KARNATAKA PAVAGADA-II SOLAR PROJECT BY AVAADA (150 MW)

Document Prepared by **WeAct Pty. Ltd.**

Project Title	Karnataka Pavagada-II Solar Project by Avaada (150 MW)
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Prepared By	WeAct Pty Ltd.
Contact	1/115 Chapal Street, Widnsor,Victoria-3181, Australia. Ph: +61-409 135 580 satish@weact.com.au

[1] The version 01.1 was the version submitted post the initial review from VERRA received on 16th November; whereas the version 01, dated 07th Nov 2019 was submitted as the first version for listing.

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The main purpose of this proposed project activity is to generate clean electricity through renewable source of solar energy and to supply generated electricity to the Indian grid system through Karnataka state grid via Power Purchase Agreement (PPA) with 'Bangalore Electricity Supply Company Limited' (BESCOM).

The project activity involves installation of total 150 MW (3 X 50 MW) solar photovoltaic grid interactive power plants, has been commissioned in three different blocks in Pavagada Solar Park[2], in the state of Karnataka (India). Project activity shall be developed, implemented and commissioned by the Special Purpose Vehicle "**Avaada Solarise Energy Private Limited"** (i.e. the Project Proponent of the VCS project)**.**

The proposed activity is a green-field project, thus The project will replace anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately **305,870 tCO_2e annualize average** (proposed avg. value of 10 years of projection), thereby displacing **326,493 MWh/year** (estimated annualized avg. for 10 years) of electricity from the generation-mix of power plants connected to the Indian electricity grid, which is mainly dominated by fossil fuel based power plants. Total estimated GHG emission reductions for a period of 10 years of the first crediting period shall be around **30,58,870 tCO_2e**.

The solar power does not involve any fossil fuel consumption and hence the project does not lead to any greenhouse gas emissions. Thus, electricity would be generated through sustainable means without causing any negative impact on the environment.

Scenario existing prior to the implementation of project activity:
The project is a green-field activity, therefore in absence of the project activity the electricity to be delivered to consumers via 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".

Baseline Scenario:
As per the applicable methodology, a Greenfield power plant is defined as "a new renewable energy power plant that is constructed and operated at a site where no renewable energy power plant was operated prior to the implementation of the project activity".

The baseline scenario as per paragraph 22 of Section 5.2.1 of applied the methodology prescribes that "If the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system". Hence, pre-project scenario and baseline scenario are the same, i.e. grid electricity.

[2] Project is located in the '2000 MW Solar Park Pavagada', in Karnataka state. It can be further referred from the commissioning certificates.

1.2 Sectoral Scope and Project Type

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

Sectoral Scope : 01 - Energy industries (renewable / non-renewable sources)
Project Type : I - Renewable Energy Projects
Methodology : ACM0002: Grid-connected electricity generation from renewable sources - Version 19[3]

The project is not a grouped project activity.

1.3 Project Proponent

Organization name	Avaada Solarise Energy Private Limited
Contact person	Praveen Golash
Title	Senior GM
Address	3rd floor, PTI building, 4 Parliamnet Street, Delhi – 110001. India.
Telephone	+91-97113 02259
Email	praveen.golash@avaada.com

'Avaada Solarise Energy Private Limited' is the SPV of "M/s Giriraj Renewables Pvt. Ltd., acting as the Project Proponent (PP) for the project activity, will be having overall operational control and ownership of the Project activity.

1.4 Other Entities Involved in the Project

Organization name	WeAct Pty Ltd
Role in the project	Authorized Representative
Contact person	Satish Duvvuru
Title	Director
Address	1/115 Chapal Street, Widnsor, Victoria-3181, Australia.
Telephone	Ph: +61-409 135 580
Email	satish@weact.com.au

WeAct Pty Ltd. is the "Authorized Representative"[4] of PP and the "Sole Focal Point" for all the communications with the DOE, VCS Board and Registry; and to take all the necessary actions for the project under VCS mechanism as and when required.

1.5 Project Start Date

8th Nov 2019.

As per VCS guidelines, the project start date is the date on which the project is commissioned.

[3] https://cdm.unfccc.int/methodologies/DB/5725LCHYPYM4I1V8OD9SFYVAMFFWNP
[4] Communication Agreement has been executed in between PP and Authorized Representative, submitted to APX.

The project activity has achieved full commissioning of the total capacity in three blocks (i.e. each block of capacity 50 MW). The first block was commissioned on 8th Nov 2019. Hence, the start date of the project is considered as per the COD of the first phase, which is 8th Nov 2019. The remaining capacity of the project has also got commissioned in two phases, as on 21st Nov & 27th Nov 2019.

1.6 Project Crediting Period

The indicative dates of crediting period for the project activity are as follow:

Crediting Period Start date : 08 November 2019
Crediting Period End date : 07 November 2029

Choice of Crediting Period : a maximum of ten (10) years of crediting period which may be renewed at most twice, which is in line with the VCS version 3 (v3.7).

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	
Large project	√

As the estimated average annual GHG emission reductions or removals is more than 300k tCO_2e, therefore project scale is considered as “Large Scale”.

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 1 (e.g. 2019)*	3,15,630
Year 2	3,13,420
Year 3	3,11,227
Year 4	3,09,048
Year 5	3,06,885
Year 6	3,04,736
Year 7	3,02,603
Year 8	3,00,485
Year 9	2,98,382
Year 10	2,96,293
Total estimated ERs	3,058,709
Total number of crediting years	10
Average annual ERs	305,870

*year 1 will start from the date of commissioning of the first phase of the project, which is 8th Nov 2019.

1.8 Description of the Project Activity

The proposed project activity shall involve installation of Solar PV plant. The total installed capacity of the project is 150 MW_{ac}. The project shall be developed by Avaada Solarise Energy Private Limited.

The project activity aims to harness solar energy through installation of PV. The solar PV power plant will have solar PV modules, inverters, transformers and other protection system and supporting components. Details of which would be provided during the validation.

The Project activity is a new facility (Greenfield) and the electricity generated by the Project will be exported to Indian grid via Power Purchase Agreement with BESCOM, in Karnataka. As per the PPA terms, the total capacity of the project will be commissioned in three different blocks (B22, B39 and B40A) in Pavagada Solar Park in Karantaka, with 50 MW capacity in each block. The Project will therefore displace an equivalent amount of electricity which would have otherwise been generated by fossil fuel dominant electricity grid.

In the Pre-project scenario the equivalent amount of electricity, either fetched (under captive/third party sale cases) or delivered to the grid by the project activity, would have otherwise been generated by the operation of grid-connected fossil fuel based power plants and by the addition of new generation sources.

The project shall result in replacing anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 305,870 tCO_2e per year (an annualized average estimated value across 10 years of crediting period), thereby displacing an annualized average of 326,493 MWh[5] electricity from the gird.

Solar Power Project Technology Details

The technology employed, converts solar energy to electrical energy. In solar power generation, energy of solar is converted into mechanical energy and subsequently into electrical energy. The technology is an environment friendly technology since there are no GHG emissions associated with the electricity generation. There is no transfer of technology involved in the project activity. The technical details of the project will be in line with guidelines prescribed under the PPAs.

The technical specifications of the project activity are as follows:

Plot 22 (50 MW):

Date of Commissioning:	**27-11-2019**
Location Number:	**Thirumani (V)**
SS connected to:	**5 (KSPDCL T1)**
Module Model:	
Make or Supplier(s)	**JA solar and Renesola**
Maximum Power (Pmax)	**325wp,330wp and 335wp**
Module technology	**Polycrystalline Silicon photovoltaic modules**
Orientation	**12*6 = 72 cells, 12 Degree, Fixed Angle**
Other details (if any)	
Invertor:	

[5] A separate ER calculation sheet has been submitted to DOE.

Model / Make	**SUNGROW & 3125KW GRID CONNECTED PV INVERTER & SG3125HV-20**
No. of Inverters	**16**
Lifetime of the Inverters	**25 YEARS**
Technical Lifetime of the SPV plant:	**25 YEARS**

Plot 39 & 40A (50 X 2 MW):

Date of Commissioning:	**Plot 39 – 8th November 2019 Plot 40 A – 21st November 2019**
Location Number:	**Rayacharlu (V)**
SS connected to:	**8**
Module Model:	
Make or Supplier(s)	**Renesola**
Maximum Power (Pmax)	**325Wp,330Wp and 335 Wp**
Module technology	**Polycrystalline Silicon photovoltaic modules**
Orientation	**12*6 = 72 cells, 12 Degree, Fixed Angle**
Other details (if any)	
Invertor:	
Model / Make	**SINENG & 3125KW ,Grid connected PV inverter, EP-3125-HA-UD**
No. of Inverters	**32**
Lifetime of the Inverters	**25 years**
Technical Lifetime of the SPV plant:	**25 years**

Emission Reductions from anthropogenic sources:

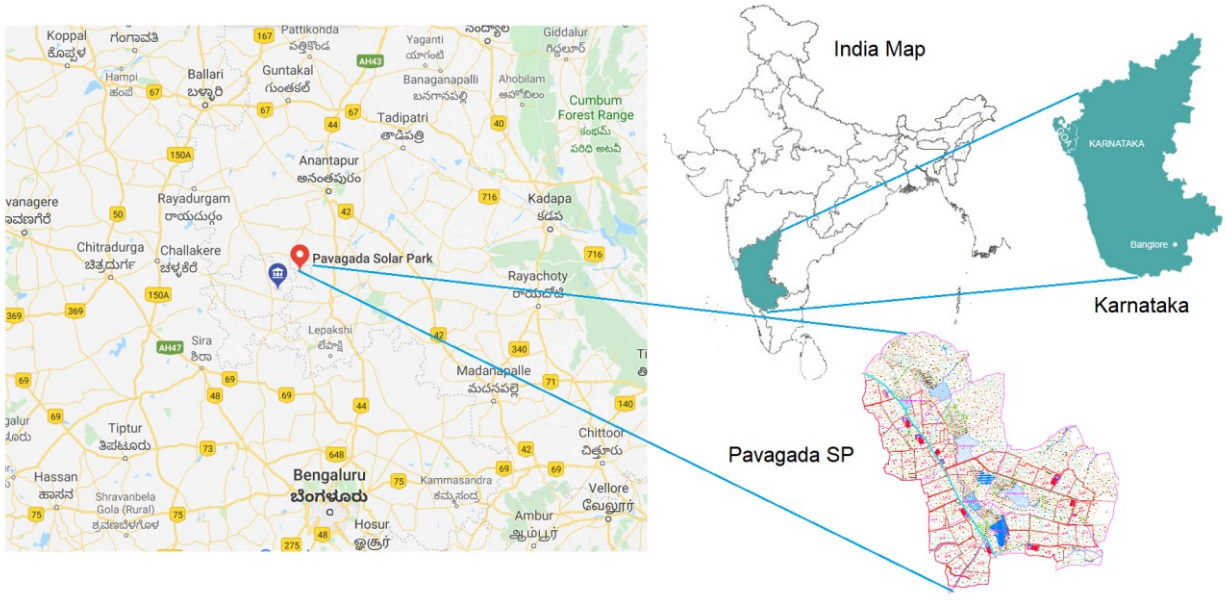
The solar power generated from the project will be displacing the electricity generated from thermal power stations feeding into Indian grid and will be replacing the usage of diesel generators for meeting the power demand during shortage periods. Since, the solar power plant harvests energy from sustainable source of "solar energy" and also it does not use any fossil fuel for its operation the power generated from the project will certainly prevent the anthropogenic GHG emissions which is generally produced by the fossil fuel based thermal power stations comprising coal, diesel, furnace oil and gas etc. which contributes to the project's baseline, i.e. Grid.

1.9 Project Location

The proposed project will be implemented in three blocks in Pavagada Solar Park, which is a solar park spread over a total area of 13,000 acres in Pavagada taluka, in Tumkur district, Karnataka, India.

The proposed Geo-coordinates for the project locations are as follows:
Latitude : 14° 40' 0.012" N
Longitude : 75° 49' 59.988" E

Total capacity of the project will be commissioned in three different blocks (B22, B39 and B40A) in the Pavagada Solar Park in Karnataka, with 50 MW capacity in each block. The representative map of the project location is shown below:



Representative Map of the project location

1.10 Conditions Prior to Project Initiation

The project is a Greenfield solar power project and does not involve generation of GHG emissions for the purpose of their subsequent reduction, removal or destruction. Prior to the initiation of the project activity, the equivalent amount of electricity would have been drawn from grid connected or new power plants, in Indian Grid. The grid is predominantly coal based and therefore is a major source of carbon di oxide emissions in India. The main emission in the pre project scenario is the fossil fuel based power plants connected to the Indian Grid, and main GHG involved is CO_2. 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 solar project from the state Nodal agencies and is in compliance to the local laws and regulations, in line with the PPAs. (The copies of different NOCs and Approvals are attached as a part of ESIA Report conducted by PP in the month of April 2019. The report is submitted to DOE)

Also, the relevant national laws and regulations pertaining to generation of energy in India are:

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

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

- Power generation using 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

The Project is developed and owned by **Avaada Solarise Energy Private Limited**, who authorizes WeAct Pty Ltd. as the authorized representative of project proponent for the VCS project, and to receive VCUs and remain focal point of communication at the registry.

As a proof of ownership, PP would like to refer to the three Power Purchase Agreements (PPAs) signed with Bangalore Electricity Supply Company Ltd. (BESCOM) on 7th November 2018. Also, the project has been recently commissioned; therefore proof of ownership can also be referred from the Commissioning Certificates. The same are available and submitted to DOE during the site audit and validation under VCS.

1.12.2 Emissions Trading Programs and Other Binding Limits

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

Hence, no evidences are included. However, PP shall submit an official declaration confirming the above statement to DOE.

1.12.3 Other Forms of Environmental Credit

Not Applicable. The project activity has applied for registration under VCS programme only and has no intend to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

A declaration shall be submitted to DOE confirming the same.

1.12.4 Participation under Other GHG Programs

The project has not been applied 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 proposed project activity.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description. (Project is currently at pre-development and pre-commissioning stage)

Sustainable Development

Contribution to sustainable development:
Ministry of Environment and Forests, has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. It has been envisaged that the project shall contribute to sustainable development using the following ways:

- **Social well-being:** Even though the project will be implemented as a part of the Solar Park, but PP will need to deploy a huge amount of work resources. Thus, the project would help in generating employment opportunities during the construction and also in operation phases. The project activity shall lead to development in infrastructure in the region like development of roads and also may promote business with improved power generation.

- **Economic well-being:** The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits the project activity will also help to reduce the demand supply gap in the state. Due to generation of direct and indirect jobs, project will directly contribute to the economic well-being of the localities in the region.

- **Technological well-being:** The successful operation of project activity would lead to promotion of solar based power generation and would encourage other entrepreneurs to participate in similar projects.

- **Environmental well-being**: Solar being a renewable source of energy, it will reduce the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. Due to its zero emission the Project activity will also help in avoiding significant amount of GHG emissions and also specific pollutants like SOx, NOx, and SPM associated with the conventional thermal power generation facilities.

Further Information

Not applicable at present.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Title of Methodology : ACM0002: Grid-connected electricity generation from renewable sources - Version 19[6]

Reference of Methodology : The project activity meets the eligibility criteria of large scale project as it is more than 15 MW

Type I : Energy industries (renewable / non-renewable sources)

Category : Approved Consolidated Methodology (ACM0002)

Tools referred with above methodology and applicable for project activity are:

- Tool to calculate the emission factor for an electricity system - Version 07.0 (EB 100, Annex 04) [7]
- Methodological Tool - Tool for the demonstration and assessment of additionality - Version 07.0.0 (EB 70, Annex 08)[8]
- Tool27 - Methodological Tool - Investment analysis (Version 09.0)[9]

2.2 Applicability of Methodology

The project activity involves generation of grid connected electricity from renewable solar energy. The project activity has a proposed capacity of 150 MW which will qualify for a large scale project activity under Type-I of the large scale methodologies of CDM. The project status is corresponding to the methodology ACM0002 version 19 and applicability of methodology is discussed below:

Applicability Criterion	Project Case
1. This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s)	The project activity is a Renewable Energy Project i.e. Solar Power Project which falls under applicability criteria option 1 (a) i.e., "Install a Greenfield power plant". Hence the project activity meets the given applicability criterion.
2. The methodology is applicable under the following conditions: (a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, solar power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power	The option (a) of applicability criteria 2 is applicable as project is renewable energy solar power plant/unit. Hence the project activity meets the given applicability criterion.

[6] https://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD
[7] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.1.pdf/history_view
[8] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf
[9] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v9.0.pdf

plant/unit; (b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for solar, 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.	
3. In case of hydro power plants, one of the following conditions shall apply: (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 W/m2; or (c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m2; or (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m2, all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m2; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m2 shall be: a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project	The project is installation of new solar based electricity generation plants (not a hydro power plant). Hence this criterion is not applicable.
4. In the case of integrated hydro power projects, project proponent shall:	The project is solar power project and thus the criterion is not applicable to this project activity.
5. 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	The project is solar power project and thus the criterion is not applicable to this project activity.
6. 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	The project is solar power project and thus the criterion is not applicable to this project activity.

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.	
7. The methodology is not applicable to: (a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; (b) Biomass fired power plants/units	(a) The project activity is Greenfield and there is no switching of fossil fuel to renewable energy. Hence the criterion is not applicable to the project activity. (b) The project is not a biomass fired power plant. Hence the criteria is not applicable to the project activity
8. 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.	Not applicable, the solar project is a Green field project activity and this project is not the enhancement or up gradation project.
9. 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

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 B.6.3 of the PD 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 proposed 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)

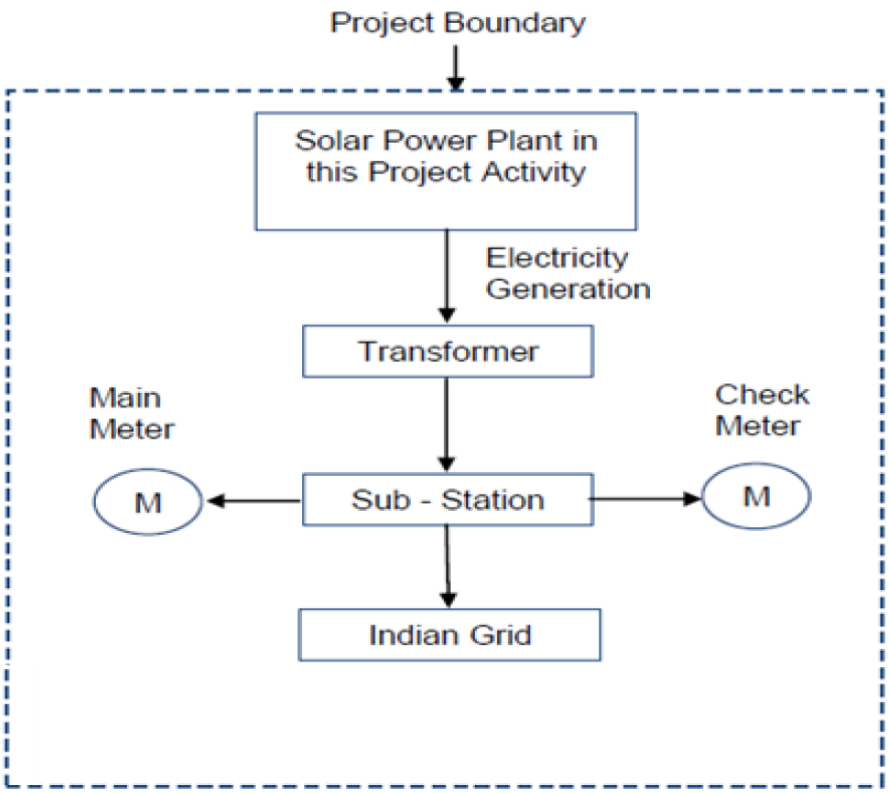
Applicability Criteria has been demonstrated in section on additionality below.

