures of the Clean Development Mechanism.

The tool stipulates the following steps to be carried out.

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

There is no legal and regulatory requirement that mandates the production of energy by the chosen technology. Investment in wind energy projects in the State of Karnataka and the southern regional electricity grid is not mandatory. There are no national or local laws or regulations that require this investment to be undertaken, i.e. setting up of wind power project. The setting up of wind energy projects is a voluntary activity. Baseline for the project activity is in compliance with relevant mandatory national and sectoral policies.

Hence, it remains unchanged in the current situation also, i.e. in the next crediting period.

Step 1.2: Assess the impact of circumstances

The baseline scenario identified at the validation of the project activity was grid i.e. the electricity delivered to the grid by the project activity which would have otherwise been taken directly from grid where power is generated predominantly by the operation of fossil fuel based power (which was also evident from the Combined Margin Emission factor calculated and detailed in the registered PD). The baseline scenario for the project activity in the current context remains same i.e. grid and the grid still supplies primarily fossil fuel based electricity as reflected in the Combined Margin emission factor (as detailed in the Appendix 1).

Hence, circumstances and the externalities for determining the baseline for the project activity are same. **Therefore, there is no change in baseline scenario for the next crediting period.**

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) **or an investment is the most likely scenario for the crediting period for which renewal is requested**

This sub-step has to be applied if the baseline scenario identified at the validation of the project activity was the continuation of use of the current equipment(s) without any investment.

Since this is not the case with the project activity under consideration, hence this condition is not applicable.

Step 1.4: Assessment of the validity of the data and parameters

This step stipulates that "Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the project activity."

In the context of the present project activity the emission factor has been updated along with the approach used to calculate the emission factor.

Step 2: Update the current baseline and the data and parameters

As evident from the explanation provided above the baseline scenario remains unchanged. Only the approach used to calculate the baseline emission factor is updated as per the latest version of CEA database available at the time of PD submission for renewal.

The approved consolidated baseline methodology, ACM0002, (Version 19), has been used to determine the baseline and the estimation of emission reductions for the applicable crediting period. As referred in the methodology "Tool to calculate the emission factor for an electricity system" (version 07.0) has been used to determine continued validity of the baseline based on combined margin (CM) calculations.

The details of CM Emission Factor calculation are reported under the Appendix I of this report. The values of the parameters are also reported under the section 4.1.

2.5 Additionality

The project additionality has been demonstrated and established under the registered VCS PD. The section 2.5 of the registered PD version 05, dated 31st May 2010, has demonstrated additionality using the relevant guidelines which confirms that project activity is additional.

As per section 3.8.5 of the VCS Standard (v3.7): "a full reassessment of additionality is not required when renewing the project crediting period. However, regulatory surplus shall be demonstrated in accordance with Section 4.6.3) and the project description shall be updated accordingly".

Now as per section 4.6.3: "the project shall not be mandated by any law, statute or other regulatory framework, or for UNFCCC non-Annex I countries, any systematically enforced law, statute or other regulatory framework. For UNFCCC non-Annex I countries, laws, statutes, regulatory frameworks or policies implemented since 11 November 2001 that give comparative advantage to less emissions intensive technologies or activities relative to more emissions-intensive technologies or activities need not be taken into account. For all countries, laws, statutes, regulatory frameworks or policies implemented since 11 December 1997 that give comparative advantage to more emissions-intensive technologies or activities relative to less emissions-intensive technologies or activities shall not be taken into account."

As per the registered PD, section 2.5, Step 1 (Regulatory Surplus): "There is no legal or regulatory requirement for the project activity considered. Hence any enforced law, statute or other

regulatory framework, cannot mandate the project. "At current scenario also the project activity is not a legal or regulatory requirement. Thus, project activity is additional.

2.6 Methodology Deviations

There is no methodological deviation is applied to the project activity.

Project activity is applicable under the same methodology, i.e. ACM0002; however for renewal of crediting period latest version of the methodology has been applied. The demonstration has already been included under the section 2.2 above.

3 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

The Baseline emissions are calculated based on para 42 of the methodology version 19, ACM0002.

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

The baseline emissions are to be calculated as follows:

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

Where:

BE_y	=	Baseline emissions in year y (t CO ₂ /yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of "TOOL07: Tool to calculate the emission factor for an electricity system" (t CO ₂ /MWh)

Calculation of $EG_{PJ,y}$:

The calculation of $EG_{PJ,y}$ is different for (a) greenfield plants, (b) retrofits and replacements, and (c) Capacity additions.

Since the project activity is a Greenfield project activity, option (a) is applicable to the project activity:

(a) Greenfield renewable energy power plants

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

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

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)

$EG_{PJ,y}$ is considered as EG_y in the registered VCS PD.

Combined margin CO_2 emission factor $EF_{grid,CM,y}$ is 0.9475 tCO_2/MWh has been calculated as per the tool to calculate the emission factor & considered the data provided by the CEA database version 13 for the renewal of Crediting Period under the VCS Joint PD & MR (version 03).

