3.5 MW SMALL HYDRO PROJECT IN HIMACHAL PRADESH

Gaur Hydro Power Pvt. ltd is the Project Proponent

Document Prepared By EKI Energy Services Limited

Project Title	3.5 MW Small Hydro Project In Himachal Pradesh
Version	01
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Monitoring Period	01-03-2018 to 31-10-2019 (including first and last dates)
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1 PROJECT DETAILS

1.1 Summary Description of the Project and its Implementation Status

The Hydro Electric Project by Gaur Hydro Power Pvt. ltd (2 MW) and Gopal Hydro Power Pvt. ltd. (1.5 MW) is a grid connected Hydro Electric Project (HEP). Gaur Hydro employs 2 Units of 1 MW each on Kullu district in the state of Himachal Pradesh. Gopal Hydro employs 1.5 MW of hydro project at Kullu district. The 2 MW by Gaur Hydro project is a run-f-river (RoR) type hydropower project. It is a run of river scheme hydro project able to generate about 10.66 MUs energy annually after considering annual loss of generation of 0.84 MU's on account of losses in outage. The project is allotted in the elevation of 1422m and 1373m.

The project was planned to be commissioned in phases. The first project phase encompasses the installation of a 2 MW generating unit which was commissioned on 23/02/2018. A second 1.5 MW generating unit was commissioned on dated 05/05/2019.

The project is a green field activity with the objective to generate electricity by using potential energy of water which is a renewable source of energy. The electricity generated by the proposed HEP will be fed in to 33kV Switchyard at Suman sarwari HEP via newly constructed 2.7 Km long 33 Kv overhead transmission line between sarwari switchyard and henceforth taken to the sub-station of Himachal Pradesh State Electricity Board (HPSEB) at Kullu, Himachal Pradesh.

The project activity is a renewable energy power project which uses potential energy for power Generation. The energy flow is as follows: potential energy at the project location is converted into mechanical energy using the turbines and subsequently into electrical energy by the generator. The generated electricity is planned to be sold to Indian grid which otherwise would have been supplied through the fossil fuel based power plants connected to the grid. This project will reduce Green House Gas (GHG) emission of 17,095 tCO_2/annum (170,951 tCO_2 in crediting period of 10 years) by harnessing clean energy instead of using fossil fuel based power generation. The project activity replaces fossil fuel based generated electricity in the INDIAN grid and therefore clearly contributes to the abatement of greenhouse gases. The details of the project and the state of installation are mentioned in the table:-

Name of the SPVs	**Capacity in MW**	**Connection with Grid**	**State**	**Usage of Electricity**
Gaur Hydro Power Pvt. ltd.	2 MW	Indian Grid	Himachal Pradesh	Sale to grid
Gopal Hydro Power Pvt. ltd.	1.5 MW	Indian Grid	Himachal Pradesh	Sale to grid
Total	**3.5 MW**			

The total AC capacity of the project activity is 3.5 MW and the power produced displaces an equivalent amount of power from the grid, which is fed mainly by fossil fuel fired power plants. Hence, it results in reduction of GHG emissions. GHG emission reductions from the project activity will be 17,095 tonnes of CO_2e and total GHG emission reductions for the chosen 10 year crediting period will be 170,951 tonnes of CO_2e.

Total emission reductions achieved in this monitoring period:

During the Current Monitoring Period from 23/02/2018 to 31/10/2019 (First and last date included) the project activity has contributed 19,452 tCO_2e GHG reductions.

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 : AMS-I.D. -Grid Connected renewable electricity generation – Version 18.0[1]

The project is not a grouped project activity.

1.3 Project Proponent

Organization name	**Gaur Hydro Power Pvt. ltd**
Contact person	Mr. Yugal Kishore Garg
Title	VP Finance
Address	339, Functional Industrial Estate Patparganj Delhi DL 110092 IN
Telephone	09818055221
Email	yugalkishore.garg@gopalcorp.com

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultancy
Contact person	Prakash Kr. Sahu
Title	Manager
Address	Office No 201, Plot No 48, Scheme 78, Part 2, Vijay Nagar, Indore-452010, Madhya Pradesh
Telephone	+91 9589899649
Email	prakash@enkingint.org

1.5 Project Start Date

23/02/2018[2] which is the date of commissioning of first phase of the Project. The SPV name is Gaur Hydro Power Pvt. ltd. Hence the project start date is 23/02/2018.

[1] http://cdm.unfccc.int/UserManagement/FileStorage/2P7FS6ZQAR84LG3NMKYUH50WI9ODBC

[2] As per the commissioning certificate.