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 150 MW which is applicable as per large scale project activities methodology ACM0002: Grid-connected electricity generation from renewable sources Version 19. The project capacity will always remain the same and hence the project activity will always be a large-scale project activity 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.



Source		Gas	Included?	Justification/Explanation
Baseline	Grid connected electricity generation.	**CO_2**	**Yes**	**Main emission source**
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
		Other	No	No other GHG emissions were emitted from the project
Project	Greenfield SOLAR Power Project Activity.	CO_2	No	No CO_2 emissions are emitted from the project
		CH_4	No	Project activity does not emit CH_4
		N_2O	No	Project activity does not emit N_2O
		Other	No	Project activity does not emit other forms of GHG emissions

2.4 Baseline Scenario

As per the approved consolidated methodology ACM0002, 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 for third party sale would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system"

The project activity 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.

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.

The combined margin ($EF_{grid,CM,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) (having weightage 75%) and build margin (BM) (having weightage 25%). Calculations for this combined margin must be based on data from an official source (where available) and made publically available.

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

Parameter	Value	Nomenclature	Source
$EF_{grid,CM,y}$	0.93684 tCO2/MWh	Combined margin CO_2 emission factor for the project electricity system in year y	Calculated as the weighted average of the operating margin (0.75) & build margin (0.25) values, sourced from Baseline CO2 Emission Database, Version 14 [10] published by Central Electricity Authority (CEA), Government of India.
$EF_{grid,OM,y}$	0.9610 tCO2/MWh	Operating margin CO_2 emission factor for the project electricity system in year y	Calculated as the last 3 year (2014-15, 2015-16 & 2016-17,) generation-weighted average, sourced from Baseline CO2 Emission Database, Version 14, published by Central Electricity Authority (CEA), Government of India.
$EF_{grid,BM,y}$	0.8644 tCO2/MWh	Build margin CO_2 emission factor for the project electricity system in year y	Baseline CO_2 Emission Database, Version 14, published by Central Electricity Authority (CEA), Government of India.

2.5 Additionality

In line with VCS Standard, the additionality of the Project activity is ascertained in line with the applicable guidance from the UNFCCC. The additionality of the project activity is demonstrated using an investment analysis as according to the steps described in the 'Tool for the demonstration and assessment of additionality' (version 07.0.0).

Step 0. Demonstration whether the proposed project activity is the first-of-its-kind.
This step is not applied to the project activity since it is not first-of-its-kind, hence the additionality of the project will be demonstrated in next steps below.

Step1. Identification of alternatives to the proposed project activity consistent with current laws and regulations
As per the applied methodology ACM0002 version 19; 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 reflected in the combined margin (CM) calculations described in "TOOL07: Tool to calculate the emission factor for an electricity system".

However, step 1 is conducted to establish the baseline in an elaborative manner. As per this step, the probable baseline scenarios could be as follows:

Alternative 1: The proposed project activity without CDM benefit;
Alternative 2: Continuation of the current situation, i.e., electricity will continue to be generated by the existing generation mix operating in the grid.

[10] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf

Having considered the fact that the project activity is a solar power project, both the alternatives are in compliance with all applicable legal and regulatory requirements as;

- The implementation of project activity is a voluntary initiative and is not mandatory or a legal requirement;
- The applicable environmental regulations do not restrict the use of solar energy; and
- There is no legal requirement on the choice of a particular technology.

It can be noted that the project fulfils the norms put down by Central Pollution Control Board of India. As per 'Central Pollution Control Board (Ministry of Environment & Forests, Govt. of India)', final document on revised classification of Industrial Sectors under Red, Orange, Green and White Categories (29/02/2016). The newly introduced White category of industries pertains to those industrial sectors which are practically non-polluting such as Biscuit trays etc. from rolled PVC sheet (using automatic vacuum forming machines), Cotton and woollen hosiers making (Dry process only without any dying/washing operation), Electric lamp (bulb) and CFL manufacturing by assembling only, Scientific and mathematical instrument manufacturing, **Solar power generation through photovoltaic cell**, wind power and mini hydel power (less than 25 MW). There shall be no necessity of obtaining the "Consent to Establish/Operate" for 'White Category' of industries. Intimation to concerned SPCB / PCC is sufficient.

Being a renewable power from Solar, project activity falls under the category of White and thus these projects do not need clearance for Consent to operate and only needs to inform the relative State pollution control board. Thus it can be confirmed that it follows the local laws of the host country. Due to above categorization of white category and being the renewable in nature, the project activity does not emit any emissions. Thus there is no any other surplus regulatory requirement for the project activity. This also demonstrates the 'regulatory surplus' aspect as prescribed by VCS.

However, of the two alternatives identified, alternative (i) cannot be considered realistic as further analysis in the following paragraph of the tool (i.e. investment analysis based on IRR) reveals that it is not economically feasible option. Hence, alternative (ii) alone could be justified as realistic, credible and plausible alternative to PP.

Therefore, all realistic and credible alternatives (with regards to the governing methodologies) including the project being undertaken as non-carbon revenue based activity (i.e. non-VCS) and continuation of current scenario, have been considered. The identification of alternatives is in conformity with the guidance given by the tool.

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

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

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

Both the alternatives are in compliance with all applicable legal and regulatory requirements as:

- The implementation of project activity is a voluntary initiative and is not mandatory or a legal requirement;
- The applicable environmental regulations do not restrict the use of solar energy; and
- There is no legal requirement on the choice of a particular technology.

Outcome of Sub-step 1b: Hence, both the alternatives enlisted above are found to comply with the mandatory laws and regulations taking into account the enforcement of the legislations in the region or country and EB decisions on national and/or sectoral policies and regulations.

Since, project investment was decided by PP based on a benchmark analysis approach (i.e. IRR calculation) and as revealed from the step 2 it is an economically unviable project for PP without carbon revenue, hence only baseline possible is Alternative (ii), i.e. "Continuation of the current situation, i.e., electricity will continue to be generated by the existing generation mix operating in the grid".

This identified baseline is in line with the para 22 of the applied methodology, ACM0002, version 19.

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
Project Developer has considered Post-Tax Equity IRR for investment analysis at the time of investment decision. As per Para 16 of EB 92, Annex 5 states that "….Required/expected returns on equity are appropriate benchmarks for an equity IRR. Therefore, the Expected return on equity is considered appropriate benchmark." Also, as per currently valid and applicable tool, i.e. Methodological Tool27 (as per para 19) the return on equity approach has been considered to calculate the benchmark.

Accordingly, the post-tax Equity IRR has been considered as the relevant financial indicator for Investment Analysis and has been compared against a default value of benchmark return (Cost of Equity), as prescribed under the para 19 of the methodological Tool27.

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

Considering conservative approach in input values, an equity IRR[11] has been estimated and compared with the benchmark. The input values of the IRR model are based on the project related information available at the time of investment decision. These values are then compared with actual values of the project financials incurred and same has been analysed through a sensitivity analysis also.

Calculation Approach: The IRR computation has been done as per standard IRR accounting practice. The guidance prescribed under the section 5 of the Methodological tool27 has been referred. In the calculation of equity IRR only the portion of investment costs which is financed by equity has been considered as the net cash outflow, the portion of the investment costs which is financed by debt is not considered a cash outflow. Also, as per the section 4 of the tool27, internal rate of return (IRR) (both Project and Equity IRR) calculations should reflect the period of expected operation of the underlying project activity (technical lifetime). Therefore, the IRR assessment has been performed for a period of 25 years, which is the technical lifetime of the project as prescribed under the section 1.8. Also, Para 10 of the tool27 prescribes that 'Input values used in all investment analysis shall be valid and applicable at the

[11] This is the listing version of the PD, therefore only the approach and outcome is being provided. The detailed IRR calculation sheet will be submitted to DOE during the validation process and results will be demonstrated in the PD.

time of the investment decision taken by the project participant'. Therefore, all input parameters (as listed under the Appendix 2) used for IRR computation are based on relevant and applicable data which were available to PP at the of investment decision (i.e. date of investment decision by board, which is 25/03/2018 as indicated in the IRR sheet and reference evidence submitted to DOE). Moreover, computations of depreciation, tax, fair value, etc. are considered as per standard accounting practices of the host country and best practices, which is also in line with the requirements of the section 4 of the tool.

In order to compare the IRR with a benchmark, the default value for the expected return on equity (after converting to nominal value as prescribed under the guideline) has been considered as per "TOOL27 Methodological tool: Investment analysis (Version 09.0)

The results shows that the proposed project activity cannot be considered as financially attractive proposition without an external revenue support as the equity IRR for the project activity is less than the expected Benchmark. The calculation of benchmark is attached under Appendix 2

Equity IRR (without carbon revenue)	Benchmark (Equity IRR)
6.71%	**14.62%**

Sub-step 2d: Sensitivity Analysis
Addressing Guidance 28 & 29 of EB92, Annex 5, following factors has been subjected to sensitivity analysis:

- PLF
- O&M Cost
- Project Cost
- Tariff

The rationale of sensitivity is, "The ultimate objective of the sensitivity analysis is to determine the likelihood of the occurrence of a scenario other than the scenario presented, in order to provide a cross-check on the suitability of the assumptions used in the development of the investment analysis."

A sensitivity analysis has been performed and the results of show that even with a variation of +10% & -10% in project cost, O&M cost, PLF and Tariff Rate, the Equity IRR remains well below the proposed benchmark. The results of sensitivity analysis are provided under the Appendix-2. Thus, the project remains additional even under the most favourable conditions. The details of sensitivity analysis are submitted in the IRR sheet.

Outcome of Step 2:
This substantiates that the investment is not financially attractive (Equity IRR for the project activity is less than the Benchmark) for the investor. Thus, it can be easily concluded that project activity is additional & is not business as usual scenario.

Step 3: Barrier analysis

Barrier analysis has not been used.