The Emission Factor calculation is demonstrated as follows:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system'. OR

(b) The weighted average emissions (in tCO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used."

The approach proposed in the "Option (a)" i.e. "Combined Margin" has been used for ascertaining Baseline Emission Reductions. The operating margin and the build margin emission factor have been considered from the information (Baseline Carbon Dioxide Emission Database -Version 13, June 2018) published by the Central Electricity Authority (CEA), Ministry of Power, Govt. of India which have been computed according to the procedures prescribed in 'Tool to calculate the emission factor for an electricity system" version 07.0.

The baseline scenario has been identified as per the combined margin (CM) approaches which consists of operating margin (OM) and build margin (BM) factors as described in this section.

STEP 1. Identify the relevant electricity System:

Historically, the Indian power system was divided into five independent regional grids, namely Northern, Eastern, Western, Southern, and North-Eastern. Each grid covered several states (see Table below). 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 FY2007-08 onwards for the purpose of this CO_2 Baseline Database. Since, 31 December 2013, the Southern grid has also been synchronised with the NEWNE grid, hence forming one unified Indian Grid. For the unified grid, the main emission factors are calculated in accordance with the relevant CDM methodologies.

The project activity is located in the state of Karnataka, which comes under southern grid of unified Indian Grid. In the proposed baseline, therefore calculation pertaining to the Unified Indian Grid has been used as the reference grid system for estimating the baseline emission.

INDIAN GRID				
Northern	Eastern	Western	North-Eastern	Southern
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Andhra Pradesh
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryana	Orissa	Daman & Diu	Manipur	Kerala
Himachal Pradesh	West Bengal	Dadar & Nagar Haveli	Meghalaya	Tamil Nadu
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Puducherry
Punjab	Andaman-Nicobar	Maharashtra	Nagaland	Lakshadweep
Rajasthan		Goa	Tripura	
Uttar Pradesh				
Uttarakhand				

STEP 2. Choose Whether to Include Off-Grid Power Plants in the Project Electricity System (Optional):

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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

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

Project participant has chosen **Option I** to include only grid power plants in the calculation.

STEP 3. Select a method to Determine the Operating Margin (OM)

As per the “tool to calculate the emission factor for an electricity system”, version 07.0.0,² “the operating margin refers to a cohort of power plants that reflect the existing power plants whose electricity generation would be affected by the proposed CDM project activity.”

Further, the OM is to be determined based upon the following methods

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

The simple OM method (option a) can only be used if low cost/must run resources² constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

² Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.

In the context of the present project activity simple OM has been considered since the contribution of low cost must run resources in the unified Indian grid mix amongst the five most recent years generation of the Indian grid mix is less than 50% of total grid generation. Hence, the statistics provided in the table above quite evidently demonstrate the fact that power generation from the low cost must run resources within the Indian grid is less than 50 % of the total generation. Hence, the use of simple operating margin method towards formulation the baseline scenario remains justified.

Further as per Step 3, the emission factor can be calculated using either of the two 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. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the VCS-PD to the DOE for validation. For off-grid power plants, use a single calendar year within the five most recent calendar years prior to the time of submission of the VCS-PD for validation.

Ex post option: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y , alternatively the emission factor of the previous year $y-1$ may be used. If the data is usually only available 18 months after the end of year y , the emission factor of the year proceeding the previous year $y-2$ may be used. The same data vintage (y , $y-1$ or $y-2$) should be used throughout all crediting periods.

For the project activity, the Ex-ante option is chosen for emission factor estimation.

The Simple OM factor is calculated as under in Step 4.

STEP 4: Calculate the Operating Margin Emission Factor According to the Selected Method

As per Step 3 of the 'tool to determine the emission factor of an electricity system', the simple OM emission factor can be calculated using the ex-ante option which states that for calculation of OM 'A 3-year generation-weighted average, based on the most recent data available at the time of submission of the VCS-PD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period'.

In this regard, the simple OM emission factor has been sourced from the most recent data available at the time of submission of the PD for renewal and has **therefore been fixed for this 2nd crediting period** (see Appendix 1 for data related to operating margin in Indian grid).

The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units.

The simple OM may be calculated:

Option A: Based on the net electricity generation and a CO₂ emission factor of each power unit;

OR

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

The Central Electricity Authority, Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database i.e. The CO₂ Baseline Database provides information about the Combined Margin Emission Factors of all the regional electricity grids in India. The Combined Margin in the CEA database is calculated ex ante using the guidelines provided by the UNFCCC in the “Tool to calculate the emission factor for an electricity system, Version 17.0.0”. We have, therefore, used the Combined Margin data published in the CEA database, for calculating the Baseline Emission Factor.

