

GRID CONNECTED SOLAR ENERGY PROJECT



Document Prepared By CLP Wind Farms (India) Private Limited

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1. PROJECT DETAILS

1.1 Summary Description of the Project and its Implementation Status

The proposed project activity involves installation of 170 MW_{AC} solar projects in the states of Telengana and Maharashtra of India. The main purpose of this project activity is to generate electricity through renewable energy source and to sale the same to Indian grid. The project activity utilises solar energy to generate clean power with a view to bring in greenhouse gas emission reductions. This project activity constitutes of three independent solar projects with different capacities. Details of the sub-project activity are mentioned below:

Name of Legal Entity	Commercial Date of Operation	Capacity	Location (Village/State)
SE Solar Limited	07-Aug-2017	100 MW _{AC}	Dwarakanagar, Ammapur and Muthyalampalle villages in Mahbubnagar dist. in the state of Telangana, India
Gale Solarfarms Private Limited	08-Feb-2018	50 MW _{AC}	Saltek and Bhamer villages in Dhule district of Maharashtra, India
Tornado Solarfarms Private Limited	09-Nov-2017	20 MW _{AC}	

Presently, SE Solar Limited (Veltoor), Gale Solarfarms Private Limited (Gale) and Tornado Solarfarms Private Limited (Tornado) are the 100% subsidiaries of CLP Wind Farms (India) Private Limited (CLPWF). Thus, being the parent organization, CLPWF is acting as project participant in this project activity.

The Project activity helps to reduce the demand-supply gap in the country and also helps in contributing to the sustainable development by using solar energy as the source of power generation and reduction of GHG emissions. The project activity is expected to supply 3.09 GWh of energy per year to the Indian Grid of India . This is expected to result in emission reductions of 289,503 tCO₂e per year of operation. During this monitoring period (from 07-Aug-2017 to 31-Mar-2019 (both days inclusive)), the project activity has exported 445,152.83 GWh of energy to the Indian grid. The total emission reductions achieved during the monitoring period is 417,018 tCO₂.

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 from this project through sustainable means without causing any negative impact on the environment.

Scenario existing prior to the implementation of project activity:

The Project activities are new facility (Greenfield) and utilizing solar energy to generate electricity and supply it to distribution licences which are the part of the Indian Grid. In absence of this Project activities, same quantity of the electricity would have been delivered by the other existing grid-connected fossil fuel based power plants and future capacity additions to meet the growing electricity requirements. Hence, generation mix of grid is considered as the baseline scenario. Thus, the project activity reduces the dependency on fossils fuels which are pre-dominantly used for electricity generation in India and helps reduction of climate change impacts. Prior to

implementation of this project activity, there was no project activity at sites and same amount of electricity was generated from other grid connected power plants.

1.2 Sectoral Scope and Project Type

The project activity has a capacity more than 15 MW and is considered under “Grid-connected electricity generation from renewable sources”. As per the scope of the project activities enlisted in the latest version of the “List of Sectoral Scopes and related approved baseline and monitoring methodologies”, the project activity can be categorized as follows:

Methodology: Grid-connected electricity generation from renewable sources, ACM0002 of version 19.0

Sectoral Scope: 01, Energy Industry (Renewable/Non Renewable Sources)

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

The project activity is not a grouped project. Currently, SE Solar Limited, Gale Solarfarms Private Limited and Tornado Solarfarms Private Limited are the 100% subsidiaries of CLP Wind Farms (India) Private Limited (CLPWF). Thus, being the parent organization, CLPWF is acting as project participant in this project activity.

1.3 Project Proponent

Organization name	CLP Wind Farms (India) Private Limited
Contact person	Mr. Dipjay Sanchania
Title	Head – CDM
Address	7 th Floor, Fulcrum, Sahar Road, Andheri (East), Mumbai – 400099, India
Telephone	+ 91-22 6758 8888
Email	carbon@clpindia.in

1.4 Other Entities Involved in the Project

Organization name	SE Solar Limited
Role in the project	Project Developer
Contact person	Mr. Dipjay Sanchania
Title	Head – CDM
Address	Survey No 48,62,77,78,79, Ammapur Village, Chinnachintakunta Mandal, Veitoor, Mahbubnagar, Telangana- 509110
Telephone	+ 91-22 6758 8888
Email	carbon@clpindia.in

Organization name	Gale Solarfarms Private Limited
Role in the project	Project Developer

Contact person	Mr. Dipjay Sanchania
Title	Head – CDM
Address	One Earth, Opposite Magarpatta city Hadapsar, Pune, Maharashtra 411028
Telephone	+ 91-22 6758 8888
Email	carbon@clpindia.in

Organization name	Tornado Solarfarms Private Limited
Role in the project	Project Developer
Contact person	Mr. Dipjay Sanchania
Title	Head – CDM
Address	One Earth, Opposite Magarpatta city Hadapsar, Pune, Maharashtra 411028
Telephone	+ 91-22 6758 8888
Email	carbon@clpindia.in

1.5 Project Start Date

Commercial date of Operations of Veltoor, Gale and Tornado solar projects are on 07/08/2017, 08/02/2018 and 09/11/2017 respectively. Thus, projects are started emission reduction from its commercial date of operations respectively. Therefore, the start date for this project is 07/08/2017 which is the commercial date of operation. .

1.6 Project Crediting Period

The Project has stated generating GHG emission reductions from 07/08/2017 i.e. form earliest date of commercial operations of these solar projects. Hence, crediting period for VCS begins on 07/08/2017 and ends on 06/08/2027 i.e. 10 years crediting period which can be renewed for maximum 2 times.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

As the estimated annual average GHG emission reductions or removal per year is 289,503 tCO_{2e} which is less than 300,000 tonnes of CO_{2e} per year. Thus, the project falls in the category of Project Scale.

Project Scale	
Project	√
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e) ¹
Year 1	296,077
Year 2	294,597
Year 3	293,124
Year 4	291,658
Year 5	290,200
Year 6	288,749
Year 7	287,305
Year 8	285,869
Year 9	284,439
Year 10	283,017
Total estimated ERs	2,895,035
Total number of crediting years	10
Average annual ERs	289,503

1.8 Description of the Project Activity

The Project activity involves installation of two solar projects in the state of Maharashtra and one project in Telengana respectively totalling capacity of 170 MW. Capacity of the solar project installed in Veltoor, Telengna is 100 MW_{AC} by SE Solar Limited. Further, capacity of the projects installed in Dhule, Maharashtra are 50 MW_{AC} and 20 MW_{AC} by Gale Solarfarms Private Limited and Tornado Solarfarms Private Limited respectively.

The electricity generated by the Project would 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 activity is in line with the sustainable development criteria of the country. The electricity generated from the solar farm will be exported to the Indian grid and sold to the state electricity utility, thereby contributing to reducing the energy demand supply gap in the state of Telengana and Maharashtra.

The project activity aims to harness solar energy through installation of PV technology. The solar PV power plant will have solar PV modules, inverters, transformers and other protection system and supporting components as under:

Technical Specification in Veltoor Solar project:

Solar Module	
AC capacity	100 MW _{AC}
Orientation	1-axis horizontal East-West tracker with backtracking
Module technology	Poly-Crystalline
Module model	Canadian Solar CS6X-310P

¹ 0.5% yearly deration of the solar panel has been considered. Thus, yearly emission reduction is also reducing in that proportion.

Rated Maximum Power	310 Wp
Inverter	
Inverter make	ABB
Inverter model	PVS800-57-1000kW-C
Number of inverters	100 Nos.
Grid Interconnection Point	400/220 kV Veltoor substation, Telangana

Technical Specification in Gale Solar project:

Solar Module			
AC capacity (MW)	50 MW _{AC}		
Orientation	Fixed		
Module technology	Poly-Crystalline		
Module model	Canadian Solar CS6U - 320P	Canadian Solar CS6U - 325P	Canadian Solar CS6U - 330P
Rated Maximum Power	320 Wp	325 Wp	330 Wp
Inverter			
Inverter make	TMIEC		
Inverter model	PVL-L1000E		
Rated AC Power	1000 kW		
Number of inverters	50 Nos.		
Grid Interconnection Point	220/33 kV Jamde substation at Sakri, Maharashtra		

Technical Specification in Tornado Solar project:

Solar Module			
AC capacity (MW)	20 MW _{AC}		
Orientation	Fixed		
Module technology	Poly-Crystalline		
Module model	Canadian Solar CS6U - 320P	Canadian Solar CS6U - 325P	Canadian Solar CS6U - 330P
Rated Maximum Power	320 Wp	325 Wp	330 Wp
Inverter			
Inverter make	TMIEC		
Inverter model	PVL-L1000E		
Rated AC Power	1000 kW		
Number of inverters	20 Nos.		
Grid Interconnection Point	220/33 kV Jamde substation at Sakri, Maharashtra		

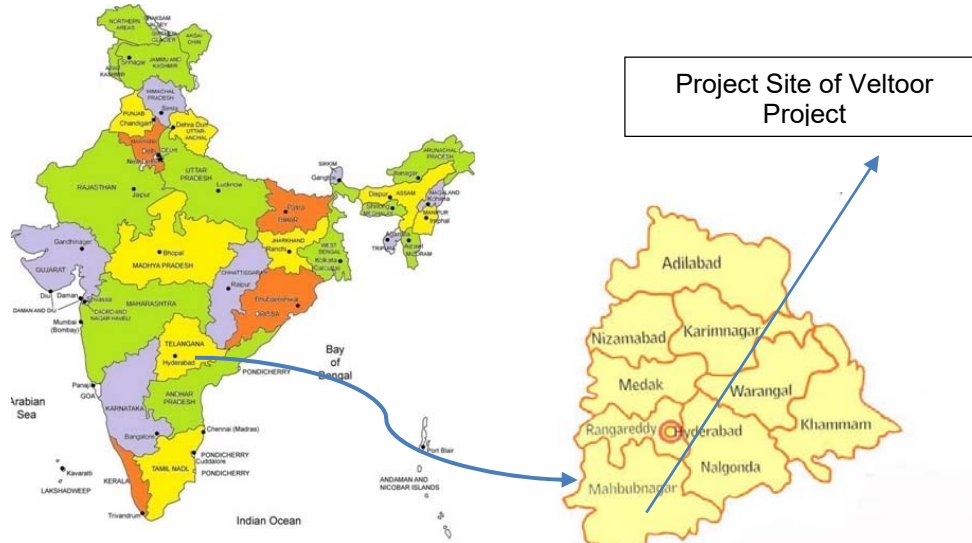
The useful life of the solar project activity is considered as 25 years in line with tariff order issued by the Central Electricity Regulatory Commission (CERC) of India. In the absence of the project activity the equivalent amount of electricity would have been generated/imported from the connected/ new power plants in the Indian grid, which is predominantly based on fossil fuels²,

² http://www.cea.nic.in/executive_summary.html

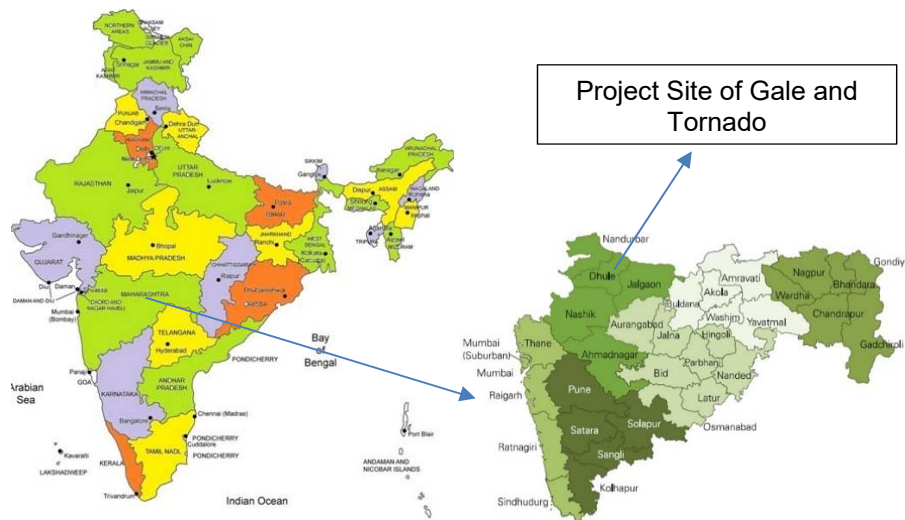
hence baseline scenario of the project activity is the grid based electricity system, which is also the pre-project scenario. Since, the electricity generated by solar power is Green House Gas (GHG) emissions free, the power generated will prevent the anthropogenic GHG emissions generated by the fossil 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.