Step 4: Common practice analysis

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

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%	225	MW
Capacity of the project activity	150	MW
-50%	75	MW

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

i) The projects are located in the applicable geographical area;
ii) The projects apply the same measure as the proposed project activity;
iii) 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;
iv) 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;
v) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;
vi) 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:

i) As the project is located in Karnataka state of India, therefore, projects in the geographical area of Karnataka have been chosen for analysis against the entire host country. This is because in the context of host country 'India', every state in the country has different power regulations, policies, evacuation facilities etc. which may directly impact the project investment decision. As can be verified from the official website of Ministry of Power (https://powermin.nic.in/en/content/power-sector-glance-all-india), every state has different policy, hence different power tariff and different guidelines related to various sources of power generation, etc. Moreover, plant load factor, power transmission facilities are different in each state. The power off-taker is also a state Discom that regulates and operates the entire modality in line with the power purchase agreement signed for the project. Therefore, considering all these aspects it's more precise to have a common practice analysis at state level (i.e. the state where project is located) against the entire host country.
ii) 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, projects applying same measure (b) are candidates for similar projects.
iii) The energy source used by the project activity is solar. Hence, only solar energy projects have been considered for analysis.
iv) The project activity produces electricity and supplies to Electricity Supply Companies in Karnataka (i.e. BESKOM) via Power Purchase Agreement; therefore, all power plants that produce electricity and supply to Grid under PPA are candidates for similar projects. Projects which produce electricity but sell electricity to third parties, or used under Land Owning Farmer Category or as part of any private solar park etc. can't be considered as output or services with comparable quality, properties and application areas as that of the project activity.
v) The capacity range of the projects is within the applicable capacity range from 75 MW to 225 MW.
vi) The start date of the project activity is only a proposed date, hence as per the definition of CDM the start date of the project activity has been considered as 07-11-2018 for the purpose of additionality assessment (i.e. date of PPA, which is the earliest date of any real action for the project, whereas date of commissioning is 08/11/2019 which is the start date for VCS). Therefore projects, which have started commercial operation before 07-11-2018, have been considered for analysis.

Numbers of Similar projects identified[12], which fulfil above-mentioned conditioned are

N_{solar} = 1

Source: PP has checked through the solar power projects commissioned list published by Karnataka Renewable Energy Development Ltd., (http://kredlinfo.in/scrollfiles/Commissioned%20list%20Solar.pdf and http://kredlinfo.in/solargrid/sqlist/Solar_alotlist.xlsx) and State wise commissioning status of grid connected Solar Power Projects - MNRE, India (https://mnre.gov.in/file-manager/UserFiles/state-wise-commissioned-grid-connected-solar-power-projects.htm & https://mnre.gov.in/file-manager/UserFiles/State%20wise%20commissioning%20status%20of%20grid%20connected%20solar%20power%20projects/Karnataka.pdf).

As can be checked from these lists, after checking all projects in line with above mentioned conditions of the guideline, there is only one project identified (i.e. sl no. 290 in the given excel sheet or above source link) that can be considered to fall under the capacity range as identified above.

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

CDM project activities, which have got registered or are under validation have been excluded in this step. The list of the power plants identified is provided to the DOE.
(https://cdm.unfccc.int/Statistics/Public/files/Database%20for%20PAs%20and%20PoAs.xlsx

After excluding the registered and under validation projects the total number of projects,

N_{all} = 1

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

As per the tool on Common Practice, the project activities have been separated from the different technologies on the basis of Investment climate on the date of the investment decision.

Hence, projects where this condition is satisfied projects are counted for calculating N_{diff} projects.

But the identified project is of similar technology (i.e. Solar) with comparable output of services with quality, properties and application. Hence,

N_{diff} = 0

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

Calculate:

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

F = 1-(0/1) = 1

[12] A separate excel file is submitted “Projects in KA for CP analysis” to provide details and rational of selection. Also, further justification provided under the Appendix-2.

Outcome of Step 4:

As,
i. F = 1; which is not less than 0.2
ii. N_{all} - N_{diff} = 1-0 = 1; is less than 3

As the project activity does not satisfy the conditions, 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 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

As per the approved consolidated Methodology ACM0002 (Version 19) para 42, *Baseline emissions include only CO_2 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*:

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

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 GS VER 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).

The methodology provides following approaches for emission factor calculations:

(a) *Combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology "Tool to calculate the emission factor for an electricity system".*

OR

(b) *The weighted average emissions (in t CO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.*

Option (a) has been considered to calculate the grid emission factor as per the 'Tool to calculate the emission factor for an electricity system' since data is available from an official source.

CO_2 Baseline Database for the Indian Power Sector, Version 14, published by Central Electricity Authority (CEA[13]), Government of India has been used for the calculation of emission reduction.

As per *Methodological tool: Tool to calculate the emission factor for an electricity system* (Version 07.0, EB 100, Annex 4), following six steps have been followed:

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

Step 1: Identify the relevant electricity systems

As described in tool *"For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity systems."* Out of the given three options under the para 17 of the tool, the option 1 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-

[13] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf

eastern and Southern. However, all the 5 zones have now been synchronized and called as Indian Grid. Therefore, identification of the electricity system is based on the option 1 and here unified Indian Grid system has been considered.

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.

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

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

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 of the tool (i.e. as per the para 6.4.1):
(a) Simple OM; or
(b) Simple adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM.

The data required to calculate Simple adjusted OM and Dispatch data analysis OM is not possible due to lack of availability of data to project developers. The choice of other two options for calculating operating margin emission factor depends on generation of electricity from low-cost/ must-run sources. In the context of the methodology low cost/must-run resources typically include hydro, geothermal, wind, low cost biomass, nuclear and solar generation. Therefore, option (a) under the para 40 of the tool has been considered, as discussed below.

The CEA database December 2018 clearly shows that the percentage of total grid generation by low-cost/ must-run plants (on the basis of average of five most recent years) for the Indian grid is less than 50 % of the total generation. Thus the Average OM method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation.

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2e/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

As per para 42 of the tool, for the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

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

OR

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

PP has chosen ex-ante option (option a) for calculation of Simple OM emission factor using a 3-year generation-weighted average, based on the most recent data available at the time of submission of the VCS-PD to the registry for initial listing.

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

Step 4: Calculate the operating margin emission factor ($EF_{grid,OM\ Simple,y}$) according to the selected method

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**
871,753,243	916,277,834	960,692,882

Simple Operating Margin Emission Factors (tCO2/MWh) (incl. Imports)		
2015-16	**2016-17**	**2017-18**
0.97	0.96	0.95

Weighted Generation Operating Margin (t CO_2/MWh)	0.9610

Step 5: Calculate the build margin (BM) emission factor ($EF_{grid,BM,y}$)
As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, Annex 4) para 72 (i.e. as per the provision of the section 6.5 of the tool):

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

(a) ***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 VCS-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.*

(b) ***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 as described above is chosen by PP to calculate the build margin emission factor for the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of VCS-PD and is fixed for the entire crediting period.

Build Margin (tCO_2/MWh) (not adjusted for imports)	
	2017-18
Indian Grid	**0.8644**

As per the Appendix D of the CEA database, it is stated that "the build margin is the generation-weighted average emission factor of the most recent power plants, consisting of the larger of (i) the five power plants that have been built most recently; or (ii) the capacity additions that represent 20% of the system

generation that have been built most recently. In India, the latter approach generally yields the larger sample and hence must be followed".

Thus the build margin value has been calculated and published in the CEA database which is in line with the procedure referred under the para 75 of the tool wherein (a), (b) & (c) of the given details were followed. Also the calculation is followed as per the equation prescribed under the para 77 of the tool, which can be further verified/evident from the CEA database and excel sheet.

Therefore, PP has considered "BM value" as calculated ex-ante based on the most recent information available at the time of submission of VCS-PD, i.e. for the 2017-18 as published in the CEA database.

Step 6: Calculate the combined margin (CM) emission factor ($EF_{grid,CM,y}$)
As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07[14].0),:

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or
(b) Simplified CM.

PP has chosen option (a) i.e., weighted average CM to calculate the combined margin emission factor for the project activity.

The combined margin emissions factor is calculated as follows:

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

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,OM,y}$	=	Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
w_{OM}	=	Weighting of operating margin emissions factor (per cent)
w_{BM}	=	Weighting of build margin emissions factor (per cent)

The following default values should be used for w_{OM} and w_{BM}:
Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods

Therefore, $EF_{grid,CM,y}$ = 0.9610*0.75 + 0.8644*0.25
= **0.93684 tCO_2e/MWh**

Baseline emission factor (EF_y) :

The baseline emission factor is calculated using the combined margin approach as described in Step 6 above:

Therefore, $EF_y = EF_{grid,CM,y}$ = **0.93684 tCO_2e/MWh**.

Therefore, the baseline emissions calculated as per equation 1:
$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$
= 326,493 MWh X 0.93684 tCO_2e/MWh
= 305,871 tCO_2e (annualized average value has been considered, whereas the yearly ex-ante projection is submitted under the section 3.4)

[14] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

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.