As per ‘Tool to calculate the emission factor for an electricity system’ **Option A** (i.e. “Based on the net electricity generation and a CO₂ emission factor of each power unit”) is used to calculate simple OM emission factor. Where Option A is used, the simple OM emission factor is calculated based on the electricity generation of each power unit and an emission factor for each power unit, as follows:

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

Where:

$EF_{\text{grid,OMsimple},y}$	Simple operating margin CO ₂ emission factor in year y (tCO ₂ /MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	CO ₂ emission factor of power unit m in year y (tCO ₂ /MWh)
m	All power units serving the grid in year y except low-cost / must-run power units y
	The relevant year as per the data vintage chosen in STEP 3

The CO₂ emission factor ($EF_{EL,m,y}$) data for simple OM, available under the CEA database (Version 13.0, June 2018) for the last three years is as follows.

CO ₂ emission factor for simple OM (tCO ₂ /MWh) (incl. Imports)			
Indian Grid	2014-15	2015-16	2016-17
	0.9903	0.9655	0.9636

Net Generation Total (MWh)			
Indian Grid	2014-15	2015-16	2016-17
	808417	871753	916278

The net electricity generation ($EG_{m,y}$) data, available under the CEA database (Version 13) , of all generating power plants (not including low-cost / must-run power plants / units) for the last three year has been taken from the database.

Thus, as can be seen from the above tables, the 3 years generation-weighted OM average for the most recent three years available at the time of PD for validation, i.e. 2014-15, 2015-16 and 2016-17 for Indian grid is:

The ex-ante 3 years generation-weighted OM average value obtained is 0.9726³ tCO₂/MWh.

STEP 5: Calculate the Build Margin (BM) Emission Factor

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of PD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The project participant has chosen Option 1 for vintage of the data.

Therefore BM for the 2nd crediting period is considered as the build margin data of the most recent available period, i.e. year 2016-17. Thus, $EF_{grid, BM, y} = 0.8723$ tCO₂e/MWh⁴.

STEP 6: Calculate the Combined Margin Emissions Factor

Combined Margin has been used for ascertaining Baseline Emission Reductions. The combined margin emission factor consists of two components i.e. the operating margin and the build margin. The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, has estimated the simple operating margin and build margin emission factor for the unified Indian grid. According to 'Tool to calculate the emission factor an electricity system' version -07, the combined margin emission factor is calculated as follows:

The weighted average CM method (option A) is preferred for calculation of combined margin emission factor.

$$EF_{grid, CM, y} = EF_{grid, OM, y} \times W_{OM} + EF_{grid, BM, y} \times W_{BM}$$

Where:

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

³Refer ER sheet for detailed calculation, and also referred in Appendix I.

⁴Refer ER sheet for detailed calculation, and also referred in Appendix I.

The combined margin emission factor has been derived from the simple operating margin and build margin emission factors after considering/ factoring the weights of 0.75 and 0.25 for operating margin (OM) and build margin (BM) emission factors respectively relevant to the hydro power generation project activities as per the 'Tool to calculate the emission factor for an electricity system (Version 07)

Combined Margin (CM) in tCO₂/MWh for grid is

$$\begin{aligned} EF_{CO_2, grid, y} &= 0.75 \times \text{Wt. avg. of OM for last 3 years} + 0.25 \times \text{BM} \\ &= 0.9475 \text{ tCO}_2/\text{MWh} \end{aligned}$$

Net Energy Generated (EG_y):

The net electricity supplied is calculated as the follows.

Net electricity supplied to the grid by the plant = Electricity exported to the grid by the project activity – Electricity imported from the grid by the project activity – Transmission losses

Electricity export to the grid is considered based on Form B certificate issued by BESCOM/KTPCL.

Electricity import from the grid is considered based on Form B certificate issued by BESCOM/KTPCL⁵.

Transmission losses⁶ are considered based on Form B certificate issued by BESCOM/KTPCL

Baseline Emissions:

The formula for Baseline emissions as discussed is provided above.

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

$$= 135,084 \times 0.9475 \text{ tCO}_2\text{e}$$

$$= 127,993 \text{ tCO}_2\text{e (round down value).}$$

3.2 Project Emissions

As per approved methodology ACM0002, for most renewable energy project activities,

$$PE_y = 0.$$

Since the project activity is a wind power project, the project emission is zero.

3.3 Leakage

No leakage emissions are considered for this Project activity since no energy generating equipment is transferred from another activity and/or the existing equipment is transferred to another activity.

⁵As per PPA, NSL is billed for 115% of the electricity imported by the project activity from grid.