1.6 Project Crediting Period

Crediting Period Start date: 23/02/2018
Crediting Period End date: 22/02/2028
The project activity adopts renewable crediting period of 10 years period which can be renewed for maximum 2 times.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	
Small scale project	✓

As per section 3.9.1 of VCS standard Version 3.7, the projects are classified as follows:

1) Projects: Less than or equal to 300,000 tonnes of CO_2e per year
2) Large projects: Greater than 300,000 tonnes of CO_2e per year

As the estimated annual average GHG emission reductions or removal per year is 17,347 tCO_2e which is more than 300,000 tonnes of CO_2e per year, thus the project falls in the category of Large Project.

Year	Estimated GHG emission reductions or removals (tCO_2e)
23/02/2018 to 31/12/2018	14,828
01/01/2019 to 31/12/2019	17,347
01/01/2020 to 31/12/2020	17,347
01/01/2021 to 31/12/2021	17,347
01/01/2022 to 31/12/2022	17,347
01/01/2023 to 31/12/2023	17,347
01/01/2024 to 31/12/2024	17,347
01/01/2025 to 31/12/2025	17,347
01/01/2026 to 31/12/2026	17,347
01/01/2027 to 31/12/2027	17,347
01/01/2028 to 22/02/2028	25,18
Total estimated ERs	170,951
Total number of crediting years	10
Average annual ERs	17095

1.8 Description of the Project Activity

The proposed project activity involves the installation of Hydro Electric Projects. The total capacity of the project is 3.5 MW. The project is promoted by Gaur Hydro Power Pvt. ltd. The project activity would use hydro energy to generate direct current form turbine that will be converted into alternating current by inverters. The project activity will install a new power plant (i.e. Hydro Electric) at a site where no renewable power plant was operating prior to the implementation of the project activity (green-field plant). The generated electricity will be supplied to the INDIAN grid. The project activity follows AMS-I.D. Version 18.0 methodology.

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".

As the project activity falls under the definition of a Greenfield power plant, the baseline scenario as per applied methodology is the following:

The baseline scenario is that the 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 into the grid. Hence, pre-project scenario and baseline scenario are the same. The estimated lifetime of the project activity is considered as 40 years for hydro technology. This may increase depending on the operation & maintenance of the plant. The Project activity is a new facility (Greenfield) and the electricity generated by the Project will be exported to the Indian Grid. The Project will therefore displace an equivalent amount of electricity which would have otherwise been generated by fossil fuel dominant electricity grid. The Project Proponent plans to avail the VCS benefits for the Project.

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 Hydroelectric power is Green House Gas (GHG) emissions free, the power generated will prevent the anthropogenic GHG emissions generated by the fossil fuel based thermal power stations comprising coal, diesel, furnace oil and gas. The estimation of GHG reductions by this project is limited to carbon dioxide (CO_2) only.

The commissioning details of the project are as follows:

S. No.	Name of the SPVs	Capacity (MW)	Commissioning Dates
1.	Gaur Hydro Power Pvt. ltd	2.5	23/02/2018
2.	Gopal Hydro Power Pvt. ltd	1.5	05/05/2019
Total		**3.5**	

The technical specifications of the plants are described below[3]:

1. M/S Gaur Hydro Pvt Ltd. (2 MW)

Hydrology & Water Area	
Catchment area	138 Sq. Km.
Annual Rainfall	2653 mm
Atmospheric temperature in °C	Min -2°C, Max+ 35°C
Humidity (%)	98%
Head Works	
Diversion Weir	Trench type weir
Weir level	EL 1421 m
Design Discharge	6 cumecs
Flood Discharge	460 cumecs
Bottom level of trench	Caries from EL 1420 to EL 1419
Power Duct	
Shape of Power Duct	Rectangular
Size of Power Duct	1.8 m x 2.6 m
Length of Power duct	130 m
Water Conductor System	
Shape of water conductor	Circular
Size of water conductor	950 m
Desilting tank cum forebay	
Size of Setting Basin	8.5 m wide x 68 m long
Transition (Expansion) from 2.6 m to 8.5 m	18 m
Maximum Flow	8.97 Cumecs
Design discharge	6 Cumecs
Inlet Bottom elevation	EL 1418.94 m
Center elevation of water conductor	EL 1416.88 m
Penstock	
Diameter of Bifurcation	1.28 m
Length of Bifurcated Penstock	25 m
Turbine / Generator	
Design Flow	3 Cumecs
Gross head	48 m
Design net head	41 m
Design discharge of Machine	6 Cumecs (For two units)
Output at “Design Net Head” & “Design Discharge”	100 kW at Generator Terminals + 20% continuous overload capacity
Type of turbine	Horizontal Francis Machine

[3] It is to be noted that in future there is possibility of change in slight configuration of projects implemented; however total project capacity of each project will remain same as above.