Hence, $LE_y = 0$

3.4 Net GHG Emission Reductions and Removals

As per methodology ACM0002 (version 19) net GHG emission reductions are calculated as follows:

$ER_y = BE_y – PE_y$

ER_y = Emission reductions in year y (tCO_2e/yr)
BE_y = Baseline emissions in year y (tCO_2e/yr)
PE_y = Project emissions in year y (tCO_2e/yr)

Ex-ante calculation (estimate) of net GHG emission reductions:
Ex-ante emission reduction calculations are calculated based on the currently proposed parameters to be included in the project activity for the entire capacity of 150 MW. Summary of ex-ante emission reduction calculations is as follows:

.Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
Year 1	3,15,630	0	0	3,15,630
Year 2	3,13,420	0	0	3,13,420
Year 3	3,11,227	0	0	3,11,227
Year 4	3,09,048	0	0	3,09,048
Year 5	3,06,885	0	0	3,06,885
Year 6	3,04,736	0	0	3,04,736
Year 7	3,02,603	0	0	3,02,603
Year 8	3,00,485	0	0	3,00,485
Year 9	2,98,382	0	0	2,98,382
Year 10	2,96,293	0	0	2,96,293
Total	**30,58,709**	0	0	**30,58,709**

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_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 version 07"
Source of data	CO_2 baseline database (Version 14.0) published by CEA on Dec 2018 (http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf)
Value applied	0.93684
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	tCO_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 2018 (http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf)
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	tCO_2 /MWh

Description	Simple build margin emission factor for Indian grid
Source of data	CO_2 baseline database (Version 14.0) published by CEA Dec 2018 (http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf)
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	$EG_{PJ, y}$
Data unit	MWh
Description	Quantity of net electricity supplied by the project plant/unit to the grid in year y
Source of data	B-Form (Monthly Joint Meter Report issued by SLDC or any other party as prescribed under article 13 of the PPA)
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: Once in 5 years. 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 project activity will be calculated as a difference of electricity exported to the grid, electricity imported from the grid and also the adjustment of line losses as per apportioning calculation; all these values will be obtained from (B-Form) joint meter reading certificates/credit notes issued as per below equation: $EG_{PJ,y} = EG_{Export} - EG_{Import} + L_{loss}$ The calculation is done by Karnataka State DISCOM or the SLDC and the PP has no control over the authority for the calculation. Based on the joint meter reading certificates/credit notes, the project shall raise the invoice. Thus, the value of net electricity supplied by the project activity shall be directly considered from the monthly B-form, hence no separate monitoring of export, import and losses and their calculations is prescribed. The electricity exported to the grid by the project activity connected to the sub-station is measured by energy meters of accuracy class 0.2s. The electricity exported will be measured continuously using Main & Check meters.

	Export readings of Main, Check meters shall be taken on monthly basis by authorized officer of Karnataka DISCOM 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 monthly invoices raised by the project participant to the third party (i.e. BESCOM).
Frequency of monitoring/recording	Monthly
Value applied:	326,493 (Annualized average value has been considered here)
Monitoring equipment	The two parameters, import and export to the grid, are measured at the same location near the connection to the grid, through standard electricity metering instrument. The metering instruments will be installed at the grid-connected point to measure the amount of electricity going from and to the grid. The readings of electricity will be continuously measured by metering instrument itself and monthly recorded.
QA/QC procedures applied	This data will be directly used for calculation of emission reductions. Measurement results of electricity supplied to the grid and that delivered from the grid to the project will be crosschecked with records for sold electricity. The meter(s) will be calibrated once in five years, in accordance with national standards and procedures or as per provisions of PPAs, as may be suitable case.
Purpose of data	The Data/Parameter is required to calculate the baseline emission.
Calculation method	N/A
Comments	Data will be archived electronically for a period of 36 months beyond the end of crediting period. During the periodic verification, the value of this parameter will be submitted here for the cumulative capacity of 150 MW for the total period; whereas ER sheet will provide month-wise data and calculation in line with monthly B-Forms (JMR) which are to be received for each phase of the project separately.

4.3 Monitoring Plan

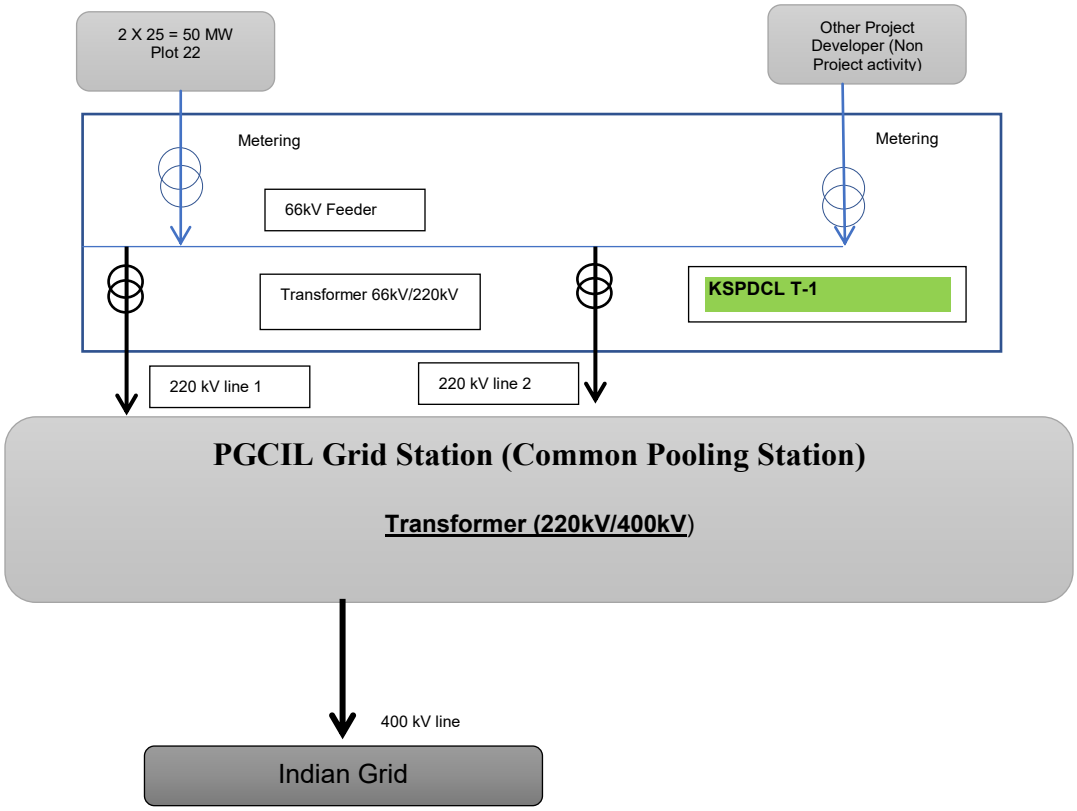
The monitoring methodology specified in the applied methodology requires that the project-monitoring plan to consist of monitoring of quantity of net electricity supplied to the grid in the year y. In order to monitor the mitigation of GHG due to the project activity, the total energy exported needs 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.

The project boundary includes the solar project, sub-stations, grid and all power plants connected to grid. The proposed project activity evacuates power to the Indian grid. Therefore, the entire Indian grid and all connected power plants have been considered in the project boundary for the project activity.

The monitoring layouts and monitoring points under the project boundary:

For Block 22:

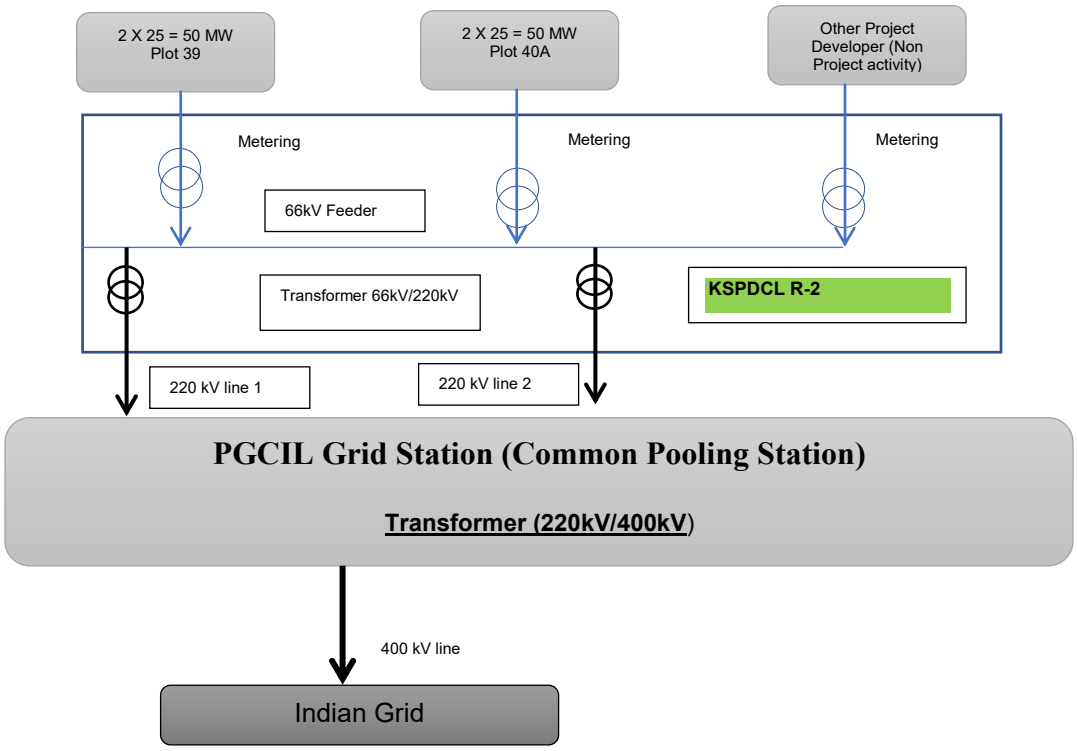


Monitoring Equipment Details: All Energy Meters have been installed at 66kV feeder line.

Block 22	Main Meter	Check Meter	Stand by Meter
RR No: KSPDCL-T1-A83 (Line 09)			
S. No	LT-0830-A	LT-0837-A	16094016
Make	L&T	L&T	L&T
Accuracy Class	0.2S	0.2S	0.2s
Calibration Date/Installation Date	25/11/2019	25/11/2019	25/11/2019
RR No: KSPDCL-T1-A84 (Line 10)	Main Meter	Check Meter	Stand by Meter

S.No	LT-0790-A	LT-0824-A	16093972
Make	L&T	L&T	L&T
Accuracy Class	0.2S	0.2S	0.2s
Calibration Date /Installation Date	25/11/2019	25/11/2019	25/11/2019

For Block 39 & 40A:



Monitoring Equipment Details: All Energy Meters have been installed at 66kV feeder line.