⁶Transmission losses:

Transmission losses = (Sum of electricity export recorded for the metering points NSLC III, NSLC IV, NSLC V, NSLC VI) – (Electricity export recorded at the substation) / (Sum of electricity export recorded for the metering points NSLC III, NSLC IV, NSLC V, NSLC VI) * 100

3.4 Estimated Net GHG Emission Reductions and Removals

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y	=	Emission reductions in year y (tCO ₂ e/yr)
BE_y	=	Baseline emissions in year y (tCO ₂ /yr)
PE_y	=	Project emissions in year y (tCO ₂ e/yr)

$$ER_y = 127,993 - 0$$

$$= 127,993 \text{ (tCO}_2\text{e/yr)}$$

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	1,27,993	0	0	1,27,993
Year 2	1,27,993	0	0	1,27,993
Year 3	1,27,993	0	0	1,27,993
Year 4	1,27,993	0	0	1,27,993
Year 5	1,27,993	0	0	1,27,993
Year 6	1,27,993	0	0	1,27,993
Year 7	1,27,993	0	0	1,27,993
Year 8	1,27,993	0	0	1,27,993
Year 9	1,27,993	0	0	1,27,993
Year 10	1,27,993	0	0	1,27,993
Total	12,79,930	0	0	12,79,930

(Here, "Year 1" starts from 06/06/2018)

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{OM,y}$
Data unit	tCO ₂ e/MWh
Description	Operating Margin Emission Factor of Indian Grid
Source of data	"CO₂ Baseline Database for Indian Power Sector" version 13 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO₂ Baseline Database for Indian Power Sector" is available at http://www.cea.nic.in/tpeandce.html
Value applied:	0.9726
Justification of choice of data or description of measurement methods and procedures applied	Calculated by using 3 years vintage (2014-2015, 2015-2016 and 2016-17) data obtained from "CO ₂ Baseline Database for Indian Power Sector" version 13.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on the tool "Tool to calculate the emission factors for an electricity system".
Purpose of Data	Baseline emission calculations
Comments	Value is fixed ex-ante for entire crediting period.

Data / Parameter	$EF_{BM,y}$
Data unit	tCO ₂ e/MWh
Description	Build Margin Emission Factor of Southern Regional Electricity Grid
Source of data	"CO₂ Baseline Database for Indian Power Sector" version 13 published by the Central Electricity Authority, Ministry of Power, Government of India. The "CO₂ Baseline Database for Indian Power Sector" is available at http://www.cea.nic.in/tpeandce.html
Value applied:	0.8723
Justification of choice of data or description of measurement methods and procedures applied	2016-17 data obtained from "CO ₂ Baseline Database for Indian Power Sector" version 13.0, published by the Central Electricity Authority, Ministry of Power, Government of India, which is based on the tool "Tool to calculate the emission factors for an electricity system".
Purpose of Data	Baseline emission calculations
Comments	Value is fixed ex-ante for entire crediting period.

Data / Parameter	$EF_{CO_2, grid,y}$
Data unit	tCO ₂ e/MWh

Description	Combined Margin Emission Factor of Southern Regional Electricity Grid		
Source of data	Combined Margin Emission Factor ($EF_{CM,y}$) is calculated as the weighted average of Operating Margin Emission Factor ($EF_{OM,y}$) and Build Margin Emission Factor ($EF_{BM,y}$). The “CO₂ Baseline Database for Indian Power Sector” Version 13 published by the Central Electricity Authority, Ministry of Power, Government of India. The “CO₂ Baseline Database for Indian Power Sector” is available at http://www.cea.nic.in/tpeandce.html		
Value applied:	In case of wind power projects default weights of 0.75 for EF_{OM} and 0.25 for EF_{BM} are applicable as per ACM0002. <table border="1"> <tr> <td>Combined Margin Emission Factor (EF_y or $EF_{CM,y}$)</td><td>0.9475</td></tr> </table> Refer ER calculation sheet for detailed calculation sheet	Combined Margin Emission Factor (EF_y or $EF_{CM,y}$)	0.9475
Combined Margin Emission Factor (EF_y or $EF_{CM,y}$)	0.9475		
Justification of choice of data or description of measurement methods and procedures applied	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002, and Tool to Calculate the emission Factor for an Electricity System.		
Purpose of Data	Baseline emission calculations		
Comments	Value is fixed ex-ante for entire crediting period.		

4.2 Data and Parameters Monitored

Data / Parameter	EG _y
Data unit	kWh
Description	Electricity supplied by the plant to the grid
Source of data	Tariff invoices submitted to KPTCL for the electricity supplied to the grid
Description of measurement methods and procedures to be applied	The metering points NSLC III, NSLC IV, NSLC V are connected to bulk metering point NSLC I and NSLC II till 30th Sep 2011. From 30th Sep 2011 onwards, the metering points NSLC III, NSLC IV are connected to bulk metering point NSLC I and metering point NSLC V, NSLC VI are connected to bulk metering point NSLC II. The WTGs of capacity load 13.5 MW (9X1.5 MW) are connected to metering point NSLC III, and WTGs of capacity load 12 MW (8X1.5 MW) are connected to metering point NSLC IV and WTGs of capacity load 12.6 MW (7X1.5 MW, 1X2.1 MW) are connected to the metering point NSLC V and WTGs of capacity load 12.3 MW (4X1.5 MW, 3X2.1 MW) are connected to metering point at NSLC VI located at group controller station, Hirekandavadi. Energy is fed to grid from NSLC III, NSLC IV, NSLC V, NSLC VI through bulk metering points NSLC I, NSLC II located at 66 KV substation, KN Halli. Actual power generated by WTGs of project activity is measured using