1.9 Project Location

The proposed 100 MW_{AC} solar plant is located in Dwarkanagar, Ammapur and Muthyapalle village in Kothakota, Chinnachintakunta and Devarkadra mandal of Mehboobnagar district of Telengana. The site is accessed through National Highway 7 (NH-7) (9 km east of project site) and further reached by a 300 m long village road connecting Kottakota village to project site. The site lies around the coordinates 16°26' 38.98" N and 77° 52' 3.83" E and at an altitude of approximately 352 m, above mean sea level. The nearest commercial city is Hyderabad, which is approximately 130 km from the Project site location. The preferred route from Hyderabad to the Project site location details of the project is given below in the figure:



The proposed 50 MW_{AC} and 20 MW_{AC} solar plants are located in Saltek and Bhamer villages in Dhule district of Maharashtra. The site is accessed through National Highway 7 (NH-7). The site lies around the coordinates 21.1° N and 74.3° E. The nearest commercial city is Nasik, which is approximately 170 km from the Project site location. The preferred route from Nasik to the Project site location details of the project is given below in the figure:



1.10 Conditions Prior to Project Initiation

This greenfield project activity involves installation of new 170 MW_{AC} solar energy based plant for generating electricity. In the absence of the project activity, the equivalent power generation would have taken place from the fossil fuel dominated Indian Grid. Prior to implementation of this project activity, there were no project activities at respective sites. Same amount of electricity was generated from other grid connected power plant. The main emission in the pre-project scenario is the power plants connected to the Indian Grid, and main GHG involved is CO₂. The baseline identified in section 2.4 is same as the pre-project scenario.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Project has received necessary approvals for development and commissioning for each solar projects from the state nodal agencies and is in compliance to the local laws and regulations. The Project activity conforms to all the applicable laws and regulations in India:

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

1.12 Ownership and Other Programs

1.12.1 Project Ownership

As per VCS Program definitions version 3.7, the project ownership is the legal right to control and operate the project activities. 100 MW_{AC}, 50 MW_{AC} and 20 MW_{AC} solar projects are owned by SE Solar Limited, Gale Solarfarms Private Limited and Tornado Solarfarms Private Limited respectively. During project conceptualization, all the above mentioned entities were formed by Suzlon Energy Limited as Special Purpose Vehicles (SPVs). Further, all these SPVs have been (100%) sold to CLP Wind Farms (India) Pvt. Ltd. Now, SE Solar Limited, Gale Solarfarms Private Limited and Tornado Solarfarms Private Limited are the 100% subsidiaries of CLP Wind Farms (India) Private Limited. Thus, CLPWF is acting as the Project Proponent of this project. As the legal right to control and operate the project activities are belongs to respective entities only, hence, it possesses right of use of ER credits. Further the ownership is demonstrated through the following documents.

1. Commissioning certificates of the projects are in the name of respective entities. Commissioning certificate of 100 MW_{AC} solar project has been issued in the name of SE Solar Limited. Similarly, commissioning certificates of 50 MW_{AC} and 20 MW_{AC} solar projects have been issued in the name of Gale Solarfarms Private Limited and Tornado Solarfarms Private Limited respectively.
2. Power Purchase Agreements (PPAs) have been signed between state utilities and respective entities. PPA of 100 MW_{AC} solar project has been signed between Southern Power Distribution Company of Telengana Limited and SE Solar Limited. Similarly, PPAs of 50 MW_{AC} and 20 MW_{AC} solar projects have been signed between Solar Energy Corporation of India Limited (a Govt. of India enterprise) and Gale Solarfarms Private Limited and Tornado Solarfarms Private Limited respectively.

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 claimed under the VCS Program.

1.12.4 Participation under Other GHG Programs

The project activity has not been registered or currently seeking registration under any other GHG programs.

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

Ministry of Environment and Forests and Climate Change 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 wellbeing & Economic wellbeing:

The project activity will lead to improved infrastructure in the area due to construction of roads and other project related activities. The project will provide employment opportunities to skilled and unskilled workers from the region during its construction and operation. The proposed project activity also contributes to the improvement of the economic conditions of the local people as there will be an improvement in the availability of electricity which leads to further economic development of the area. Further, series of CSR activities has been initiated for the project location which would positively stimulate the social & economic wellbeing of the local area.

Technological wellbeing:

The technology employed is proven and environmentally safe and sound. The technology is available and supplied from the host country and hence there is no transfer of technology from an Annex-I country.

Environmental well-being:

The project activity reduces carbon dioxide emissions through the avoided usage of fossil fuel based electricity generation. Being a renewable resource, using solar energy to generate electricity contributes to resource conservation. Thus, the project will cause no negative impact on the surrounding environment contributing to environmental well-being.

Further Information

Not Applicable

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Following approved baseline & monitoring methodology is applied in this project activity:

Title : Grid-connected electricity generation from renewable sources, ACM0002

Version : 19

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

Web link : <https://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD>

- The tools referenced in this methodology include:
Tool to calculate the emission factor for an electricity system Version 07.0.0, EB 100, Annex 04 (<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.0.pdf>)

Methodological tool: Tool for the demonstration and assessment of additionality version 07.0 (<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf>)

- Apart from this following Tools/Guidelines are referred :
 - i. Guidance on the Assessment of Investment Analysis (EB 62 Annex 05)³ (https://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf)
 - ii. Methodological tool for Investment analysis, Version-06, Annex-12 of EB 85 Report⁴ (<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v1.pdf>)
 - iii. Methodological tool for Investment analysis, Version-09.0, Annex-11 of EB 101 Report⁵ (<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v9.0.pdf>)

2.2 Applicability of Methodology

The project activity involves generation of grid connected electricity from renewable solar energy. The project status corresponding to the methodology ACM0002 version 19 and applicability of methodology is discussed below.

Applicability Criterion	Project Case
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³ Guidelines referred to determine benchmark for sub-project 100 MW_{AC} at Veltor, Telengna because it was the latest version of guidelines available at the time of decision making.

⁴ Guidelines referred to determine benchmark for sub-projects 50 MW_{AC} and 20 MW_{AC} in Dhule, Maharashtra because it was the latest version of guidelines available at the time of decision making.

⁵ Referred to demonstrate additionality

Applicability Criterion	Project Case
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 proposed project activity is a Greenfield, grid connected renewable power project. The project activity uses renewable solar source to generate electricity that will be fed into the Indian grid. In the absence of the project activity this power would have been produced by the current grid generation mix which is predominantly fossil fuel based, thus the project activity meets this criterion.

Applicability Criterion	Project Case
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 proposed project activity is the installation of a greenfield solar power plant/unit. Therefore, the project activity is satisfying the said criteria.
In case of hydro power plants, one of the following conditions shall apply:⁶ • The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or • 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 • 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 an integrated hydro power project involving multiple reservoirs, where the	The proposed project activity involves installation of a solar power plant/unit. As the criteria are related to hydro power project, therefore, the said criteria are not applicable.

⁶ Project participants wishing to undertake a hydroelectric project activity that result in a new reservoir or an increase in the volume of an existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology.

Applicability Criterion	Project Case
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.	
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 involves installation of a solar power plant/unit. As the criteria are related to hydro power project, therefore, the said criteria are not applicable.

Applicability Criterion	Project Case
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 case the baseline may be the continued use of fossil fuels at the site; - Biomass fired power plants/units.	The proposed project activity is the installation of solar power plant/unit. Therefore, the said criteria is not applicable.
In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance.	The proposed project activity is a Greenfield project, thus this criteria is not applicable.
In addition, the applicability conditions included in the tools referred to below apply.	Please refer tables below.

Tool to calculate the emission factor for an electricity system - Version 07.0 (EB 100, Annex 04)

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 Greenfield solar 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 3.1 of the joint PD&MR 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 CO ₂ emission factor of bio fuels is zero.	The project is a solar project and there is no involvement of bio fuels.

Methodological Tool- Tool for the demonstration and assessment of additionality- Version 07.0.0 (EB 70, Annex 08)

Applicability Criteria has been demonstrated in section on additionality below.

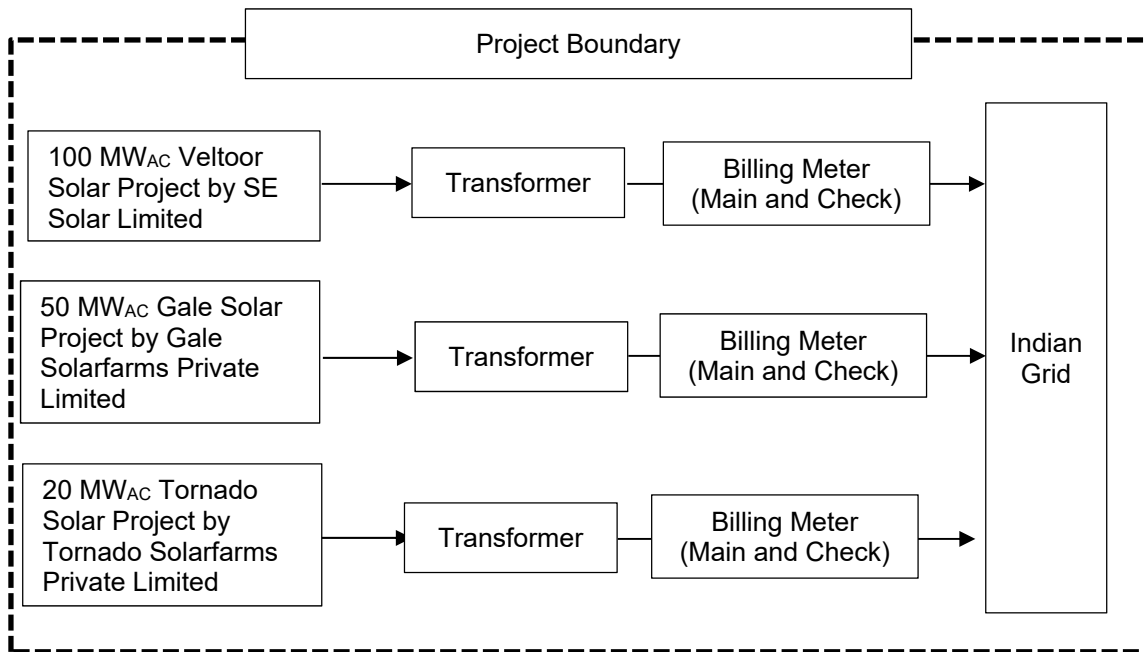
The project activity qualifies as Type I during every year of the crediting period in accordance with applicable provisions for project activity eligibility as discussed above. Also the total installed capacity of project activity is 170 MW_{AC} which is applicable as per Project scale project activities methodology ACM0002: Grid-connected electricity generation from renewable sources Version 19. The project capacity will be always remain the same and hence the project activity will always be project scale project activities throughout the crediting period and thereafter.

2.3 Project Boundary

As per ACM0002 version 19 - “*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*”.

The project boundary includes the solar project, sub-stations, grid and all power plants connected to grid. The proposed project activity will evacuate power to the Indian grid. Therefore, the entire

Indian grid and all connected power plants have been considered in the project boundary for the proposed VCS project activity.



Therefore, the project boundary includes all the three solar projects 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		Gas	Included?	Justification/Explanation
Baseline Scenario	CO ₂ emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity	CO ₂	Yes	Major emission source
		CH ₄	No	Minor emission source. Same has been excluded from consideration for simplification.
		N ₂ O	No	Minor emission source Same has been excluded from consideration for simplification.
Project Scenario	For geothermal power plants, fugitive emissions of CH ₄ and CO ₂ from non-condensable gases contained in geothermal steam	CO ₂	No	The project activity is a solar power project and not a geothermal project. Thus, these emission sources are not applicable to the proposed project.
		CH ₄	No	
		N ₂ O	No	
	CO ₂ emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO ₂	No	The project activity is a solar power project and not a geothermal project. Thus, these emission sources are not applicable to the proposed project.
		CH ₄	No	
		N ₂ O	No	
	For hydro power plants, emissions of CH ₄ from the reservoir	CO ₂	No	The project activity is a solar power project and not a geothermal project. Thus, these emission sources are not applicable to the proposed project.
		CH ₄	No	
		N ₂ O	No	

2.4 Baseline Scenario

As per para 22 of ACM0002 version 19.0, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

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

As per para 42 of ACM0002 version 19.0, *“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 project activity involves setting up of solar projects to harness the power of sun to produce electricity and supply to the grid. In the absence of the project activity, the equivalent amount of power would have been supplied by the Indian grid, which is fed mainly by fossil fuel fired plants. Further, in the absence of the project activity, the equivalent amount of power would have been drawn from the Indian grid. Hence, the baseline for the project activity is the equivalent amount of power from the Indian grid.