Type of Speed Regulation	Multi regulation using Digital Electro Hydraulic Type turbine governor.
Type of Generator	Horizontal, synchronous, Brushless excited, Air cooled open ventilated, 3 phase, having sufficient shaft extension to mount turbine runner.
Rated Speed	750 rpm
Generation voltage	3.3 kV Ph-Ph
Generator Rating	1000 kW, 3.3KV, 0.9 pf, +20% cont. overload capacity.
Power Evacuation	
Voltage rating of setup (Generation) transformer	3.3 kV/ 33kV, ONAN, OLTC
Power rating of generating transformer	2800KVA
Type of tap changer	On Load Tap Changer
Transmission Line Voltage	33 kV
Substation	33KV Grid Substation at Suman Sarwari PH
Length of 33KV single transmission line from PH to substation	2.7 Km long, DOF conductor & XLPE cable if necessary

1.9 Project Location

S. No.	Name of the SPVs	Village	Tehsil	District	State	Latitude	Longitude
1.	Gaur Hydro Pvt Ltd.	Dadka, Sarwari nallah	Kullu	Kullu	Himachal Pradesh	31°57'34.9" N	77°03'55.2" E
2.	Gopal Hydro Pvt Ltd.	Garola	Bharmour	Chamba	Himachal Pradesh	32°26'17.8"N	76°28'03.9"E