	energy meters (Main & Check) located at group controller station, Hirekandavadi. The main meter and check meter are installed at group controller station, Hirekandavai. The energy meters are 0.2s accuracy class and regularly calibrated. The details of calibration along with respective energy meter are provided in Appendix-I of this monitoring report. Net electricity exported to grid by the wind farm is measured using KPTCL meters installed at HT end of the 33/66 KV substation at KN Hali. The main meter and check meter are installed at the substation. Both of these are joint meter readings and are taken on monthly basis in the presence of KPTCL/BESCOM and representative of the project proponent. KPTCL & BESCOM is issued a certificate for the share of electricity generated every month. Monthly share of electricity certificate is prorated by KPTCL/BESCOM based on actual generation of WTGs and the net total electricity supplied by the Wind Farm. Reading recorded in this certificate for the WTGs in the project activity is used for actual estimations.				
Frequency of monitoring/recording	Measuring frequency – Continuous Recording frequency – Monthly				
Value applied	135,084,000				
Monitoring equipment	<table border="1"> <thead> <tr> <th>Energy Meter</th><th>Accuracy Class</th></tr> </thead> <tbody> <tr> <td>Trivector energy meter</td><td>0.2s</td></tr> </tbody> </table> The details of calibration along with respective energy meter are provided in Appendix-I of this monitoring report.	Energy Meter	Accuracy Class	Trivector energy meter	0.2s
Energy Meter	Accuracy Class				
Trivector energy meter	0.2s				
QA/QC procedures to be applied	The main and check energy meters are of 0.2s accuracy class. Calibration of energy meters at group controller end and substation end are carried out by BESCOM/KPTCL annually. The invoices raised to BESCOM/ KPTCL by NSL can be used for cross checking the electricity readings.				
Purpose of data	Calculation of baseline emission				
Calculation method	Not applicable				
Comments	The data will be archived for the crediting period plus two years in electronic format.				

Data / Parameter	TEG _y
Data unit	kWh
Description	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y
Source of data	Form B certificate issued by KPTCL/BESCOM.
Description of measurement methods and procedures to be applied	The metering points NSLC III, NSLC IV, NSLC V are connected to bulk metering point NSLC I and NSLC II till 30th Sep 2011. From 30th Sep 2011 onwards, the metering points NSLC III, NSLC IV are connected to bulk metering point NSLC I and metering point NSLC V, NSLC VI are connected to bulk metering point NSLC II. The WTGs of capacity load 13.5 MW (9X1.5 MW) are connected to metering point NSLC III, and WTGs of capacity load 12 MW (8X1.5 MW) are

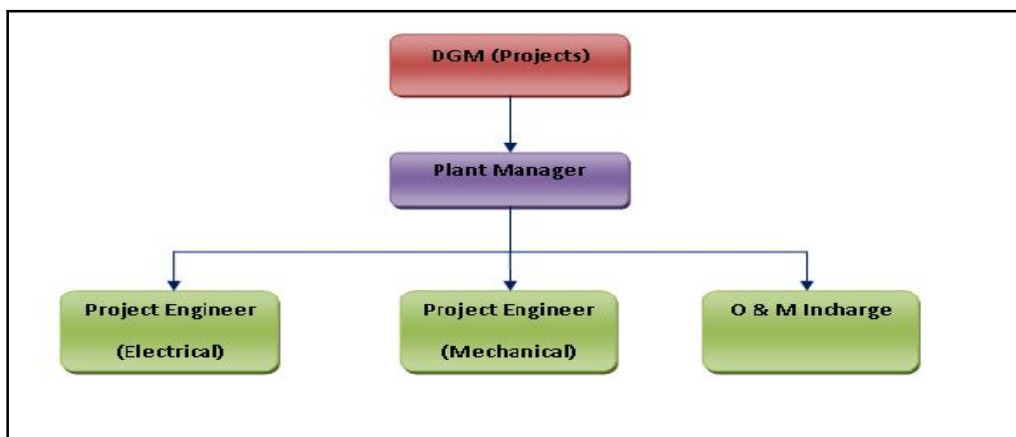
	connected to metering point NSCL IV and WTGs of capacity load 12.6 MW (7X1.5 MW, 1X2.1 MW) are connected to the metering point NSLC V and WTGs of capacity load 12.3 MW (4X1.5 MW, 3X2.1 MW) are connected to metering point at NSLC VI located at group controller station, Hirekandavadi. Energy is fed to grid from NSLC III, NSLC IV, NSLC V, NSLC VI through bulk metering points NSLC I, NSLC II located at 66 KV substation, KN Halli. Actual power generated by WTGs of project activity is measured using energy meters (Main & Check) located at group controller station, Hirekandavadi. The main meter and check meter are installed at group controller station, Hirekandavadi. Net electricity exported to grid by the wind farm is measured using KPTCL meters installed at HT end of the 33/66 KV substation at KN Hali. The main meter and check meter are installed at the substation. Both of these are joint meter readings and are taken on monthly basis in the presence of KPTCL/BESCOM and representative of the project proponent. KPTCL & BESCOM is issued a certificate for the share of electricity generated every month. Monthly share of electricity certificate is prorated by KPTCL/BESCOM based on actual generation of WTGs and the net total electricity supplied by the Wind Farm. Reading recorded in this certificate for the WTGs in the project activity is used for actual estimations.				
Frequency of monitoring/recording	Measuring frequency – Continuous Recording frequency – Monthly				
Value applied	13,576,000				
Monitoring equipment	<table border="1"> <thead> <tr> <th>Energy Meter</th><th>Accuracy Class</th></tr> </thead> <tbody> <tr> <td>Trivector meter</td><td>0.2s</td></tr> </tbody> </table> The details of calibration along with respective energy meter are provided in Appendix-I of this monitoring report.	Energy Meter	Accuracy Class	Trivector meter	0.2s
Energy Meter	Accuracy Class				
Trivector meter	0.2s				
QA/QC procedures to be applied	The main and check energy meters are of 0.2s accuracy class. Calibration of energy meters at group controller end and substation end are carried out by BESCOM/KPTCL annually. The invoices raised to BSECOM/ KPTCL by NSL can be used for cross checking the electricity readings.				
Purpose of data	Calculation of baseline emission				
Calculation method	Not applicable				
Comments	The data will be archived for the crediting period plus two years in electronic format.				