Block 39	Main Meter	Check Meter	Stand by Meter
RR No: KSPDCL-R2-A73 (Line 03)			
S. No	LT-0780-A	LT-0786-A	17010111
Make	L&T	L&T	L&T
Accuracy Class	0.2S	0.2S	0.2s
Calibration Date/Installation Date	04/11/2019	04/11/2019	04/11/2019
RR No: KSPDCL-R2-A74 (Line 04)	Main Meter	Check Meter	Stand by Meter
S. No	LT-0787-A	LT-0789-A	17010150
Make	L&T	L&T	L&T
Accuracy Class	0.2S	0.2S	0.2s
Calibration Date /Installation Date	04/11/2019	04/11/2019	04/11/2019
Block 40A:			
RR No: KSPDCL-R2-A75 (Line 05)	Main Meter	Check Meter	Stand by Meter

S. No	LT-0806-A	LT-0791-A	17010143
Make	L&T	L&T	L&T
Accuracy Class	0.2S	0.2S	0.2S
Calibration Date/Installation Date	18/11/2019	18/11/2019	18/11/2019
RR No: KSPDCL-R2-A76 (Line 6)	Main Meter	Check Meter	Stand by Meter
S. No	LT-0793-A	LT-0800-A	17010123
Make	L&T	L&T	L&T
Accuracy Class	0.2S	0.2S	0.2S
Calibration Date/Installation Date	18/11/2019	18/11/2019	18/11/2019

Methods of measuring, recording and reporting of data etc.:
As prescribed under the section 4.2, the monitoring parameter will be measured continuously by metering system to be installed at the grid interconnection points.

Data shall be recorded by SLDC and monthly net power exported reports/statements shall be generated in the form of B-form or JMR. Billing will be on monthly basis, to be billed by PP to BESCOM.

Metering Equipment:
As per PPA provisions, the metering point will be at 66kV side of 220/66kV substation (as shown in the line diagrams above), where the power from the solar project is injected and at 220 kV side of 400/220 kV substation of CTU. i.e. Powegrid. For commercial settlement, PPA proposes interconnection point or delivery point shall mean the point at 220 kV side of 400/220 kV PGCL substation of CTU.

Calibration of monitoring equipment:
The energy meters at the feeders are maintained and owned by BESCOM. Neither the project proponent nor the site personnel have any control over it. The records will be cross-checked with the records of sold electricity to the third party. As per ongoing practice in the region, the meters are being tested/calibrated by authority in every quarter or at once in six months. However, in line with the CEA order dated 17 Mar 2016 (para 18(b)), PP proposes that the meters will be calibrated by the authority at-least once in five years.

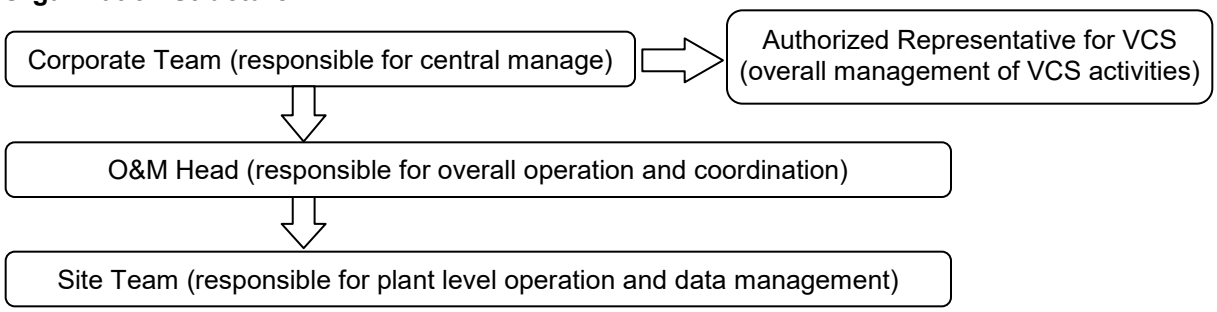
The procedures for internal auditing and QA/QC:
PP shall also keep records of all data and reports for internal auditing purpose for the VCS activity. Such data/reports are like monthly records, invoices, meter test/calibration reports, etc. The QA/QC procedure will be generic in line with the overall quality maintained by PP across its operations.

Since the internal audit & QA/QC process will oversight the requirements of the monitoring activity and its accountability, hence this will suffice the requirement of the overall monitoring plan.

Emergency preparedness:
The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. No need for emergency preparedness in data monitoring is visualized. However, in the event that the main meter, which is used to record the net electricity exported by the project, is found to be faulty it will be repaired, recalibrated or replaced and the data from the check meter will be used in its place.

In case both the main and check meters are found to be beyond the permissible limit of error, both meters shall be calibrated immediately and correction applicable to main meter shall be applied to the energy registered by the Main Meter at the correct energy for the purpose of energy accounting/billing for the actual period during which such inaccuracy may occur.

Organization Structure:



This is the proposed organizational structure which will help PP achieving effective operation & management of the VCS project activity.

Training and maintenance requirements:
Training on the technical components, plant operation etc. are essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the solar plants, it is extremely essential, that the engineers and technicians understand the equipment(s) and keep them in good health. In order to ensure, that O&M team is deft at handling technical snags, the necessity of ensuring that they are capable of handling mounts and structures with absolute ease and comfort has been established. Each and every site personnel shall be provided with proper training to meet the requirements of the Operations and maintenance.

The procedures for handling non-conformances with the validated monitoring plan:
PP would conduct best possible practice to monitor all required parameters in order to implement the validated monitoring plan as prescribed in the VCS PD. In this regard, procedure established for internal audit and QA/QC will be adopted to avoid any non-conformances. However, in case of any non-conformances observed during the verification process, PP would submit a project description deviation applicable to the reporting period, justifying the conservativeness of the alternative approach as may be selected. Also PP shall identify why the scheduled checks were missed or non-conformity arose in the monitoring process; and thereby enhanced monitoring and quality assurance procedures will be adopted accordingly. In case non-conformity is unjustifiable, required post registration changes shall be applied to be in line with the requirements of the applied methodology and VCS guidelines.

Sampling Approach:
No sampling approach is proposed.

5 SAFEGUARDS

5.1 No Net Harm

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

Rational: as per 'Central Pollution Control Board (Ministry of Environment & Forests, Govt. of India)', final document on revised classification of Industrial Sectors under Red, Orange, Green and White Categories (29/02/2016), it has been declared that solar project activity falls under the "White category". White Category projects/industries do not require any Environmental Clearance such as 'Consent to Operate' from PCB as such project does not lead to any negative environmental impacts. Additionally, as per Indian Regulation (as described under section 5.2 below) Environmental and Social Impact Assessment is not required for Solar Projects.

Nevertheless, a stakeholders' consultation process was conducted to understand, discuss, record all possible concerns related environment and socio-economic aspects of the project so that as per requirements mitigation measures can be taken. The section 5.3 below described the same and further confirms that no negative impact is foreseen by the stakeholders.

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 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[15] is not required.

5.3 Local Stakeholder Consultation

The PP has conducted a Stakeholders Consultation on 20th November 2019, at the project site. The local stakeholder's consultation has been conducted as per the standard guidelines and requirements followed under CDM & VCS mechanism. The invitations will be sent to the relevant stakeholder of the regions in the vicinity along with public display of invitation letters for the stakeholder consultation so that maximum number of local stakeholder can be accounted.

The identified local stakeholders at the project site:

- Local villagers,
- Gram Panchayat members,
- Shopkeepers, suppliers, vendors and representatives of project developer.

[15] However, as a part of internal reporting and interest, PP has conducted an ESIA assessment for the entire project capacity. This report also includes all NOCs and approvals related to the project. The ESIA report is submitted to DOE for reference.

- Local labours, women groups, NGOs etc.

The stakeholders were made aware about the project activity and shall discuss about the various benefits arising out of the project activity. A feedback round has been held in which the views of the local stakeholders were addressed.

Attendance records, summary of comments received and photographs of the stakeholder meet were documented & provided under Appendix 1.

The outlines of the entire stakeholders consultation process has summarized as follows:

- **The procedures used for engaging local stakeholders:**

In order to engage relevant stakeholders public notice was displayed in and around the local region both in English and local language "Kannada". This notice was published 2 weeks prior to the date of the meeting such that sufficient time is given to the attendees. The date of the consultation was on 20th Nov 2019.

- **The procedures used for documenting the outcomes of the local stakeholder consultation:**

The consultation process involved knowledge sharing, open discussion, feedback and suggestion rounds so that all required information related to the project can be shared and inputs, outcomes, grievances etc. can properly documented. The comments/questions/feedbacks and their respective answers were written in a particular form. The person names who commented or gave inputs and also the response given from local team of PP were properly recorded in the sheets. Similarly, attendance records of the attendees were also recorded in a specified sheet with all required details.

- **The mechanism for on-going communication with local stakeholders:**

During the meeting it was informed that stakeholders may directly approach to the local team anytime during the project operation phase to provide any communication related to the project, concerns, grievances, suggestions etc. In this regard a grievance register is kept at the site office and also the contact details (Phone number and email address) of the Project Manager at site level have been provided. This will ensure on-going communication with local stakeholders during the project operational phase.

All evidences related to this consultation have been submitted to DOE.
It has been confirmed from the stakeholder's documentation that there is no negative comment or concern received from any local stakeholder and project has been positively supported. Therefore, there was no mitigation measure required or any update related to project design was sought.