2.5 Additionality

In line with VCS Standard version 3.7, 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 published 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.

The proposed project activity is a solar power project located in Telengana and Maharashtra which is using the latest available and proven technology. Thus, this project activity is not a first-of-its-kind project. The additionality of the project activity has demonstrated by using the investment analysis and the same has been discussed in the following steps.

Outcome of Step 0: This project activity is not a first-of-its-kind project.

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

As per the applied methodology ACM0002 version 19.0; Para 22, if the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid connected power plant and by the addition of new generation sources. As the baseline scenario is prescribed by applied methodology, hence no further analysis is carried out to identify alternatives.

Outcome of Sub-step 1b: The alternative for this project activity has been prescribed by the ACM0002. Hence, no further analysis is required for identification of alternatives.

Step 2: Investment Analysis

Sub-step 2a: Determine appropriate analysis method

As per “Tool for the demonstration and assessment of additionality” (version 07.0.0), for financial analysis of the project, the following three options are available:

- Option I: Simple cost analysis
- Option II: Investment comparison analysis
- Option III: Benchmark analysis

The project will generate revenues from sale of electricity, therefore Option I is not applicable. Option II also does not apply since there is no comparable investment alternative available to the project participant. The most appropriate financial analysis method is therefore option III: the benchmark analysis, where the returns on investment in the project activity are compared to benchmark returns that are available to any investors in the country.

Sub-step 2b: Option III. Apply benchmark analysis

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

Choice of Financial Indicator:

As allowed by the Methodological tool for Investment analysis (version 09.0), post tax Equity Internal Rate of Return (IRR) was selected as the financial indicator to assess the attractiveness of the project.

Choice of Benchmark:

As per paragraph 15 of the 'investment analysis tool' version 09.0,

"The applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or WACC are appropriate benchmarks for a project IRR. Required/expected returns on equity are appropriate benchmarks for equity IRR. Benchmarks supplied by relevant national authorities are also appropriate. The DOE shall validate that the benchmarks used are applicable to the project activity and the type of IRR calculation presented."

As per the above guideline the required/expected returns on equity are appropriate benchmarks for equity IRR.

In accordance with the para 20 of the Investment Analysis tool, version 09.0 /20/,

'If the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in Appendix; or by (b) calculating the cost of equity using CAPM. The default values in the Appendix A are based on long term historical returns and therefore may also be applied by projects with a start date prior to the adoption of default values by the Board.'

The project proponent has referred the latest version of investment guidelines/tool available at the time of conceptualization of particular sub-project for determination of respective "Benchmark", as described below in details.

Calculations of Default Benchmark Value for Veltoor Solar Project:

Guidelines on the Assessment of Investment Analysis, version 05.0 (EB 62, annex 5) is referred for calculation of benchmark because it was the latest version of guidelines valid and available at the time of decision making (date 04/05/2015).

In accordance with the paragraph 7 of Appendix EB 62, annex 5 "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”.

As mentioned in para 8 of Guidelines on The Assessment Of Investment Analysis ver 5.0, specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = 11.75%

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

Nominal Benchmark⁷ = $\{(1 + \text{Real Benchmark}) * (1 + \text{Inflation rate})\} - 1$

Where:

- Default value for Real Benchmark i.e. 11.75%
- Inflation Rate forecast by Reserve Bank of India (RBI) (i.e. Central Bank) for India

Benchmark estimation:

Table-1 of EB 62 Annex 5 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = **11.75%**

Further, Long Term Median Forecasts for Growth and Inflation Rate Forecast issued by RBI which was available during decision making = 5.0%

Thus, Benchmark = $\{(1 + 11.75\%) * (1 + 5.0\%)\} - 1$
= 17.34%

Hence value of benchmark is arrived as 17.34%.

Calculations of Default Benchmark Value for Gale and Tornado Solar Projects:

The project proponent has referred “Methodological tool: Investment Analysis, version 06.0 (EB 85, annex 12) for calculation of benchmark because it was the latest version of guidelines valid and available at the time of decision making (date 17/09/2015).

In accordance with the paragraph 17 of EB 85, annex 12 “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”.

⁷ As per Pg. 320 of Corporate Finance, Second Edition of Aswath Damodaran

⁸ <https://m.rbi.org.in/scripts/PublicationsView.aspx?id=16217>

Table 1 under the Appendix of “Methodological tool: Investment Analysis, version 06.0 (EB 85, 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:

$$\text{Nominal Benchmark}^9 = \{(1 + \text{Real Benchmark}) * (1 + \text{Inflation rate})\} - 1$$

Where:

- Default value for Real Benchmark i.e. 11.10%
- Inflation Rate forecast by Reserve Bank of India (RBI) (i.e. Central Bank) for India

Benchmark estimation:

Table-1 of EB 85 Annex 12 specifies default value of expected return on equity in real terms for Energy Industries (Group 1) in India = **11.10%**

Further, Long Term Median Forecasts for Growth and Inflation Rate Forecast issued by RBI which was available during decision making = 4.90%

$$\begin{aligned} \text{Thus, Benchmark} &= \{(1 + 11.10\%) * (1 + 4.9^{10}\%)\} - 1 \\ &= 16.54\% \end{aligned}$$

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

All the input values used in all investment analysis were valid and applicable at the time of the investment decision taken by the management.

Project 1: 100 MW_{AC} Veltoor Solar Project by SE Solar Limited in Mahbubnagar dist. in Telangana

Key assumptions used for calculating post-tax Equity IRR applicable at the time of investment decision are mentioned below:

Particulars	Value	Unit	Source/Remarks
Capacity of the project	100	MW _{AC}	Management Decision dated 04/05/2015
Net generation	181.30	GWh	Energy assessment report by third party (Table 1 of Pg. No. 2)
Annual degradation from 3 rd year onwards (%)	0.5	%	Performance of solar power plants In India by Central Electricity Regulatory Commission dated February, 2011 http://www.cercind.gov.in/2011/whats-new/performance%20of%20solar%20power%20plants.pdf (Ref Pg. 41)

⁹ As per Pg. 320 of Corporate Finance, Second Edition of Aswath Damodaran

¹⁰ <https://m.rbi.org.in/Scripts/PublicationsView.aspx?id=16422>

Particulars	Value	Unit	Source/Remarks
Project cost	6,149.38	INR Million	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref Pg. 18) (http://www.cercind.gov.in/2015/orders/SO5.pdf)
Debt	70	%	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg. 202) (http://www.cercind.gov.in/2015/orders/SO4.pdf)
Equity	30	%	
Debt	4,304.56	INR Million	Calculated
Equity	1,844.81	INR Million	
Interest rate	13.00	%	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg. 202) (http://www.cercind.gov.in/2015/orders/SO4.pdf)
Debt Repayment tenure	12	years	
Moratorium	0	Months	
Operation and Maintenance	1.30	INR Million /MW	
Escalation in O & M	5.72	%	
Working Capital			
O&M Charges (Month of O&M Charges)	1	Month	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg. 202) (http://www.cercind.gov.in/2015/orders/SO4.pdf)
Maintenance of Spare (% of O&M expenses)	15	%	
Receivables for Debtors	2	Month	
Interest on Working Capital	13.5	%	
Insurance premium/MW	0.50	% of Project Cost	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg.16) (http://www.cercind.gov.in/2015/orders/SO5.pdf)
Tariff	6.3200	INR/kWh	Celling (maximum) tariff mentioned in Request for Selection document for selection of Solar PV developers in the State of Telangana for procuring 2000 MW through tariff based competitive bidding process dated 01/04/2015
Depreciation Rate (Book)	4.75	%	Companies Act Schedule XIV
IT Depreciation Rate	7.69	%	Appendix IA of IT Rules
Salvage Value	10	%	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg. 29) (http://www.cercind.gov.in/2015/orders/SO4.pdf)
Depreciable cost of Project	90	%	
Income tax rate (%)	30.00	%	Indian IT Act for FY 2015-16 (http://indiabudget.nic.in/ub2015-16/fb/bill91.pdf)
MAT (%)	18.50	%	
Service Tax (%)	12.00	%	
Surcharge (%)	7.00	%	
Education cess (%)	3.00	%	

The result of the analysis is as follows:

Considering the above input values, Equity IRR for Veltor Solar project activity is given below:

Equity IRR without Carbon Revenue	Benchmark
10.09 %	17.34 %

Project 2: 50 MW_{AC} Gale Solar Project by Gale Solarfarms Private Limited in Dhule dist. in Maharashtra

Key assumptions used for calculating post-tax Equity IRR applicable at the time of investment decision are mentioned below:

Particulars	Value	Unit	Source/Remarks
Capacity of the project	50	MW _{AC}	Management Decision dated 17/09/2015
Net generation	96.24	GWh	Energy assessment report by third party (Ref pg. 7)
Annual degradation from 3 rd year onwards (%)	0.5	%	Performance of solar power plants In India by Central Electricity Regulatory Commission dated February, 2011 http://www.cercind.gov.in/2011/whats-new/performance%20of%20solar%20power%20plants.pdf (Ref Pg. 41)
Project cost	3,074.69	INR Million	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref Pg. 18) (http://www.cercind.gov.in/2015/orders/SO5.pdf)
Debt	70	%	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg. 202) (http://www.cercind.gov.in/2015/orders/SO4.pdf)
Equity	30	%	
Debt	2,152.28	INR Million	Calculated
Equity	922.41	INR Million	
Interest rate	13.00	%	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg. 202) (http://www.cercind.gov.in/2015/orders/SO4.pdf)
Debt Repayment tenure	12	Years	
Moratorium	0	Months	
Operation and Maintenance	1.30	INR Million /MW	
Escalation in O & M	5.72	%	
Working Capital			
O&M Charges (Month of O&M Charges)	1	Month	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg. 202) (http://www.cercind.gov.in/2015/orders/SO4.pdf)
Maintenance of Spare (% of O&M expenses)	15	%	
Receivables for Debtors	2	Month	

Particulars	Value	Unit	Source/Remarks
Interest on Working Capital	13.5	%	
Insurance premium/MW	0.50	% of Project Cost	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg.16) (http://www.cercind.gov.in/2015/orders/SO5.pdf)
Tariff	5.7900	INR/kWh	Celling (maximum) tariff mentioned in Request for Selection document for selection of Solar PV developers dated 27/08/2015
Depreciation Rate (Book)	4.75	%	Companies Act Schedule XIV
IT Depreciation Rate	7.69	%	Appendix IA of IT Rules
Salvage Value	10	%	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg 29) (http://www.cercind.gov.in/2015/orders/SO4.pdf)
Depreciable cost of Project	90	%	
Income tax rate (%)	30.00	%	
MAT (%)	18.50	%	
Service Tax (%)	12.00	%	
Surcharge (%)	7.00	%	
Education cess (%)	3.00	%	Indian IT Act for FY 2015-16 (http://indiabudget.nic.in/ub2015-16/fb/bill91.pdf)

The result of the analysis is as follows:

Considering the above input values, Equity IRR for Gale Solar project activity is given below:

Equity IRR without Carbon Revenue	Benchmark
9.16 %	16.54 %

Project 3: 20 MW_{AC} Tornado Solar Project by Tornado Solarfarms Private Limited in Dhule dist. in Maharashtra

Key assumptions used for calculating post-tax Equity IRR applicable at the time of investment decision are mentioned below:

Particulars	Value	Unit	Source/Remarks
Capacity of the project	20	MW _{AC}	Management Decision dated 17/09/2015
Net generation	38.50	GWh	Energy assessment report by third party (Ref pg. 7)
Annual degradation from 3 rd year onwards (%)	0.5	%	Performance of solar power plants In India by Central Electricity Regulatory Commission dated February, 2011 (http://www.cercind.gov.in/2011/whats-new/performance%20of%20solar%20power%20plants.pdf) (Ref Pg. 41)