4.3 Monitoring Plan

Monitoring Plan has been proposed as prescribed under the registered PD. Also, as the renewal crediting period applies the latest version of the Methodology (i.e. ACM0002 Version 19), hence monitoring of emission reductions are also comply with the requirements of the methodology.

The operational and management structure implemented by NSL at the project site is as follows:

Organisational chart for data collection of Bhimasamudra Wind farm:



Roles and Responsibilities:

Designation	Responsibilities
DGM (Projects)	Certifying official (Authorized for signing invoice)
Plant Manager	Verification of correctness of data
Project Engineer / O & M In-charge	Staff who present during collection of data by BESCOM/KPTCL

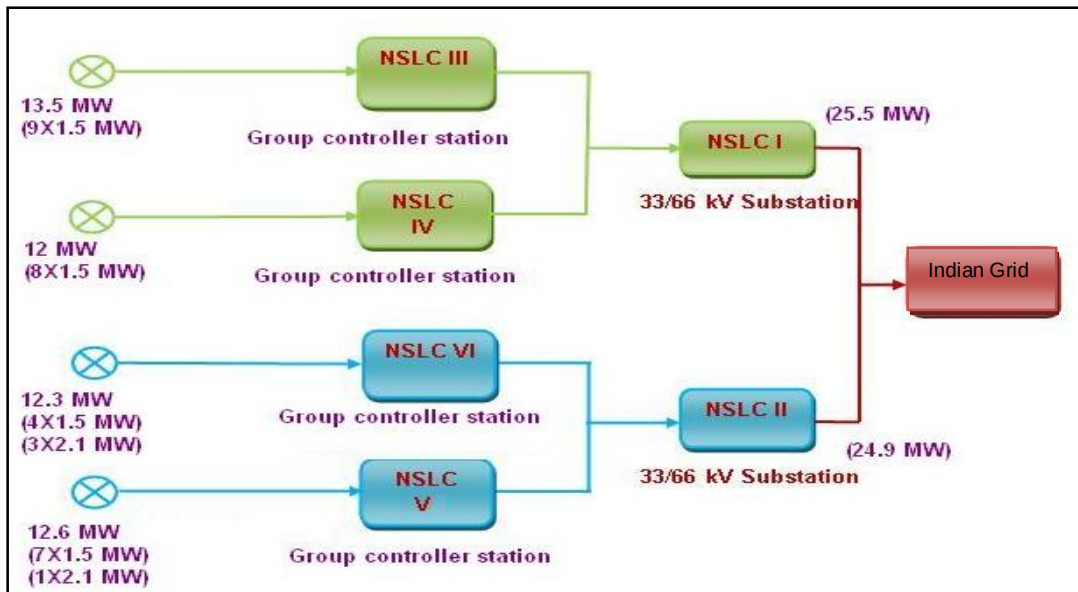
Metering arrangements:

The metering points NSLC III, NSLC IV, NSLC V are connected to bulk metering point NSLC I and NSLC II till 30th Sep 2011. From 30th Sep 2011 onwards, the metering points NSLC III, NSLC IV are connected to bulk metering point NSLC I and metering point NSLC V, NSLC VI are connected to bulk metering point NSLC II.