5.4 Public Comments

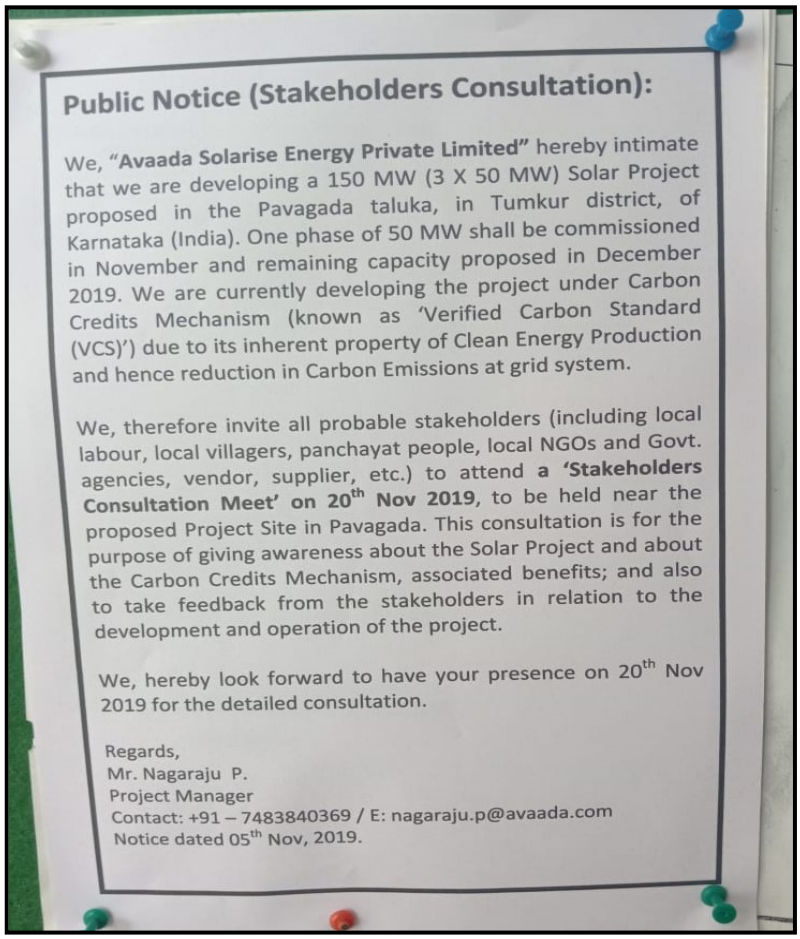
The project has been listed on VCS registry for a period of 30 days.

The status of public commenting period can be referred from the link below:
https://www.vcsprojectdatabase.org/#/pipeline_details/PL2017

This project was open for public comment from 20 Nov – 20 Dec 2019.
However, as can be seen from the above link, no comment has been received during the listing period.

Appendix-1: Records of Stakeholder consultation

Public Notice



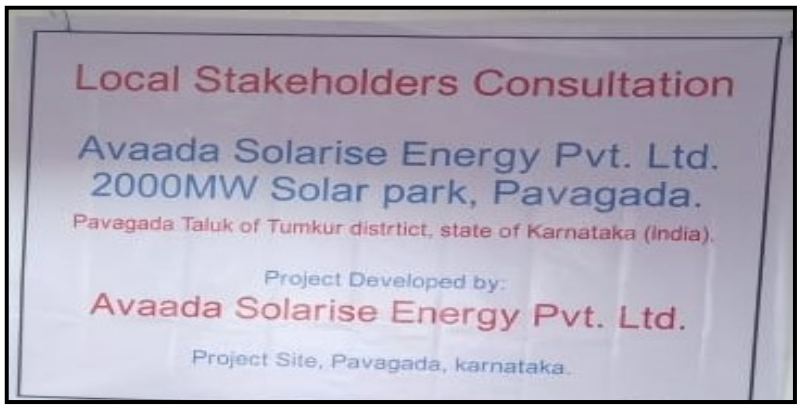
Public Notice (Stakeholders Consultation):

We, "**Avaada Solarise Energy Private Limited"** hereby intimate that we are developing a 150 MW (3 X 50 MW) Solar Project proposed in the Pavagada taluka, in Tumkur district, of Karnataka (India). One phase of 50 MW shall be commissioned in November and remaining capacity proposed in December 2019. We are currently developing the project under Carbon Credits Mechanism (known as 'Verified Carbon Standard (VCS)') due to its inherent property of Clean Energy Production and hence reduction in Carbon Emissions at grid system.

We, therefore invite all probable stakeholders (including local labour, local villagers, panchayat people, local NGOs and Govt. agencies, vendor, supplier, etc.) to attend **a 'Stakeholders Consultation Meet' on 20th Nov 2019**, to be held near the proposed Project Site in Pavagada. This consultation is for the purpose of giving awareness about the Solar Project and about the Carbon Credits Mechanism, associated benefits; and also to take feedback from the stakeholders in relation to the development and operation of the project.

We, hereby look forward to have your presence on 20th Nov 2019 for the detailed consultation.

Regards,
Mr. Nagaraju P.
Project Manager
Contact: +91 – 7483840369 / E: nagaraju.p@avaada.com
Notice dated 05th Nov, 2019.



Local Stakeholders Consultation

Avaada Solarise Energy Pvt. Ltd.
2000MW Solar park, Pavagada.

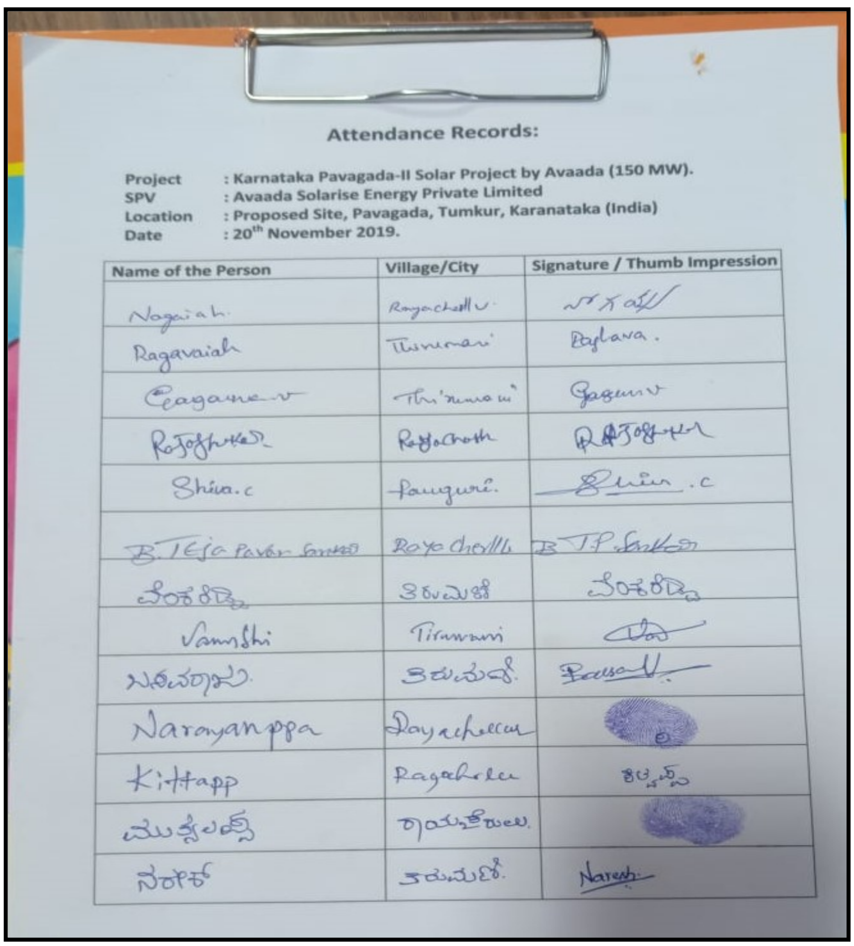
Pavagada Taluk of Tumkur distrtict, state of Karnataka (India).

Project Developed by:
Avaada Solarise Energy Pvt. Ltd.

Project Site, Pavagada, karnataka.

The reference texts used in the banner "Avaada Solarish Energy Pvt. Ltd. 2000 MW Solar Park Pavagada" is just the reference of the company name "Avaada Solarish Energy Pvt. Ltd." and location of the solar park which is "2000 MW Solar Park in Pavagada". This location reference of the solar park is also consistent with the commissioning certificates. This is not the project title; all other documents such as Public Notice, Attendance Sheet, Comment Sheet, etc. specifically mention the project title as per VCS.

Attendance Record:

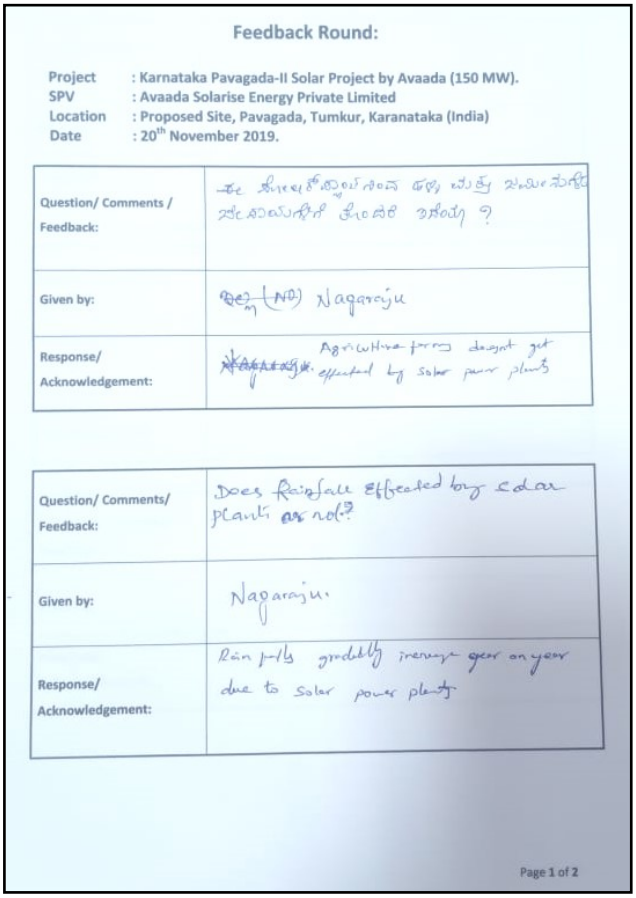


Attendance Records:

Project : Karnataka Pavagada-II Solar Project by Avaada (150 MW).
SPV : Avaada Solarise Energy Private Limited
Location : Proposed Site, Pavagada, Tumkur, Karanataka (India)
Date : 20th November 2019.