Particulars	Value	Unit	Source/Remarks
Project cost	1,229.88	INR Million	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref Pg. 18) (http://www.cercind.gov.in/2015/orders/SO5.pdf)
Debt	70	%	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg. 202) (http://www.cercind.gov.in/2015/orders/SO4.pdf)
Equity	30	%	
Debt	860.91	INR Million	Calculated
Equity	368.96	INR Million	
Interest rate	13.00	%	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg. 202) (http://www.cercind.gov.in/2015/orders/SO4.pdf)
Debt Repayment tenure	12	Years	
Moratorium	0	Months	
Operation and Maintenance	1.30	INR Million /MW	
Escalation in O & M	5.72	%	
Working Capital			
O&M Charges (Month of O&M Charges)	1	Month	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg. 202) (http://www.cercind.gov.in/2015/orders/SO4.pdf)
Maintenance of Spare (% of O&M expenses)	15	%	
Receivables for Debtors	2	Month	
Interest on Working Capital	13.5	%	
Insurance premium/MW	0.50	% of Project Cost	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg. 16) (http://www.cercind.gov.in/2015/orders/SO5.pdf)
Tariff	5.7900	INR/kWh	Celling (maximum) tariff mentioned in Request for Selection document for selection of Solar PV developers dated 27/08/2015
Depreciation Rate (Book)	4.75	%	Companies Act Schedule XIV
IT Depreciation Rate	7.69	%	Appendix IA of IT Rules
Salvage Value	10	%	Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015 (Ref pg 29) (http://www.cercind.gov.in/2015/orders/SO4.pdf)
Depreciable cost of Project	90	%	
Income tax rate (%)	30.00	%	Indian IT Act for FY 2015-16 (http://indiabudget.nic.in/ub2015-16/fb/bill91.pdf)
MAT (%)	18.50	%	
Service Tax (%)	12.00	%	
Surcharge (%)	7.00	%	
Education cess (%)	3.00	%	

The result of the analysis is as follows:

Considering the above input values, Equity IRR for Tornado Solar project activity is given below:

Equity IRR without Carbon Revenue	Benchmark
9.16 %	16.54 %

Considering the input values, Equity IRRs is given below:

Organization Name	Equity IRR without Carbon Revenue	Benchmark (Equity IRR)
SE Solar Limited	10.09 %	17.34 %
Gale Solarfarms Private Limited	9.16 %	16.54 %
Tornado Solarfarms Private Limited	9.16 %	16.54 %

The Post tax Equity IRR is evaluated for the entire lifetime of the project activity, i.e. 25 years. It is calculated based on the cash outflows from and cash inflows into the project activity. Based on result of IRR excel spreadsheets, equity IRR is less than Benchmark. This substantiates that the investments are not financially attractive (Equity IRR for the project activity is less than the Benchmark). Thus, it can be easily concluded that project activities are additional & is not business as usual scenario.

Sub-step 2d: Sensitivity Analysis

Addressing Guidance 27 of Tool 27, Investment Analysis, only variables, including the initial investment cost, that constitutes 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 PD 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 costs are already firmed up, the costs are not variable. The tariff has already determined after competitive reverse bidding which is fixed for entire life of the project and hence it need not be subjected to variation. All other expenses are much less than 20% of the total cost. Hence, only generation needs to be subjected to reasonable variation. Nevertheless, following factors have been considered in to sensitivity analysis:

- Plant Load Factor
- Electricity Tariff
- Project Cost
- O&M Cost

The results of sensitivity analysis are as follows:

Project 1: 100 MW_{AC} Veltor Solar Project by SE Solar Limited in Mahbubnagar dist. in Telangana

Variation %	-10%	Normal	10%	Variation required to breach benchmark
Electricity Tariff	6.71%	10.09%	13.57%	20.42%
Plant Load Factor	6.71%	10.09%	13.57%	20.42%
Project Cost	13.24%	10.09%	7.66%	-19.75%
O&M Cost	10.83%	10.09%	9.33%	-107.10%

- To evaluate the additionality of the project, electricity tariff structure is sourced from ceiling (maximum) tariff mentioned in “Request for Selection document for selection of Solar PV developers in the State of Telangana” for tariff based competitive bidding process dated 01/04/2015”. According to this selection document, Southern Power Distribution Company of Telangana Limited considered the INR 6.32 as the ceiling tariff for prospective bidders who willing to participate in the selection process. Since the tariff is fixed for a period of 25 years, i.e. lifetime of the project, revenue generation is also fixed for the entire lifetime of the project and considering this tariff rate, equity IRR is coming out 10.09%. Thus, considering this tariff rate, in any scenario, equity IRR would not cross the benchmark. Further, sensitivity analysis of +10% to -10% have been conducted and in both the cases equity IRR is less than the benchmark. Sensitivity analysis shows that project would cross the benchmark if electricity tariff increased by 20.42% which is not possible in as PPA has already been signed for the entire life time of the project.

However, after competitive bidding, 100 MW_{AC} project was awarded to SE Solar Limited and Power Purchase Agreement was signed between SE Solar Limited and Southern Power Distribution Company of Telangana Limited at the tariff rate of INR 5.5949 per unit which would be fixed for a period of 25 years. Considering this tariff, equity IRR is coming out 6.22%. Thus, the financial indicator crossing the benchmark could be ruled out.

- The plant load factor (PLF) affects the equity IRR of the project activity as increase in the PLF would leads to an increase in export of electricity and the revenues associated with the project activity. For Veltoor site, 20.70% PLF has been considered to demonstrate the additionality of the project in line with the 3rd party PLF assessment report. Further, sensitivity analysis of +10% to -10% have been conducted and in both the cases equity IRR is less than the benchmark. Sensitivity analysis shows that project would cross the benchmark, if in any favorable scenario, PLF increased by 20.42%.

Further, as the project was commissioned on 07/08/2017, thus, actual generation from this project site is available. During CY 2018, project has generated 210,725.00 MWh of electricity. Thus, actual PLF achieved during CY 2018 from Veltoor site was 24.06% which is 17.80% higher than the envisaged value. Considering actual PLF with tariff of INR 6.32/kWh (ceiling tariff mentioned in bid document) and with tariff of INR 5.5949/kWh (tariff mention in PPA), equity IRRs are coming out 15.80% and 11.09% respectively which are far behind the benchmark value.

- To assess the additionality of this project, normative project cost was considered inline with “Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission” dt. 31/03/2015. According to the same, project cost was INR 6,149.38 million for Veltoor project. If project cost decreased by 19.75%, then equity IRR would cross the benchmark. Further, sensitivity analysis of +10% to -10% have been conducted and in both the cases equity IRRs are less than the benchmark.

However, post bidding process and receipt of LOI from Southern Power Distribution Company of Telangana Limited, costs of the project components were negotiated with respective suppliers and final purchase orders were issued. In line with the actual signed contracts and issued purchase orders, total project cost is coming out INR 7,255.15 million which is 17.98% higher than the project cost considered during decision making. Considering the actual project cost, equity IRR is coming out 6.07% which is less than the benchmark. As the purchase orders are already placed, thus, the project cost is firm and further change is not possible.

- The O & M costs associated with the project has a major impact on the financial returns of the project. To assess the additionality of this project, normative O&M cost was considered inline with “Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission” dt. 31/03/2015. According to the same, O&M cost was INR 1.3 million/MW for Veltor project with yearly escalation of 5.72%. Considering the same, equity IRR is coming out 10.09%.

SE Solar has signed O&M agreement with Suzlon Global Services Limited on 14/06/2016 for this project. According to this agreement, O&M cost would be INR 0.50 Million/MW_{AC} with 5% escalation which is 61.54% less than the envisages value. Considering the same, equity IRR is coming out 14.52%. Thus, financial analysis predicts that if the O&M cost decrease by 107.10%, then only project would be financially viable. Further, decrease of O&M cost more than 100% is not possible. Thus, in any scenario project will not breach the benchmark return.

Project 2: 50 MW_{AC} Gale Solar Project by Gale Solarfarms Private Limited in Dhule dist. in Maharashtra

Variation %	-10%	Normal	10%	Variation required to breach benchmark
Electricity Tariff	5.89%	9.16 %	12.51%	21.56%
Plant Load Factor	5.89%	9.16 %	12.51%	21.56%
Project Cost	12.16%	9.16 %	6.84%	-20.78%
O&M Cost	9.91%	9.16 %	8.39%	-108.65%

- To evaluate the additionality of the project, electricity tariff structure is sourced from ceiling (maximum) tariff mentioned in “Request for Selection” (RfS) document for selection of Solar PV developers for tariff based competitive bidding process dated 27/08/2015”. According to this selection document, Solar Energy Corporation of India (SECI) considered the levelized tariff of INR 5.79 as the ceiling tariff for prospective bidders who willing to participate in the selection process. Since the tariff is fixed for a period of 25 years, i.e. lifetime of the project, revenue generation is also fixed for the entire lifetime of the project and considering this tariff rate, equity IRR is coming out 9.16%. Further, sensitivity analysis of +10% to -10% have been conducted and in both the cases equity IRR is less than the benchmark. Thus, considering this tariff rate, in any scenario, equity IRR would not cross the benchmark. Sensitivity analysis shows that project would cross the benchmark if electricity tariff increased by 21.56% which is not possible as PPA has already been signed for the entire life time of the project.

However, after competitive bidding, 50 MW project was awarded to Gale Solarfarms Private Limited and Power Purchase Agreement was signed between Gale Solarfarms Private Limited and SECI, govt. of India at the tariff rate of INR 4.430 per unit which would be fixed for a period of 25 years. Considering this tariff, equity IRR is coming out 0.99%. Further, due to delay in commissioning, SECI

has also further reduced the tariff to INR 3.66 per unit. Considering this tariff, equity IRR is coming out – 4.00% which making this project as loss making venture. Thus, the financial indicator crossing the benchmark could be ruled out.

- The plant load factor (PLF) affects the equity IRR of the project activity as increase in the PLF would leads to an increase in exports of electricity and revenues. For Gale solar project, 21.97% PLF has been considered to demonstrate the additionality of the project in line with the 3rd party PLF assessment report. Further, sensitivity analysis of +10% to -10% have been conducted and in both the cases equity IRR is less than the benchmark. Sensitivity analysis shows that project would cross the benchmark, if in any favorable scenario, PLF increased by 21.56%.

Further, as the project has commissioned on 09/01/2018 and Commercial Date of Operation (COD) was on 08/02/2018 (30 days after project commission in line with Power Purchase Agreement), thus, actual generation from this project site is available. From 01/04/2018 to 01/04/2019, project has generated 76,591.50 MWh of electricity. Thus, actual PLF achieved during this period is CY 2018 from Veltoor site was 17.44% which is 20.62% less than the envisaged value. Considering actual PLF with tariff of INR 5.79/kWh (ceiling tariff mentioned in bid document) and with tariff of INR 3.66/kWh (actual tariff after reduction by SECI), equity IRRs are coming out 2.40% and -10.65% respectively which are far behind the benchmark value and makes this project economically unviable.

- To assess the additionality of this project, normative project cost was considered inline with “Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission” dt. 31/03/2015. According to the same, project cost was INR 3,074.69 million for Gale solar project. Considering this project, equity IRR is coming out 9.16%. Further, sensitivity analysis of +10% to -10% have been conducted and in both the cases equity IRR is less than the benchmark. In a favorable scenario, if project cost decreased by 20.78%, then equity IRR would cross the benchmark.

However, post bidding process, costs of the project components were negotiated with respective supplier and final EPC contracts were signed. In line with the actual signed contracts and issued purchase orders, total project cost is coming out INR 3,012.30 million which is 2.03% higher than the project cost considered during decision making. Considering the actual project cost equity IRR is coming out 9.70% which is less than the benchmark. As the purchase orders are already placed, thus, the project cost is firm and further change is not possible.

- The O & M costs associated with the project has a major impact on the financial returns of the project. To assess the additionality of this project, normative O&M cost was considered inline with “Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission” dt. 31/03/2015. According to the same, O&M cost was INR 1.3 million/MW for Veltoor project with yearly escalation of 5.72%. Considering the same, equity IRR is coming out 9.16%.

Gale Solarfarms Private Limited has signed O&M agreement with Suzlon Global Services Limited on 27/07/2017 for this project. According to this agreement, O&M cost would be INR 0.50 Million/MW_{AC} with 5% escalation which is 61.54% less than the envisages value. Considering the same, equity IRR is coming out 13.63%. Thus, financial analysis predicts that if the O&M cost decrease by 108.65%, then only project would be financially viable. Further, decrease of O&M cost more than 100% is not possible. Thus, in any scenario project will not breach the benchmark return.