The WTGs of capacity load 13.5 MW (9X1.5 MW) are connected to metering point NSLC III, and WTGs of capacity load 12 MW (8X1.5 MW) are connected to metering point NSCL IV and WTGs of capacity load 12.6 MW (7X1.5 MW, 1X2.1 MW) are connected to the metering point NSLC V and WTGs of capacity load 12.3 MW (4X1.5 MW, 3X2.1 MW) are connected to metering point at NSLC VI located at Group Control Station, Hirekandavadi. Energy is fed to grid from NSLC III, NSLC IV, NSLC V, NSLC VI through bulk metering points NSLC I, NSLC II located at 66 KV substation, KN Halli.

Metering points	WTGs No	Capacity of WTGs (MW)	Commissioning date
NSLC III	HK 1	1.5	29/09/2008
	HK 2	1.5	01/07/2008
	HK 3	1.5	06/06/2008
	HK 4	1.5	09/09/2008
	HK 5	1.5	09/09/2008

	HK 6	1.5	29/09/2008
	HK 7	1.5	08/12/2009
	HK 8	1.5	08/12/2009
	HK 9	1.5	08/12/2009
NSLC IV	HK 10	1.5	15/12/2009
	HK 11	1.5	15/12/2009
	HK 12	1.5	21/01/2010
	HK 13	1.5	15/12/2009
	HK 14	1.5	21/01/2010
	HK 15	1.5	15/12/2009
	HK 22	1.5	21/01/2010
	HK 23	1.5	21/01/2010
NSLC V	HK 25	1.5	30/09/2011
	HK 27	1.5	30/09/2011
	HK 29	1.5	30/09/2011
	HK 30	1.5	30/09/2011
	HK 31	1.5	30/09/2011
	HK 32	1.5	30/09/2011
	HK 33	1.5	30/09/2011
	HK 26	2.1	30/09/2011
NSLC VI	HK 16	1.5	30/09/2011
	HK 17	1.5	30/09/2011
	HK 18	1.5	30/09/2011
	HK 24	1.5	30/09/2011
	HK 19	2.1	30/09/2011
	HK 20	2.1	30/09/2011
	HK 21	2.1	30/09/2011

Current Metering arrangements:

Actual power generated by WTGs of project activity is measured using energy meters located at Group Control Station, Hirekandavadi. The main and check meter of the WTGs are installed at Group Control Station, Hirekandavadi.

Net electricity exported to grid by the wind farm is measured using KPTCL meters installed at HT end of the 33/66 KV substation at KN Halli. The main meter and check meter of the net electricity exported to the grid is installed at the substation. Both of these are joint meter readings and are taken on monthly basis in the presence of KPTCL/BESCOM and representative of the project proponent.

KPTCL & BESCOM is issued a certificate for the share of electricity generated every month. Monthly share of electricity certificate is prorated by KPTCL/BESCOM based on actual generation of WTGs and the net total electricity supplied by the Wind Farm. Reading recorded in this certificate for the WTGs in the project activity is used for actual estimations. The calibration details of the energy meter are given in the Appendix-I of the report

QA/QC procedures & Data collection and archiving:

The reading can be cross verified with the actual invoices presented to BESCOM/KTPCL by NSL. The daily data at the site is collected in electronic form. Monthly data is also collected and maintained in plant log books. The project proponent shall keep complete and accurate records of all the data as a part of monitoring for at least a period of 2 years after the end of the crediting period or the last issuance of ERs for the project activity, whichever occurs later.

5 SAFEGUARDS

5.1 No Net Harm

As demonstrated in the registered VCS PD, there is no negative impact to any socio economic conditions of the region due to the project activity. The WECs are installed for generation of power using wind which is a clean source of energy. Hence no mitigation measures are required.

5.2 Environmental Impact

As demonstrated in the registered VCS PD, as per the Schedule 1 of the EIA notification dated 14th September 2006 (<http://envfor.nic.in/legis/eia/eia-2006.htm>), given by the Ministry of Environment and Forests (Government of India) under the Environment (Protection) Act 1986, EIA is not a regulatory requirement in India for wind energy projects.

Thus the project activity doesn't fall under the list of activities requiring EIA. Also, the project has been successfully running from the date of its commissioning and regular monitoring and verification have been conducted. There is no any event observed that indicates negative environmental impacts due to the project activity.

5.3 Local Stakeholder Consultation

Before starting of the VCS project activity, a stakeholders' consultation had been conducted in the project site. There were no negative comments or resistance to the project activity, whereas project activity was supported by the local people.

The details of local stakeholders' consultation had been already reported in the section 6 of the registered PD.