Name of the Person	Village/City	Signature / Thumb Impression
Nagaiah	Rayachallu	[illegible]
Ragavaiah	Thirumani	Raghava.
Gagana v	Thirumani	Gagan v
Rajashekar	Rayachellu	R. Rajashekar
Shiva.c	Paaguri	Shiva .c
B. Teja Pavan Sankar	Rayachellu	B.T.P. Sankar
ವೆಂಕಟರೆಡ್ಡಿ	ತಿರುಮಣಿ	ವೆಂಕಟರೆಡ್ಡಿ
Vamshi	Tirumani	[illegible]
[illegible]	ತಿರುಮಣಿ	[illegible]
Narayanappa	Rayachellu	(thumb impression)
Kittapp	Ragachellu	ಕಿಟ್ಟಪ್ಪ
[illegible]	ರಾಯಚೆರ್ಲು	(thumb impression)
ನರೇಶ್	ತಿರುಮಣಿ	Naresh

Feedback:



Feedback Round:

Project : Karnataka Pavagada-II Solar Project by Avaada (150 MW).
SPV : Avaada Solarise Energy Private Limited
Location : Proposed Site, Pavagada, Tumkur, Karanataka (India)
Date : 20th November 2019.

Question/ Comments / Feedback:	ಈ ಸೌರಶಕ್ತಿಯಿಂದ ರೈತರ ಬೆಳೆಗೆ ಏನಾದರೂ ತೊಂದರೆಯಾಗಿದೆ ಪರಿಹಾರವನ್ನು ಕೊಡಿಸಿ ?
Given by:	Nagaraju
Response/ Acknowledgement:	Agricultural farms doesn't get effected by solar power plants

Question/ Comments/ Feedback:	Does Rainfall Effected by solar plants or not?
Given by:	Nagaraju.
Response/ Acknowledgement:	Rainfalls gradually increase year on year due to solar power plants

Page 1 of 2

Question/ Comments/ Feedback:	will we get back our lands which is given to KSPDCL
Given by:	Venkata Swamy.
Response/ Acknowledgement:	Yes, After the completion of lease Agreement they will Return back to your lands.

Question/ Comments/ Feedback:	will you get the rain after installation of solar power plant
Given by:	Satish Reddy
Response/ Acknowledgement:	Yes, heat will be generated more such that humidity will increase as a result cloud formation is more and then rainfall will occurs

Question/ Comments/ Feedback:	what are the necessary steps to be taken for installation of solar for irrigation purpose.
Given by:	Need to check the capacity of Inverter & modules which are compatable or not then the angle at which arms was placed & mostly the interconnection of modules.
Response/ Acknowledgement:	Venkata Swamy.

Appendix-2: More details on Additionality Assessment to the project

A. Details of the IRR calculation parameters:

Financial Parameters of the project (as applicable and valid at the time of investment decision):

Details of the project	Values	Reference
Total Capacity in AC (MW)	150	As per DPR & commissioning certificates
Date of Commissioning	8-Nov-19	Commissioning date of first phase out of total capacity
Life of the plant (Yrs.)	25	CERC Order Dated: April 2016
Project Location	Karnataka	DPR, PPA, Commissioning Certificates
Generation and sale of electricity		
CUF (%)	25.64%	As per DPR & PPA
Annual degradation from 2nd year onwards	0.70%	As per DPR
Tariff rate at the decision making (INR/kWh)	2.92	As per DPR
Operation and maintenance cost and Insurance		
O & M Expenses (INR Mn.)	56.64	As per DPR
Escalation in the operational expenses (%)	5.00%	As per DPR
O & M free for (Yr.)	-	
Insurance (INR Mn.)	22.69	DPR and also assumption as per prior experience
Financial parameters		
TOTAL COST (INR Mn.)	6,753.30	As per DPR
Equity Investment (INR Mn.)	1,688.33	Calculated Value
Loan Amount (INR Mn.)	5,064.98	As per D:E ratio
Debt: Equity Ratio	75:25	As per DPR
Term loan		
Margin (%)	30.00%	As per DPR
Loan Amount (INR Mn.)	5,064.98	Calculated Value
Interest rate (%)	12.76%	CERC Order 2016
Loan Tenure (Qtr.)	80	As per DPR
Moratorium Period (Qtr.)	2	As per DPR
Repayment Period (Qtr.)	78	Calculated Value
Repayment instalments value (INR Mn.)	64.936	Calculated Value
1st instalment from (Qtr. end)	30-Jun-20	Considered from the next Quarter End
Working Capital		
No. of Days Receivables	60	As per standard practice
O&M Expenses (Days)	30	As per standard practice
Interest on Working Capital Debt	12.76%	As per DPR/CERC Tariff Order April 2016
Book Depreciation (SLM Method)		
Land Cost (INR Mn.)	652.50	Calculated Value
Gross Depreciable Value (INR Mn.)	6,100.80	Calculated Value
Book Depreciation Rate (%)	3.80%	As per IT rule
Salvage Value (%)	5.00%	As per IT rule
Salvage value (INR Mn.)	305.04	Calculated Value
Residual Value (INR Mn.)	957.54	Calculated Value
IT Depreciation (SLM Method)		
IT Depreciation Rate (%)	7.69%	As Per Income Tax , Depreciation rates for power generating units
Income Tax		
Financial Year	FY 2019-20	
Income tax rate (%)	34.61%	DPR & as per Tax rates applicable to a domestic company (Also as per CERC Order 2016)
MAT (%)	21.34%	DPR & as per Tax rates applicable to a domestic company (Also as per CERC Order 2016)

GST (%)*	5.00%	As per GST rules
Final Tax rates		
Income tax rate (%)	34.61%	
MAT (%)	21.34%	
GST (%)*	5.00%	
	18.00%	

* GST has been applicable from 1st July 2017. For all equipment applicable GST is 5%, whereas for services 18%.

The IRR calculation approach and consideration in line with the Investment Analysis tool has been demonstrated under the sub-step 2c of the section 2.5.

Benchmark Calculations	Value	Sources Link	Source Page No.	Document Date
Default Value for India as per UNFCCC guidelines	**9.79%**	https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-27-v9.0.pdf	Page 14	29-Nov-2018
Inflation forecast (CPI Combined Mean) as per RBI for 5yrs	**4.5%**	https://m.rbi.org.in/scripts/PublicationsView.aspx?id=18092		07-Feb-2018
Benchmark (with 5yrs Forecast)	**14.73%**			
Inflation forecast (CPI Combined Mean) as per RBI for 10yrs	**4.4%**	https://m.rbi.org.in/scripts/PublicationsView.aspx?id=18092		07-Feb-2018
Benchmark (with 10yrs Forecast)	**14.62.%**			

Final Results	**Equity IRR without CDM**		**Benchmark (Equity IRR)**	
	6.71%		**14.62%**	
Sensitivity Analysis	**Equity IRR**			
Variation %	**-10%**	**Normal**	**10%**	**Variation required to reach benchmark**
PLF	**4.76%**	**6.71%**	**9.48%**	**29.10%**
O&M	**7.35%**	**6.71%**	**6.86%**	**-314.00%**
Project Cost	**9.44%**	**6.71%**	**5.23%**	**-24.30%**
Tariff Rate	**4.76%**	**6.71%**	**9.48%**	**29.05%**

Please refer to the final IRR calculation sheet (version 02, dated 02 Dec 2019) for detailed calculation.

B. **Details related to Common Practice Analysis:**

The common practice analysis has been performed in line with guidance prescribed under the methodological tool 24 for Common Practice Analysis.

By applying the steps all relevant conditions were listed out and accordingly all applicable projects in the region have been identified. However, it has been observed that within the applicable capacity range, i.e. 75 MW to 225 MW there are maximum of 3 projects identified which were already commissioned as on the start date of the project as per definition of CDM under the tool. The list of projects and identified projects are submitted in an excel sheet “Projects in KA for CP analysis”, where source of information are as follows:

http://kredlinfo.in/scrollfiles/Commissioned%20list%20solar.pdf
http://kredlinfo.in/solargrid/sglist/Solar_alotlist.xlsx

However, as can be witnessed from the list of commissioned projects as on 07 Nov 2018, only 1 project has been identified that fulfils all conditions related to the current common practice as set out under the

step 2 (ref. Section 2.5), which has same or comparable output or services as that of the project activity, i.e. sale power to ESCOM via PPA. Whereas, other identified projects are under third party power sell through wheeling arrangements and under private solar park for captive power.

Therefore, PP has conducted two set of analysis to demonstrate the common practice in the region as per the tool.

Scenario 1: Commissioned Projects in the +50% & -50% capacity range (i.e. 75 to 225 MW) with 'electricity' as the produced goods and services (for all types of power sell)

Scenario 2: Commissioned Projects in the +50% & -50% capacity range (i.e. 75 to 225 MW) with 'electricity' as the produced goods and services but with quality, properties, application areas are similar/comparable to the VCS Project activity of Avaada Solar.

Under Scenario 1, total projects identified is 3 (after filtering out other probable projects based on individual capacity or mode of power sell), wherein $N_{all} = 3$ and $N_{diff} = 0$.
Thus, common practice condition (i) $F = 1 - N_{diff}/N_{all} = 1$
And condition (ii) $N_{all} - N_{diff} = 3$

Similarly, under Scenario 2, total projects identified is 1 wherein $N_{all} = 1$ and $N_{diff} = 0$.
Thus, common practice condition (i) $F = 1 - N_{diff}/N_{all} = 1$
And condition (ii) $N_{all} - N_{diff} = 1$

Thus, under both the scenarios the two required conditions for common practice are not fulfilled. Hence, project is not a common practice in the region.

As 'Scenario 1' is not the best suited for analysis as per the conditions prescribed under Step 2 of the common practice tool which is mainly due to the different mode of power sale as compared to the VCS project activity, therefore only the Scenario 2 has been considered to present under the section 2.5 of the VCS PD.