Project 3: 20 MW_{Ac} Tornado Solar Project by Tornado Solarfarms Private Limited in Dhule dist. in Maharashtra

Variation %	-10%	Normal	10%	Variation required to breach benchmark
Electricity Tariff	5.89%	9.16%	12.51%	21.57%
Plant Load Factor	5.89%	9.16%	12.51%	21.57%
Project Cost	12.16%	9.16%	6.83%	-20.78%
O&M Cost	9.91%	9.16%	8.39%	-108.75%

- To evaluate the additionality of the project, electricity tariff structure is sourced from ceiling (maximum) tariff mentioned in “Request for Selection” (RfS) document for selection of Solar PV developers for tariff based competitive bidding process dated 27/08/2015”. According to this selection document, Solar Energy Corporation of India (SECI) considered the levelized tariff of INR 5.79 as the ceiling tariff for prospective bidders who willing to participate in the selection process. Since the tariff is fixed for a period of 25 years, i.e. lifetime of the project, revenue generation is also fixed for the entire lifetime of the project and considering this tariff rate, equity IRR is coming out 9.16%. Further, sensitivity analysis of +10% to -10% have been conducted and in both the cases equity IRR is less than the benchmark. Thus, considering this tariff rate, in any scenario, equity IRR would not cross the benchmark. Sensitivity analysis shows that project would cross the benchmark if electricity tariff increased by 21.57% which is not possible as PPA has already been signed for the entire life time of the project.

However, after competitive bidding, 20 MW project was awarded to Tornado Solarfarms Private Limited and Power Purchase Agreement was signed between Tornado Solarfarms Private Limited and SECI, govt. of India, at the tariff rate of INR 4.430 per unit which would be fixed for a period of 25 years. Considering this tariff, equity IRR is coming out 0.98%. Further, due to delay in commissioning, SECI has also further reduced the tariff to INR 4.115 per unit. Considering this tariff, equity IRR is coming out -0.85% which making this project as loss making venture. Thus, the financial indicator crossing the benchmark could be ruled out.

- The plant load factor (PLF) affects the equity IRR of the project activity as increase in the PLF would leads to an increase in exports of electricity and revenues. For Tornado project, 21.97% PLF has been considered to demonstrate the additionality of the project in line with the 3rd party PLF assessment report. Further, sensitivity analysis of +10% to -10% have been conducted and in both the cases equity IRR is less than the benchmark. Sensitivity analysis shows that project would cross the benchmark, if in any favorable scenario, PLF increased by 21.57%.

Further, as the project has commissioned on 10/10/2017 and Commercial Date of Operation (COD) was on 09/11/2017 (30 days after project commission in line with Power Purchase Agreement), thus, actual generation from this project site is available. From 01/04/2018 to 01/04/2019, project has generated 39,158.06 MWh of electricity. Thus, actual PLF achieved during this period was 22.29% which is 3.34% higher than the envisaged value. Considering actual PLF with tariff of INR 5.79/kWh (ceiling tariff mentioned in bid document) and with tariff of INR 4.1115/kWh (actual tariff after reduction by SECI), equity IRRs are coming out 9.73% and -0.37% respectively which are far behind the benchmark value and makes this project economically unviable.

- To assess the additionality of this project, normative project cost was considered inline with “Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission” dt. 31/03/2015.

According to the same, project cost was INR 1,229.88 million for Tornado solar project. Considering this project, equity IRR is coming out 9.16%. Further, sensitivity analysis of +10% to -10% have been conducted and in both the cases equity IRR is less than the benchmark. In a favorable scenario, if project cost decreased by 20.78%, then equity IRR would cross the benchmark.

However, post bidding process, costs of the project components were negotiated with respective supplier and final contracts were signed. In line with the actual signed contracts and issued purchase orders, total project cost is coming out INR 1,219.80 million which is 0.82% higher than the project cost considered during decision making. Considering the actual project cost equity IRR is coming out 9.38% which is less than the benchmark. As the purchase orders are already placed, thus, the project cost is firm and further change is not possible.

- The O&M costs associated with the project has a major impact on the financial returns of the project. To assess the additionality of this project, normative O&M cost was considered inline with “Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission” dt. 31/03/2015. According to the same, O&M cost was INR 1.3 million/MW for Veltor project with yearly escalation of 5.72%. Considering the same, equity IRR is coming out 9.16%.

Tornado Solarfarms Private Limited has signed O&M agreement with Suzlon Global Services Limited on 26/07/2017 for this project. According to this agreement, O&M cost would be INR 0.50 Million/MW_{AC} with 5% escalation which is 61.54% less than the envisages value. Considering the same, equity IRR is coming out 13.63%. Thus, financial analysis predicts that if the O&M cost decrease by 108.75%, then only project would be financially viable. Further, decrease of O&M cost more than 100% is not possible. Thus, in any scenario project will not breach the benchmark return.

Outcome of Step 2:

It can be observed from above elastration 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 VERs is important to alleviate this gap and hence the project has been considered to be additional

Step 3: Barrier analysis

Barrier analysis has not been used.

Step 4: Common practice analysis

Common practice analysis has been carried out as per Methodological tool “Common Practice”, version 03.1 EB84, Annex 7”. 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 9): The host country, i.e. India has been considered as the applicable geographical area for this project.
2. Measure (Para 10): The project activity reduces greenhouse gas emissions by generating electricity using renewable energy source-solar. 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 11): The project activity produces electricity. Therefore, electricity is considered as output of the project activity.
4. Different Technologies (Para 12): The project activity uses solar energy for producing electricity and hence as per Para 12(a), the technologies which use energy source/ fuel other than solar will be considered as the different technologies for the project activity.

The common practice analysis is carried out as per Stepwise approach for common practice. Stepwise approach for common practice as follows:

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%	255	MW
Capacity of the proposed project activity	170	MW
-50%	86	MW

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

- *The projects are located in the applicable geographical area;*
- *The projects apply the same measure as the proposed project activity;*
- *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;*
- *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;*
- *The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;*
- *The projects started commercial operation before the project design document (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. As the projects are located in India, therefore, the applicable geographical area is India and projects in the host country India have been chosen for analysis.
- b. The project activity is a green-field solar 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 Solar. Hence, only solar 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 86 MW to 255 MW
- f. The start date of the project activity is 07/08/2017. As Kyoto Protocol was ratified by India on 26/08/2002¹¹, therefore projects, which had started commercial operation between 26/08/2002 to 07/08/2017, have been identified.

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

Particulars	No. of Projects	Source
N _{Solar}	9	Bloomberg NEF, UNFCCC and VERRA
Project Proponent	Capacity in MW	CDM Reference
Tata Power Renewable Energy Ltd	130 MW	CPA 8261-0001: Grid Connected Solar PV Power Project in Neemuch, Madhya Pradesh https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/KXEG6BOIQD7ARP4NTUCJ9Y1WZ5F0HM/view
ACME Group	100 MW	Solar Grouped project by ACME Group (EKIESL-VCS-Aug-16-01) (100 MW project is part of bundled project) https://www.vcsprojectdatabase.org/#/project_details/1580
Dahanu Solar Power Pvt. Ltd	100 MW	Greenhouse Gas Emission Reductions Through Photovoltaic Technology - Dahanu Solar Power Pvt. Ltd. https://cdm.unfccc.int/Projects/Validation/DB/0X08K2S69DA4W2H07YDLH2XR0MSLAM/view.html
Adani Kutch PV Plant	100 MW	CDM Prior consideration submitted https://cdm.unfccc.int/Projects/PriorCDM/notifications/index.html
Adani Green Energy (Tamilnadu) Limited	216 MW	216 MWac Adani Green Energy (Tamilnadu) Solar Power Project https://cdm.unfccc.int/Projects/Validation/DB/NDH4VJWJ5V306A60CB7BR5FW5HG80T/view.html
Orange Energy Suvaan Private Limited	100 MW	2 x 50 MW Orange Suvaan Solar Photovoltaic Power Project in Maharashtra, India (CDM Prior consideration submitted) https://cdm.unfccc.int/Projects/PriorCDM/notifications/index.html
Hanwha Energy	152 MW	152 MW Solar Photovoltaic Power Project in Punjab, India

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

Project Proponent	Capacity in MW	CDM Reference
Corporation		(CDM Prior consideration submitted) https://cdm.unfccc.int/Projects/PriorCDM/notifications/index.html
Prayatna Developers Private Limited	105 MW	105 MWp Solar PV Power Project by M/s Prayatna Developers Pvt. Ltd. at Bhatinda, Punjab (CDM Prior consideration submitted) https://cdm.unfccc.int/Projects/PriorCDM/notifications/index.html?s=20
Kamuthi Solar Power Limited	216 MW	216 MWac Kamuthi Solar Power Project (CDM Prior consideration submitted) https://cdm.unfccc.int/Projects/PriorCDM/notifications/index.html?s=40

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 either registered or project activities submitted for registration, or project activities undergoing validation in CDM /VCS scheme or informed UNFCCC about the intention to avail carbon benefit.

Thus $N_{all} = 0$

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

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} .

As $N_{all} = 0$; 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 $F=1-N_{diff}/N_{all}$

$$F=1-0/0$$

$F= \text{Undefined}$

Outcome of Step 5:

As,

- $F = \text{Not defined}$
- $N_{all}-N_{diff} = 0$; is less than 3

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

The above discussions show that solar power development is not a common practice and the project activity is not financially attractive; hence the project activity is additional.

2.6 Methodology Deviations

Not applicable.

3 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

As per para 42 of ACM0002 version 19.0, 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 (tCO₂)

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

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

Calculation of $EG_{PJ,y}$

The methodology ACM0002 (Version 19.0) has procedures for calculation of $EG_{PJ,y}$ for the following cases:

- (a) Greenfield plants,
- (b) Capacity addition to wind, solar, wave or tidal plant
- (c) Capacity addition to hydro or geothermal power plant
- (d) Retrofit or rehabilitation or replacement of an existing renewable energy power plant

As all the three projects included in the proposed project activity are Greenfield plants, option (a) as provided in the methodology ACM0002 (Version 19.0) shall be applicable and is described below:

“If the project activity is the installation of a new grid-connected renewable power plant”:

$$EG_{PJ,y} = EG_{facility,y} \quad (2)$$

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 19.0) requires that the combined margin for the grid be calculated in accordance with the procedure provided in the *“Tool to calculate the emission factor for an electricity system”, ver 7.0*

As per version 7 of Tool to calculate emission factor for an electricity system, following steps are included in the calculation of the emission factor for the baseline scenario:

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) emissions factor.

The Central Electricity Authority (CEA) has published CO₂ baseline database in its version 14.0¹² (December 2018). The values for OM, BM, CM are given excluding and including imports. For the present project activity, including imports are considered.

Step 1: Identifying the relevant electricity system

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 2018, the Southern grid has also been synchronized with the NEWNE grid, hence forming one unified Indian Grid. The project activity is located in the state of Telangana and Maharashtra which come under Indian grid system. 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.

¹² http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf

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.

Only grid power plants are included in the calculation of OM & BM.

Step 3: Selection of an Operating Margin 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 (Refer “Tool to calculate the emission factor for an electricity system”, version 05.0)

- (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 resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

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

Grid	2013-14	2014-15	2015-16	2016-17	2017-18
NEWNE	18.6%	16.8%	15.1%	14.6%	14.3%

Source: CEA Baseline Carbon Dioxide Emission Data Base Version 14

In Indian Grid, the low-cost/must run resources vary from 18.6% to 14.3% of the total net grid generation (From Year 2013-14 to Year 2017-18). The calculation above shows that the generation from low-cost/must-run resources constitutes less than 50% of total grid generation, hence usage of the Simple OM method in the project case is justified.

The Simple OM emission factor can be calculated using either of the two following data vintages for years(s) y:

- Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period,
- Or
- Ex post option: 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.

The project proponents choose the Ex ante option for estimating the simple OM emission factor wherein as described above a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period will be undertaken.

As observed in the CEA database, (Version 14, Dec'18) 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 only 18.3% which is much lesser than 50% of the total generation. Thus, Simple OM method has been used for calculating the emission factor.

The project proponent has chosen the ex-ante option for the calculation of the OM with a 3-year generation-weighted average, based on the most recent data available at the time of submission of the VCS-PD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.

Step 4: Calculation of the OM according to the Simple OM method

The simple OM method has been selected as justified above. 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 using the following formula:

$$EF_{grid,OM,simple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO_2,i,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,OM,simple,y}$	=	Simple operating margin CO ₂ emission factor of in year y (tCO ₂ /MWh)
$FC_{i,m,y}$	=	Amount of fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fuel type i in year y (GJ / mass or volume unit)
$EF_{CO_2,i,y}$	=	CO ₂ emission factor of fuel type i in year y (tCO ₂ /GJ)
$EG_{m,y}$	=	Net electricity generated and delivered to the grid by power unit m in year y (MWh)
m	=	All power units serving the grid in year y except low-cost / must-run power units
i	=	All fuel types combusted in power plant / unit m in year y
y	=	Either the three most recent years for which data is available at the time of submission of the CDM-PD to the DOE for validation (ex-ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

In India, the Central Electricity Authority (CEA) has estimated the baseline emission factor for the power sector. This data has also been endorsed by the DNA and is the most authentic information available in the public domain. The details of same can be found on CEA website at http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf.