5.4 Public Comments

The details of public comments are already reported in the Registered VCS PD.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	EG _y
Data unit	kWh (Mega-watt hour)
Description	Electricity supplied by the plant to the grid
Value applied:	50,656,719
Comments	The value applied here is for the current monitoring period, i.e. 06/06/2018 to 30/09/2018. The data will be archived for the crediting period plus two years in electronic format.

Data / Parameter	TEG _y
Data unit	kWh (Mega-Watt hour)
Description	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y
Value applied:	50,655,300
Comments	The value applied here is for the current monitoring period, i.e. 06/06/2018 to 30/09/2018. The data will be archived for the crediting period plus two years in electronic format.

6.2 Baseline Emissions

The baseline emissions are calculated as:

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

Where,

EG_{PJ,y} is considered as EG_y in the registered VCS PD.

EF_{grid,CM,y} is the emission factor (0.94515 tCO_{2e}/MWh fixed ex-ante).

$$\begin{aligned}
 BE_y &= 50,656.719 \times 0.9475 \text{ tCO}_{2e} \\
 &= 47,875 \text{ tCO}_{2e}
 \end{aligned}$$

6.3 Project Emissions

Since the project activity is a renewable energy project which generates electricity using wind power and hence does not result in project emissions.

6.4 Leakage

No leakage is considered from the project activity as per approved methodology ACM0002.

6.5 Net GHG Emission Reductions and Removals

Year/Period	Baseline emissions or removals (tCO _{2e})	Project emissions or removals (tCO _{2e})	Leakage emissions (tCO _{2e})	Net GHG emission reductions or removals (tCO _{2e})
Year 2018 (Period:06/06/2018 - 30/09/2018)	47,875	0	0	47,875
Total	47,875	0	0	47,875

APPENDIX 1: <METER CALIBRATION DETAILS>

As per registered PD, all the energy meters including pooling station meters should be calibrated once in a year i.e. calibration frequency is "Annual". However, It is identified from the below table that calibration has happened in every 4 months in the current monitoring period and the results of latest calibration shows that all the meters are found to be working satisfactory. Hence, there is no delay in calibration of energy meter during this monitoring period.

Metering Points	Meter Details					Test Result
	Serial no	Make	Type	Accuracy class	Date of Calibration	
NSLC I	Main meter – 11071857	L & T	3P4W	0.2s	27/10/2017	Satisfactory
	Check meter – 15195281				27/01/2018	Satisfactory
					26/04/2018	Satisfactory
					24/07/2018	Satisfactory
NSLC II	Main meter – 11071861	L & T	3P4W	0.2s	27/10/2017	Satisfactory
	Check meter – 11071863				27/01/2018	Satisfactory
					26/04/2018	Satisfactory
					24/07/2018	Satisfactory
NSLC III	Main meter – 07022896	L & T	3P4W	0.2s	27/10/2017	Satisfactory
	Check meter – 07022921				27/01/2018	Satisfactory
					26/04/2018	Satisfactory
					24/07/2018	Satisfactory
NSLC IV	Main meter – 07022985	L & T	3P4W	0.2s	27/10/2017	Satisfactory
	Check meter – 07022986				27/01/2018	Satisfactory
					26/04/2018	Satisfactory
					24/07/2018	Satisfactory
NSLC V	Main meter – 09142342	L & T	3P4W	0.2s	27/10/2017	Satisfactory
	Check meter - 13191365				27/01/2018	Satisfactory
					26/04/2018	Satisfactory
					24/07/2018	Satisfactory
NSLC VI	Main meter – 11071865	L & T	3P4W	0.2 S	27/10/2017	Satisfactory
	Check meter - 13191363				27/01/2018	Satisfactory
					26/04/2018	Satisfactory
					24/07/2018	Satisfactory

APPENDIX 2: <BASELINE EMISSION FACTOR>

Baseline Emission factor has been calculated as combined margin emission factor of Indian grid.

CEA database, Version 13, June 2018 has been used for calculation. The CEA has estimated the simple operating margin and build margin emission factors unified Indian grid. For calculating the CO₂ emission factor as per combined margin method for the second crediting period, the weights of 0.75 for operating margin and 0.25 for build margin are considered as per 'Tool to calculate the emission factor for an electricity system (Version 07.0)'. The details are provided below:

Simple Operating Margin (tCO₂/MWh) (incl. Imports) (1) (2)			
	2014-15	2015-16	2016-17
Indian Grid	0.9903	0.9655	0.9636

Net Generation in Operating Margin (MWh)			
	2014-15	2015-16	2016-17
Indian Grid	808417	871753	916278

Build Margin (tCO₂/MWh) (not adjusted for imports)			
			2016-17
Indian Grid			0.8723

Operating Margin (OM) - weighted average	
Indian	0.9726

Combined Margin EF		
		Indian Grid
	Weights	tCO₂e/MWh
Operating Margin	0.75	0.9726
Build Margin	0.25	0.8723
Combined Margin		0.9475