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

Net Generation in Operating Margin (MWh) (incl. imports)		
2015-16	2016-17	2017-18
871,753	916,278	960,693

Simple Operating Margin Emission Factors (tCO ₂ /MWh) (incl. Imports)		
2015-16	2016-17	2017-18
0.96553	0.96363	0.95434

Therefore, weighted OM average for Indian grid comes out to be 0.9610 tCO₂/MWh

i.e. $EF_{grid,OM,y} = 0.9610 \text{ tCO}_2/\text{MWh}$

In this PD *ex-ante* vintage has been fixed and will not be changed during the crediting period.

Step 5: Calculate the build margin 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.

Option 1 has been considered for this project activity.

Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor.

The sample group of power units *m* used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET-5-units}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total} , in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET_{\geq 20\%}}$, in MWh);

(c) From $SET_{5-units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin.

In India, the installed capacity and corresponding annual generation from power plants is quite high. The Central Electricity Authority (CEA) has estimated the annual electricity generation from $SET_{\geq 20\%}$ to be larger than the generation from $SET_{5-units}$. The details of same can be found on CEA website at http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf. Further, none of the power units in $SET_{\geq 20\%}$ started to supply electricity to the grid more than 10 years ago.

Therefore, SET_{sample} is selected as $SET_{\geq 20\%}$ for the estimation of build margin.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid, BM, y} = \frac{\sum_m EG_{m, y} \cdot EF_{EL, m, y}}{\sum_m EG_{m, y}}$$

Where:

- $EF_{grid, BM, y}$ = Build margin CO_2 emission factor in year y (tCO_2 / MWh)
- $EG_{m, y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
- $EF_{EL, m, y}$ = CO_2 emission factor of power unit m in year y (tCO_2 / MWh)
- M = Power units included in the build margin
- Y = Most recent historical year for which electricity generation data is available

Calculations for the Build Margin emission factor $EF_{grid, BM, y}$ is based on the most recent information available on the plants already built for sample group m at the time of PD submission. The sample group m consists of the power plant capacity additions in the electricity system that comprise 20 % of the system generation and that have been built most recently ($SET_{\geq 20\%}$). PP has sourced the data from CEA website at http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf and same in inline with the Tool to calculate the emission factor of the electricity system.

Build margin emission factor is calculated, ex-ante as per the most recent data available. So, build margin emission factor for NEWNE grid for 2017-18 is 0.8644 tCO_2/MWh

$$EF_{grid, BM, y} = 0.8644 \text{ tCO}_2\text{e/MWh}$$

The build margin emissions factor is the generation-weighted average emission factor (tCO₂e/MWh) of all power units m during the most recent year y for which power generation data is available and will be calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (4)$$

Where:

- EF_{grid, BM, y}: Build margin CO₂ emission factor in year y (tCO₂e/MWh)
 EG_{m, y}: Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
 EF_{EL, m, y}: CO₂ emission factor of power unit m in year y (tCO₂e/MWh)
 m: Power units included in the build margin
 y: Most recent historical year for which power generation data is available

As described above, the Build Margin would be calculated annually during the entire crediting period. For the purpose of ex-ante emission reduction calculations the most recent data available (from CEA for 2017-18) has been used and the build margin thus calculated is 0.8644 (tCO₂e/MWh)

Therefore, EF_{grid,BM,y} = 0.8644 (tCO₂e/MWh)

Step 6: Calculation of the combined Build Margin emission factor

The combined margin emission factor will be calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM} \quad (5)$$

Where,

- EF_{grid, BM, y} = Build margin CO₂ emission factor in year y (tCO₂e/MWh)
 EF_{grid, OM, y} = Operating margin CO₂ emission factor in year y (tCO₂e/MWh)
 W_{OM} = Weightage of operating margin emissions factor (%)
 W_{BM} = Weightage of build margin emissions factor (%)

As per the 'Tool to calculate the Emission Factor for an electricity system' version 07, the default values for w_{OM} and w_{BM} are taken as 0.75 and 0.25 respectively as per the guidance provided for solar project activities for the first crediting period and subsequent crediting periods.

Hence, the Baseline Emission Factor is calculated using the formula stated below:

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

$$EF_{grid, CM, y} = 0.75 * 0.9610 + 0.25 * 0.8644 \text{ (tCO}_2\text{/MWh)}$$

$$EF_{\text{grid, CM, y}} = 0.9368 \text{ tCO}_2/\text{MWh}$$

3.2 Project Emissions

For most renewable power generation projects activities $PE_y = 0$. As per applied methodology only emission associated with the fossil fuel combustion, emission from operation of geo-thermal power plants due to release of non-condensable gases, emission from water reservoir of Hydro should be accounted for the project emission. Since the project activity is a solar power project,

Hence $PE_y = 0$

3.3 Leakage

As per ACM0002, no Leakage emissions are considered. The main emission potentially giving rise to leakage in the context of electrical sector projects is emission arising due to activities arising such as power plant construction and upstream emission from fossil fuel use (e.g. extraction, processing, and transport). These emission sources are neglected.

3.4 Estimated Net GHG Emission Reductions and Removals

Baseline Emissions

As per the equation 6 of the methodology ACM 0002 (Version 17.0),

$$BE_y = EG_{PJ, y} * EF_{\text{grid, CM, y}} \quad (1)$$

Where:

BE_y : Baseline emissions in year y ($\text{tCO}_2\text{e/yr}$)

$EG_{PJ, y}$: 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)

$EF_{\text{grid, CM, y}}$: 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" ($\text{tCO}_2\text{e/MWh}$)

Project Emissions

As per the para 34 of methodology ACM0002 (Version 19.0), "For most renewable power generation project activities, $PE_y = 0$."

Leakage Emissions

As per para 5.6 of the methodology ACM0002 (Version 19.0) does not consider any leakage emissions.

Emission reductions

As per equation number (17) of the applied methodology, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (7)$$

Where:

ER_y Emission reductions in year y (tCO₂e/yr)

BE_y Baseline emissions in year y (tCO₂e/yr)

PE_y Project emissions in year y (tCO₂e/yr)

Further, Ex-ante emission reduction has been calculated considering de-ration of 0.5% in generation for solar project. Summary of ex-ante emission reduction calculations is as follows:

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	296,077	0	0	296,077
Year 2	294,597	0	0	294,597
Year 3	293,124	0	0	293,124
Year 4	291,658	0	0	291,658
Year 5	290,200	0	0	290,200
Year 6	288,749	0	0	288,749
Year 7	287,305	0	0	287,305
Year 8	285,869	0	0	285,869
Year 9	284,439	0	0	284,439
Year 10	283,017	0	0	283,017
TOTAL	2,895,035	0	0	2,895,035

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,CM,y}
Data unit	t CO ₂ /MWh
Description	Combined margin emission factor for Indian grid connected power generation in year y calculated using the latest version of "Tool to calculate the emission factor for an electricity system"
Source of data	CO ₂ baseline database (Version 14.0) published by CEA on Dec-2018
Value applied:	0.9368
Justification of choice of data or description of measurement methods and procedures applied	This value is calculated using OM and BM values as per Version 7.0 of methodological tool to calculate the emission factor for an electricity system and using data base of CEA.
Purpose of Data	For the calculation of Emission Factor of the grid
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,OM,y}
Data unit	t CO ₂ /MWh
Description	Simple operating margin emission factor for Indian grid
Source of data	CO ₂ baseline database (Version 14.0) published by CEA on Dec-18
Value applied:	0.9610
Justification of choice of data or description of measurement methods and procedures applied	This value is calculated by taking weighted average of Simple Operating Margin of recent three years for Indian grid as per the "Tool to calculate the emission factor for an electricity system", version 07.0.0
Purpose of Data	For the calculation of Emission Factor of the grid
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,BM,y}
Data unit	t CO ₂ /MWh
Description	Simple build margin emission factor for Indian grid
Source of data	CO ₂ baseline database (Version 14.0) published by CEA in Dec-18
Value applied:	0.8644
Justification of choice of data or description of measurement methods and procedures applied	This value is calculated by taking weighted average of Simple build Margin of recent three years for Indian grid as per the "Tool to calculate the emission factor for an electricity system", version 07.0.0
Purpose of Data	For the calculation of Emission Factor of the grid
Comments	This parameter is fixed ex-ante for the entire crediting period.

4.2 Data and Parameters Monitored

Data / Parameter	EG _{PJ, Veltloor, y}
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project Veltloor plant to the grid in year y
Source of data	Monthly Joint Meter Reading Report by state utility
Description of measurement methods and procedures applied	Data Type : Measured Monitoring equipment : Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: 5 years Accuracy class: 0.2s Electricity exported/imported to the grid is in kWh. However, for the calculation purpose electricity exported is converted in MWh. The Net electricity supplied to the grid by the Veltloor project activity will be calculated as a difference of electricity exported to the grid and electricity imported from the grid obtained from joint meter reading report notes issued by state utility as per below equation:

	$EG_{PJ, Veltloor, y} = EG_{Export, Veltloor} - EG_{Import, Veltloor}$ The calculation is done by state utility and project developer has no say in the calculation. Based on the joint meter reading report, the project shall raise the invoice. Export readings of Main and Check meters shall be taken on monthly basis by authorized officer of state utility in the presence of PP or representative of PP. Cross Checking: Quantity of net electricity supplied to the grid will be cross checked from the invoices raised by the project participant to the grid.
Frequency of monitoring/recording	Continuous monitoring, hourly measurement and monthly recording
Value applied:	181,300
Monitoring equipment	Energy meters of accuracy class 0.2s
QA/QC procedures applied	- The energy meter reading are taken on monthly basis - Energy meters will be calibrated once in a five year in line with guidance stipulated by Central Regulatory Authority, Govt. of India and faulty meters will be duly replaced immediately. - Details of energy meters are mentioned in Annexure-1 - All the energy meters are under the control of state utility and calibration/testing 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	N/A
Comments	Data will be archived electronically for a period of 2 years beyond the end of crediting period.

Data / Parameter	EG PJ, Gale, y
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project Gale plant to the grid in year y
Source of data	Monthly Joint Meter Reading Report by state utility
Description of measurement methods and procedures applied	Data Type : Measured Monitoring equipment : Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: 5 years Accuracy class: 0.2s

	Electricity exported/imported to the grid is in kWh. However, for the calculation purpose electricity exported is converted in MWh. The Net electricity supplied to the grid by the Gale project activity will be calculated as a difference of electricity exported to the grid and electricity imported from the grid obtained from joint meter reading report notes issued by state utility as per below equation: $EG_{PJ, Gale, y} = EG_{Export, Gele} - EG_{Import, Gale}$ The calculation is done by state utility and project developer has no say in the calculation. Based on the joint meter reading report, the project shall raise the invoice. Export readings of Main and Check meters shall be taken on monthly basis by authorized officer of state utility in the presence of PP or representative of PP. Cross Checking: Quantity of net electricity supplied to the grid will be cross checked from the invoices raised by the project participant to the grid.
Frequency of monitoring/recording	Continuous monitoring, hourly measurement and monthly recording
Value applied:	96,244
Monitoring equipment	Energy meters of accuracy class 0.2s
QA/QC procedures applied	- The energy meter reading are taken on monthly basis - Energy meters will be calibrated once in a five year in line with guidance stipulated by Central Regulatory Authority, Govt. of India and faulty meters will be duly replaced immediately. - Details of energy meters are mentioned in Annexure-1 - All the energy meters are under the control of state utility and calibration/testing 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	N/A
Comments	Data will be archived electronically for a period of 2 years beyond the end of crediting period.

Data / Parameter	$EG_{PJ, Tornado, y}$
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project Tornado plant to the grid in year y

Source of data	Monthly Joint Meter Reading Report by state utility
Description of measurement methods and procedures applied	Data Type : Measured Monitoring equipment : Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: 5 years Accuracy class: 0.2s Electricity exported/imported to the grid is in kWh. However, for the calculation purpose electricity exported is converted in MWh. The Net electricity supplied to the grid by the Tornado project activity will be calculated as a difference of electricity exported to the grid and electricity imported from the grid obtained from joint meter reading report notes issued by state utility as per below equation: $EG_{PJ,Tornado,y} = EG_{Export,Tornado} - EG_{Import,Tornado}$ The calculation is done by state utility and project developer has no say in the calculation. Based on the joint meter reading report, the project shall raise the invoice. Export readings of Main and Check meters shall be taken on monthly basis by authorized officer of state utility in the presence of PP or representative of PP. Cross Checking: Quantity of net electricity supplied to the grid will be cross checked from the invoices raised by the project participant to the grid.
Frequency of monitoring/recording	Continuous monitoring, hourly measurement and monthly recording
Value applied:	38,496
Monitoring equipment	Energy meters of accuracy class 0.2s
QA/QC procedures applied	- The energy meter reading are taken on monthly basis - Energy meters will be calibrated once in a five year in line with guidance stipulated by Central Regulatory Authority, Govt. of India and faulty meters will be duly replaced immediately. - Details of energy meters are mentioned in Annexure-1 - All the energy meters are under the control of state utility and calibration/testing 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	N/A
Comments	Data will be archived electronically for a period of 2 years beyond the end of crediting period.

4.3 Monitoring Plan

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. 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.

Suzlon Global Services Limited (SGSL) is the O&M contractor for all three solar projects. Further, all the companies will be responsible for maintaining respective monitoring data in respect of the project activity. SE Solar Limited, Gale Solarfarms Private Limited and Tornado Solarfarms Private Limited have implemented the management structure for managing the monitored data.

This approved monitoring methodology requires monitoring of the following:

Net electricity supplied from the project activity: While Emission factor of the project activity is fixed ex ante hence no further monitoring of this parameter is required. As per ACM0002 leakage need not be considered hence leakage has not been considered for the project activity. Hence, the sole parameter for monitoring is the net electricity supplied by the project activity to the grid.

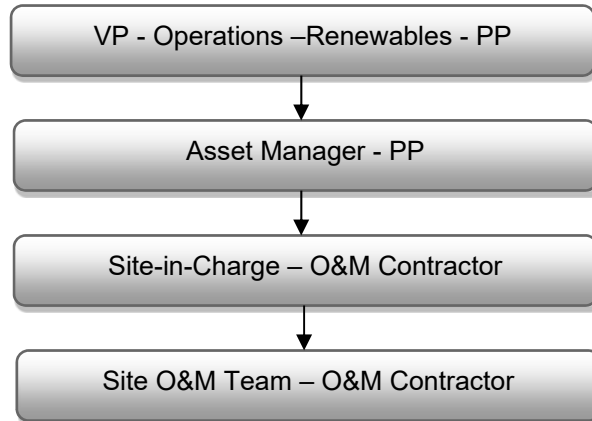
The Project activity is operated and managed by SE Solar Limited, Gale Solarfarms Private Limited and Tornado Solarfarms Private Limited respectively. SE Solar Limited, Gale Solarfarms Private Limited and Tornado Solarfarms Private Limited follow the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, resource assessment, logistics, finance, construction, commissioning and operation of the solar power project.

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 VCS project activities and is proposed for grid-connected solar power project being implemented in Telengana and Maharashtra, India. The monitoring plan, which will be implemented by SE Solar Limited, Gale Solarfarms Private Limited and Tornado Solarfarms Private Limited, 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 respective project proponent. SE Solar Limited, Gale Solarfarms Private Limited and Tornado Solarfarms Private Limited proposed the following structure for data monitoring, collection, data archiving and calibration of equipment's for this project activity. The Project activity is operated and managed by the PP. SE Solar Limited, Gale Solarfarms Private Limited and Tornado Solarfarms Private Limited follow the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, resource assessment, logistics, finance, construction, commissioning and operation of the solar power projects. The data for the project is compiled and subsequently stored by the PP. The roles and responsibilities for the project are described as below;



Data Recording

The state utility and representative of concerned Power Producer / developer shall jointly read the metering system every month at the delivery point.

Meter readings taken jointly will be signed by the representatives of state utility and of concerned power producer/developer. If Power Producer/ Developer's representative is not present for joint meter reading then the meter reading taken by state utility shall be considered as final; provided a signed copy of the meter reading is sent to the Power Purchase / Developer within twenty four (24) hours of such reading of the main metering system or back up metering system as the case may be.

The solar power developer has installed main meter and check meter of static type 0.2s class accuracy of ABT Meters at the Interconnection Point. The solar power developer has also install stand-by meter of same accuracy as per the norms specified in the Metering Code by CEA. The main meter, check meter and stand-by meter shall consist of a pair of export and import parameters with facility for recording meter readings using meter recording instrument.

All the meters have installed shall be jointly inspected and sealed and shall not be interfered with, tested or checked except in the presence of representatives of both parties. The meter readings of the main meter shall form the basis of billing. If any of the meters installed at interconnection point are found to be registering inaccurately the affected meter shall be replaced immediately.

During meter test check of the main meter and check meter indicates an error in the main meter beyond the permissible limits of error provided in the relevant standards (as defined in the Central

Electricity Authority (Installation and Operation of Meters) Regulations, 2006, but no such error is indicated in the corresponding check meter, billing for the month shall be done on the basis of the reading of the check meter and the main meter shall be replaced immediately. If main meter and check meter indicate an error beyond the limits, billing for the month shall form the basis of the readings of the standby meter, and the main meter and the check meter shall be replaced immediately.

Calibration Frequency

The main, check and standby meters shall be calibrated once in a five year in line with notification issued by Central Electricity Authority, Govt of India dated the 17th March, 2006. The meters would be tested by any accredited laboratory in the presence of the parties (State Electricity Board, Project investor and the O&M Contractor) involved. Both parties shall seal main and backup meters. Defective meters shall be replaced immediately. As per the schedule, calibration of all energy meter, instruments and equipment will be carried out once in five year and recorded in calibration reports.

Emergency Preparedness

In case of any abrupt breakdown, the fault will be immediately identified by the O&M personnel. All minor faults shall be taken care of by the O&M personnel, In case of any major faults, the grid personnel will be informed and replacement of the equipment shall be made within 24 hours.

Data Adjustment in case of monitoring period different from billing period:

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

$$D = (A/B) * C$$

A = Difference of number of days which are not matching of billing period and monitoring period.

B = Number of days of the billing period/ month which was not matched with the monitoring period.

C = Net Electricity supplied to the grid for that given billing period/ month

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

5 SAFEGUARDS

5.1 No Net Harm

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

5.2 Environmental Impact

According to Indian regulation, the implementation of the renewable energy power project does not require an Environmental Impact Assessment (EIA). As all the project activity instances involved in the grouped project activity involves installation of the renewable energy power project and as the Indian regulation on the Environmental Impact Assessment is the same for all the renewable

energy Power Projects, it is decided to analyze the environmental impacts at the grouped project activity Level.

As per the Ministry of Environment and Forests (Government of India) notification dated September 14, 2006 regarding the requirement of environmental Impact Assessment (EIA) studies as per the Environmental Protection Rule, 1986 (Published in the Gazette of India, Extraordinary, Part-II, and Section 3, Sub-section (ii) Ministry of Environment and Forests), any project developer in India needs to file an application to the Ministry of Environment and Forests (including a public hearing and an EIA) in case the proposed industry or project is listed in a predefined list. The renewable energy power Projects are not included in this list and thus an EIA is not required. Hence, environmental impact analysis is not required for the grouped project activity and also for the project activity instances.

5.3 Local Stakeholder Consultation

Local Stakeholder meeting has been conducted for all the project activity. All details along with the supporting documents like the Public Notice, MOM and the list of attendees have been submitted to the DOE.

SE Solar Limited, Gale Solarfirms Private Limited and Tornado Solarfirms Private Limited had identified different stakeholders for its solar power project as per the different phases of Implementation. Separate stakeholder consultations were carried out for all the three projects. Following are the identified stakeholders,

- a) Representatives from O&M contractor;
- b) Employees of SE Solar Limited, Gale Solarfirms Private Limited and Tornado Solarfirms Private Limited;
- c) Contractor of SE Solar Limited, Gale Solarfirms Private Limited and Tornado Solarfirms Private Limited;
- d) Villagers from nearby villages

100 MW_{AC} Veltoor solar project by SE Solar Limited is located in Mehboobnagar district of Telengana. Further, 50 MW_{AC} Gale Solarfirms Private Limited and 20 MW_{AC} Tornado Solarfirms Private Limited are located in the dist. of Dhule, Maharashtra. As the projects are located at two different project sites, thus, two separate stakeholders' meeting were organized to receive comprehensive feedback from the local peoples. Description of the same are mentioned below:

Stakeholders' meeting at Veltoor Site:

At Veltoor project, the meeting was carried out by SE Solar Limited on 18/07/2018 at the site office in Veltoor solar project at 02:00 pm. All stakeholders were invited via personal invitation letter and also by public notice.

During the meetings the stakeholders emphasized that the project has not only provided employment but also significantly contributed to the infrastructure development likes roads. The

stakeholders also expressed satisfaction that the project would help alleviating the power deficit currently being faced by the region.

During stakeholder meeting, no negative feedback was received from any of the stakeholders. All of them supported the initiative and appreciated the project proponent for carrying out such an activity in the region. Hence no comments warranting action from the project proponent were received.

Stakeholders' meeting at Dhule, Maharashtra Site:

As 50 MW_{AC} Gale solar project and 20 MW_{AC} Tornado solar project are located in Dhule, Maharashtra site. Thus, the meeting was combinedly carried out by Gale Solarfirms Private Limited and Tornado Solarfirms Private Limited on 17/06/2018 at the Site office at 2:00 pm. All stakeholders were invited via personal invitation letters and public notices.

During the meeting, the stakeholders appreciated the project activity as local villagers have received direct and indirect employment in this project activity. Further, local stakeholders also appreciated project management to significant contribution to the local infrastructure development like newly constructed roads, water supply etc. The stakeholders also expressed satisfaction for this project activity and also requested project management to replicate the same type of projects in the local area.

All the stakeholders were happy in knowing that the project activities in their respective locality will be contributing to a global cause and they appreciated these activities for their initiatives in the areas of climate change and sustainable development. In particular, the stakeholders appreciated the project promoter for the environment friendly power generation using solar energy.

The questions asked during the meetings at the site have been summarized below:

Stakeholder Name	Question	Answer by CLP
Mr. Arvind Sonaware	Are there any other benefits of solar power projects that you have installed?	Yes, there has been improved transportation for villagers, increased connectivity and employment to local villagers and therefore benefits of economic betterment.
Mr. M Veskatesh	How this project helps in social development in local area	Being a socially responsible organization, several social projects have been planned at sites. Baseline study and implementation of the identified projects would be initiate shortly.
Mr. Nitin Rajput	Will the project help in improving the electricity supply to the villagers?	The power generated is fed to the state electricity grid, but the same cannot be promised. It becomes the jurisdiction of the electricity board in the state. They have to decide from the amount of power available

Stakeholder Name	Question	Answer by CLP
		as to how much is to given to which area.
Mr. Prasant V. Bagul	Do these projects affect the rainfall?	No, such projects do not affect the rainfall by any chance. Solar panel only converting the solar radiation into
Mr. Ashoke Kumar	Did project provide employment opportunities or improve economic development of area?	Yes, it has definitely done so. It has brought employment opportunity at the village level. Lot of villagers have got employment have got employment – either as security guards, drivers etc.
Mr. T. Balakrishna	Do the project personnel and authorities maintain a good relationship with villagers?	Yes, they all maintain a very good relationship. PP is looking forward to more such renewable energy projects being brought here.

Further to above, the stakeholders expressed their pleasure with the setting up of the solar power projects as it had provided the rural population with permanent employment opportunities. During stakeholder meeting, no negative feedback was received from any of the stakeholders. All of them supported the initiatives and appreciated the project proponents for carrying out such an activity in these regions. After ensuring that all the queries of the stakeholders were answered, the meeting was concluded after thanking all the participants for attending the meeting.

5.4 Public Comments

The project was listed on VCS registry from 05/05/2019 to 04/06/2019. Projects have received following comments during the public consultation period:

SL No.	Public Comments	Response
01	They say that "At the time of decision making for the project activities, 'Guidelines on The Assessment Of Investment Analysis' (EB 62 Annex 05) was the latest available tool, hence same has been considered for default value of return on equity. In line with the same the default value of Return on Equity for Group-1 projects in India is 11.75%.' No cannot do that. The EB62 Annex 05 document they say is from 15 July 2011 and has been replaced four	At the time of decision making, SE Solar Limited, Gale Solarfarms Pvt. Limited and Tornado Solarfarms Pvt. Limited considered prevailing investment guidelines to ascertain the benchmark for the project and financial viabilities of the projects were evaluated considering that value. It is not possible for the management of SE Solar Limited, Gale Solarfarms Pvt. Limited and Tornado Solarfarms Pvt. Limited to envisage future value of Return on Equity for India. Management of SE Solar Pvt. Ltd decided to consider carbon revenue for 100 MW solar project on 04/05/2015 and 'Guidelines on The Assessment Of Investment Analysis' (EB 62 Annex 05) was the

SL No.	Public Comments	Response																																																												
	times over by what is today the CDM document "Investment Analysis, v9.0". They use EB62 Annex 5 to claim default value for expected return on equity of 11.75 for India, as appendix of those guidelines say. Today, the CDM document "Investment Analysis, v9.0" puts this default value at 9.79. Big difference.	prevailing guidelines issued by UNFCCC. Further, Management of Gale Solarfarms Pvt. Ltd. and Tornado Solarfarms Pvt. Ltd, decided to considered carbon revenue for 50 MW and 20 MW solar projects on 17/09/2015 and “Guidelines on The Assessment of Investment Analysis (version 6.0)”, EB 85, Annex 12 was the prevailing guidelines issued by UNFCCC. Thus, default values of Return on Equity for SE Solar Limited, Gale Solarfarms Pvt. Limited and Tornado Solarfarms Pvt. Limited are justified. Considering latest Investment Analysis, v9.0, benchmark, benchmark for SE Solar Limited, Gale Solarfarms Pvt. Limited and Tornado Solarfarms Pvt. Limited are coming out 15.28% and 15.17% respectively. Thus, considering these benchmark values, sensitivity analysis is mentioned below: Sensitivity Analysis for SE Solar Limited: <table><tr><th>Variation</th><th>-10%</th><th>Normal</th><th>10%</th></tr><tr><td>Tariff Rate</td><td>6.71%</td><td>10.09%</td><td>13.57%</td></tr><tr><td>Net Generation</td><td>6.71%</td><td>10.09%</td><td>13.57%</td></tr><tr><td>Project Cost</td><td>13.24%</td><td>10.09%</td><td>7.66%</td></tr><tr><td>O&M Cost</td><td>10.83%</td><td>10.09%</td><td>9.33%</td></tr></table> Sensitivity Analysis for Gale Solarfarms Pvt. Ltd: <table><tr><th>Variation</th><th>-10%</th><th>Normal</th><th>10%</th></tr><tr><td>Tariff Rate</td><td>5.89%</td><td>9.16%</td><td>12.51%</td></tr><tr><td>Net Generation</td><td>5.89%</td><td>9.16%</td><td>12.51%</td></tr><tr><td>Project Cost</td><td>12.16%</td><td>9.16%</td><td>6.84%</td></tr><tr><td>O&M Cost</td><td>9.91%</td><td>9.16%</td><td>8.39%</td></tr></table> Sensitivity Analysis for Tornado Solarfarms Pvt. Ltd: <table><tr><th>Variation</th><th>-10%</th><th>Normal</th><th>10%</th></tr><tr><td>Tariff Rate</td><td>5.89%</td><td>9.16%</td><td>12.51%</td></tr><tr><td>Net Generation</td><td>5.89%</td><td>9.16%</td><td>12.51%</td></tr><tr><td>Project Cost</td><td>12.16%</td><td>9.16%</td><td>6.83%</td></tr><tr><td>O&M Cost</td><td>9.91%</td><td>9.16%</td><td>8.39%</td></tr></table> The above analysis shows that all the projects are still additional considering latest version of investment guidelines.	Variation	-10%	Normal	10%	Tariff Rate	6.71%	10.09%	13.57%	Net Generation	6.71%	10.09%	13.57%	Project Cost	13.24%	10.09%	7.66%	O&M Cost	10.83%	10.09%	9.33%	Variation	-10%	Normal	10%	Tariff Rate	5.89%	9.16%	12.51%	Net Generation	5.89%	9.16%	12.51%	Project Cost	12.16%	9.16%	6.84%	O&M Cost	9.91%	9.16%	8.39%	Variation	-10%	Normal	10%	Tariff Rate	5.89%	9.16%	12.51%	Net Generation	5.89%	9.16%	12.51%	Project Cost	12.16%	9.16%	6.83%	O&M Cost	9.91%	9.16%	8.39%
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Net Generation	5.89%	9.16%	12.51%																																																											
Project Cost	12.16%	9.16%	6.84%																																																											
O&M Cost	9.91%	9.16%	8.39%																																																											
Variation	-10%	Normal	10%																																																											
Tariff Rate	5.89%	9.16%	12.51%																																																											
Net Generation	5.89%	9.16%	12.51%																																																											
Project Cost	12.16%	9.16%	6.83%																																																											
O&M Cost	9.91%	9.16%	8.39%																																																											
02	Common practice analysis uses combined capacity of the three sites even though three separate	Inline with Step-1 of “Common Practice” analysis (version 03.1 EB84, Annex 7”), <i>calculate applicable capacity or output range as +/-50% of the total</i>																																																												

SL No.	Public Comments	Response
	investments. Cannot do that.	<i>design capacity or output of the proposed project activity.</i> Thus, total output of the proposed project activity is 170 MW. Thus, $\pm 50\%$ range of 170 MW has been considered for common practice analysis and same is justified.
03	There may be more issues but all financial assumptions in Appendix that is not included so cannot see. Why is that not posted?	All the input parameters of investment analysis (except 3 rd party energy assessment data) are considered from <i>Terms and Conditions for Tariff determination by Central Electricity Regulatory Commission dt. 31/03/2015</i> . Same are publicly available data which are the authentic value applicable for any solar projects in India. Further, all the input parameters along with respective supportive documents are submitted to DoE for assessment.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	EG PJ, Veltor, y											
Data unit	MWh											
Description	Quantity of net electricity generation supplied by the project Veltor plant to the grid in year y											
Value applied:	<table><tr><th>Year</th><th>Value (MWh)</th></tr><tr><td>2017 (07-Aug-17 to 31-Dec-17)</td><td>41,281.00</td></tr><tr><td>2018 (01-Jan-18 to 31-Dec-18)</td><td>206,251.00</td></tr><tr><td>2019 (01-Jan-19 to 31-Mar-19)</td><td>65,605.20</td></tr><tr><td>Total</td><td>313,137.20</td></tr></table>		Year	Value (MWh)	2017 (07-Aug-17 to 31-Dec-17)	41,281.00	2018 (01-Jan-18 to 31-Dec-18)	206,251.00	2019 (01-Jan-19 to 31-Mar-19)	65,605.20	Total	313,137.20
Year	Value (MWh)											
2017 (07-Aug-17 to 31-Dec-17)	41,281.00											
2018 (01-Jan-18 to 31-Dec-18)	206,251.00											
2019 (01-Jan-19 to 31-Mar-19)	65,605.20											
Total	313,137.20											
Comments	Data will be archived electronically for a period of 2 years beyond the end of crediting period.											

Data / Parameter	EG PJ, Gale, y									
Data unit	MWh									
Description	Quantity of net electricity generation supplied by the project Gale plant to the grid in year y									
Value applied:	<table><tr><th>Year</th><th>Value (MWh)</th></tr><tr><td>2017 (07-Aug-17 to 31-Dec-17)</td><td>0.00</td></tr><tr><td>2018 (01-Jan-18 to 31-Dec-18)</td><td>49,455.30</td></tr><tr><td>2019 (01-Jan-19 to 31-Mar-19)</td><td>28,786.05</td></tr></table>		Year	Value (MWh)	2017 (07-Aug-17 to 31-Dec-17)	0.00	2018 (01-Jan-18 to 31-Dec-18)	49,455.30	2019 (01-Jan-19 to 31-Mar-19)	28,786.05
Year	Value (MWh)									
2017 (07-Aug-17 to 31-Dec-17)	0.00									
2018 (01-Jan-18 to 31-Dec-18)	49,455.30									
2019 (01-Jan-19 to 31-Mar-19)	28,786.05									

	Total	78,241.35	
Comments	Data will be archived electronically for a period of 2 years beyond the end of crediting period.		

Data / Parameter	EG PJ, Tornado, y											
Data unit	MWh											
Description	Quantity of net electricity generation supplied by the project Tornado plant to the grid in year y											
Value applied:	<table><tr><th>Year</th><th>Value (MWh)</th></tr><tr><td>2017 (07-Aug-17 to 31-Dec-17)</td><td>4,244.22</td></tr><tr><td>2018 (01-Jan-18 to 31-Dec-18)</td><td>37,988.13</td></tr><tr><td>2019 (01-Jan-19 to 31-Mar-19)</td><td>11,541.93</td></tr><tr><td>Total</td><td>53,774.28</td></tr></table>		Year	Value (MWh)	2017 (07-Aug-17 to 31-Dec-17)	4,244.22	2018 (01-Jan-18 to 31-Dec-18)	37,988.13	2019 (01-Jan-19 to 31-Mar-19)	11,541.93	Total	53,774.28
Year	Value (MWh)											
2017 (07-Aug-17 to 31-Dec-17)	4,244.22											
2018 (01-Jan-18 to 31-Dec-18)	37,988.13											
2019 (01-Jan-19 to 31-Mar-19)	11,541.93											
Total	53,774.28											
Comments	Data will be archived electronically for a period of 2 years beyond the end of crediting period.											

6.2 Baseline Emissions

As per the equation 6 of the methodology ACM 0002 (Version 19.0),

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

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 CDM project activity in year y (MWh/yr)

EF_{grid, CM, y}: Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO₂e/MWh)

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

$$\begin{aligned} \text{Thus, } BE_y &= 445,152.83 \text{ MWh} * 0.9368 \text{ tCO}_2\text{e/MWh} \\ &= 417,018.00 \text{ tCO}_2 \text{ (after rounding down)} \end{aligned}$$

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 as per the applicable methodology ACM0002, version 19.

$$PE_y = 0$$

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	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)
2017 (07-Aug-17 to 31-Dec-17)	42,648.00	0.00	0.00	42,648.00
2018 (01-Jan-18 to 31-Dec-18)	275,132.00	0.00	0.00	275,132.00
2019 (01-Jan-19 to 31-Mar-19)	99,238.00	0.00	0.00	99,238.00
Total	417,018.00	0.00	0.00	417,018.00

Appendix -1: Meter Calibration Details**A) Calibration details for 100 MW_{AC} Veltoor Solar Project in Telengana:**

Sl. No.	Meter Identification No	Meter Make	Accuracy Class	Calibration Date	Calibration Validity Date
1	XD551230 (Main Meter)	Secure	0.2s	05/01/2017	04/01/2022
				14/12/2018	13/12/2023
2	XD551231 (Check Meter)	Secure	0.2s	05/01/2017	04/01/2022
				14/12/2018	13/12/2023
3	XD551232 (Standby Meter)	Secure	0.2s	05/01/2017	04/01/2022
				14/12/2018	13/12/2023

B) Calibration details for 50 MW_{AC} Gale Solar Project in Dhule, Maharashtra:

Sl. No.	Meter Identification No	Meter Make	Accuracy Class	Calibration Date	Calibration Validity Date
1	2832489 (Temporary Meter used during COD)	Secure	0.2s	10/07/2017	09/07/2022
	22/03/2018			21/03/2023	
	XD462713 ¹³ (Main Meter)			31/01/2019	30/01/2024
2	XD462714 (Check Meter)	Secure	0.2s	22/03/2018	21/03/2023
				31/01/2019	30/01/2024
3	XD462712 (Standby Meter)	Secure	0.2s	22/03/2018	21/03/2023
				31/01/2019	30/01/2024

C) Calibration details for 20 MW_{AC} Tornado Solar Project in Dhule, Maharashtra:

Sl. No.	Meter Identification No	Meter Make	Accuracy Class	Calibration Date	Calibration Validity Date
1	02832488 (Main Meter)	Secure	0.2s	10/07/2017	09/07/2022
				31/01/2019	30/01/2024
2	02832490 (Check Meter)	Secure	0.2s	10/07/2017	09/07/2022
				31/01/2019	30/01/2024
3	02832501 (Standby Meter)	Secure	0.2s	10/07/2017	09/07/2022
				31/01/2019	30/01/2024

Calibration frequency of the meter is once in five years. There was not any significant period of shut-down or break-down period during this monitoring period.

¹³ Meters replace on 22/03/2018