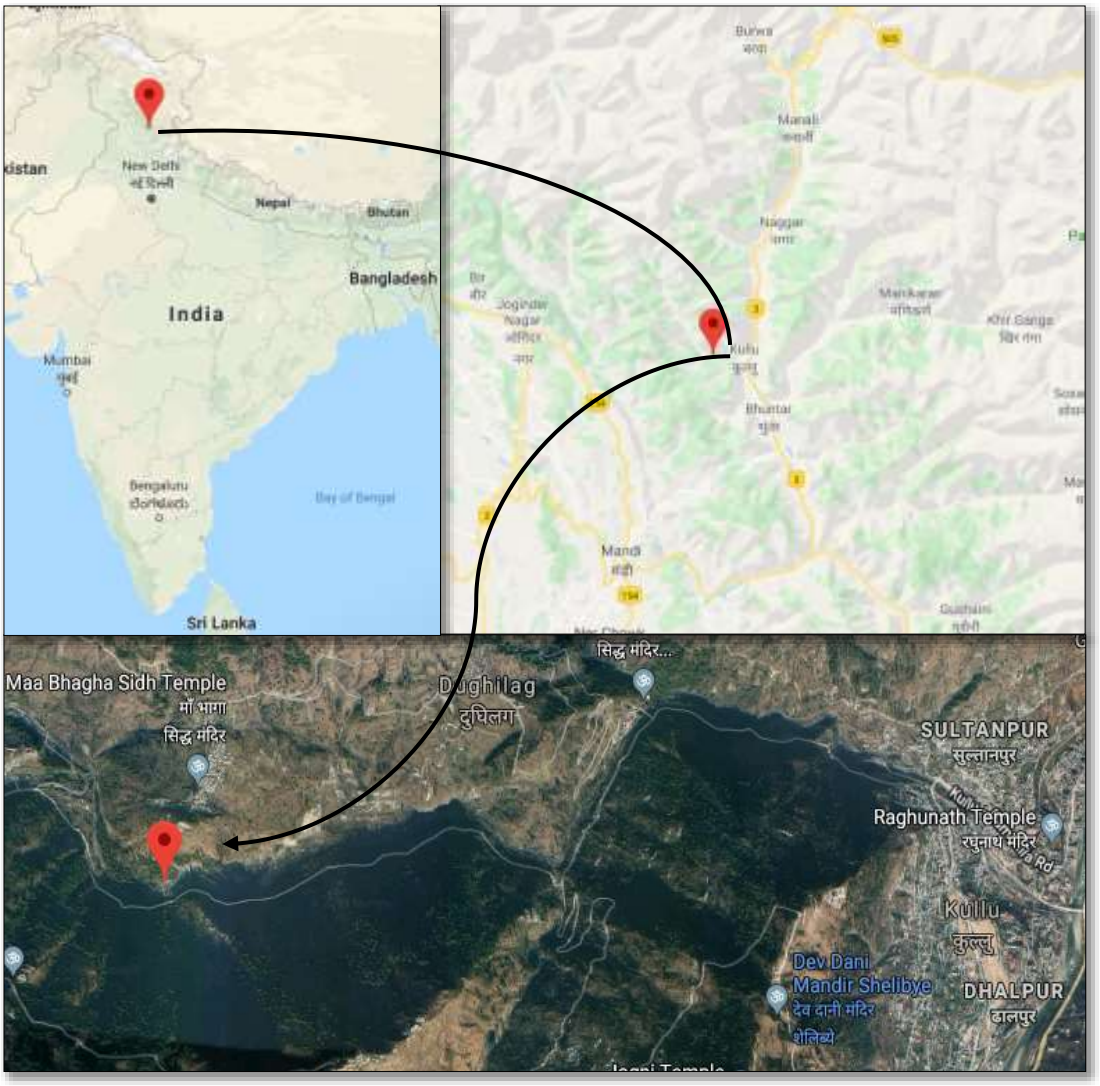


Figure 1. Satellite Location

1.10 Conditions Prior to Project Initiation

The project is a Greenfield hydroelectric 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 dioxide emissions in India. The main emission in the pre project scenario is the power plants connected to the Indian Grid, and main GHG involved is CO_2. Project activity thus helps in exploiting the small hydro potential and leads to a cleaner environment through lower greenhouse gas emissions and other pollutants and greater energy security of the nation through lower fuel consumption, fossil fuel conservation for other activities. Since the project activity generates electricity through sustainable means, it will not cause any negative impact on the

environment and there by contribute to climate change mitigation efforts. The baseline identified in section 2.4 is same as the pre-project scenario.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

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

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

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

1.12 Ownership and Other Programs

1.12.1 Project Ownership

As per VCS Program Definitions version 3.7, the project ownership is the legal right to control and operate the project activities.

Gaur Hydro Pvt Ltd.is the project proponent (PP) of project activity and they have formed each SPVs which have the legal right to control and operate the project activities.

The project ownership has been demonstrated through below supporting documents:

1. **Commissioning certificates –** The letter from respective State Nodal Agency to the SPVs of Azure Power India Pvt ltd for registration of commissioning of generation facility indicates that PP have the legal right to control and operate the project activities.

2. **Contract with EPC contractor –** The purchase order in the name of the SPVs of Azure Projects indicate that PP have the legal right to control and operate the project activities.

Based on above evidences, the project ownership is with **Gaur Hydro Pvt Ltd.**

1.12.2 Emissions Trading Programs and Other Binding Limits

The project activity under consideration is not participating in any other Emission trading programme and other binding limits.

The project activity is not participating at moment in any other emission trading programme and other binding limits. The GHG emission reductions generated during the current monitoring period have not been used for compliance of other mechanism

1.12.3 Other Forms of Environmental Credit

The proposed project activity neither has nor intends to generate any other form of GHG related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

The initial project activity is neither has nor intends to generate any other form of GHG related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

1.12.4 Participation under Other GHG Programs

The proposed project activity has not been registered and is not seeking registration at moment under any other GHG programs.

This project activity is not participating in any other GHG program.

1.12.5 Projects Rejected by Other GHG Programs

The proposed project activity is not participating in other Environmental credits, other GHG programs and has not been rejected by other GHG programs.

This project activity is not participating in other Environmental credits, other GHG programs and have not been rejected by other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

The proposed project activity is not a grouped project activity.

Leakage Management

This project activity is renewable energy project based on hydroelectric technology, therefore no leakage emissions are considered. Thus leakage management plan and implementation of leakage and risk mitigation measures are not applicable for this project activity.

Commercially Sensitive Information

Not applicable. No any commercially sensitive information has been excluded from the public version of the project description. There is no commercially sensitive information.

Sustainable Development

Contribution to sustainable development:

Apart from generation of renewable electricity, the project activity would contribute to the sustainable development of the region - socially, environmentally and economically. Ministry of Environment and Forests, has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. The project contributes to sustainable development using the following ways.

- **Social well-being:** The project would help in generating employment opportunities during the construction and operation phases. The project activity will lead to development in

infrastructure in the region like development of roads and also may promote business with improved power generation.

- **Economic well-being:** The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits the project activity will also help to reduce the demand supply gap in the state. The project activity creates local employment generation which helps economic well-being of local people.

- **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. The generation of electricity from the project leads to strengthening of the grid, increasing the energy availability thereby meeting the energy demand to a certain extent leading to technological wellbeing

- **Environmental well-being**: Hydro Electric Project reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. Due to its zero emission the Project activity also helps in avoiding significant amount of GHG emissions.

Further Information

Not Applicable.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The methodology for the project activity is approved methodology for large-scale CDM project activities. The details of the methodology are as follows:

Methodology: AMS I.D
Project Type: Type-I: Renewable Energy Projects
Title: Grid connected renewable electricity generation
Version No.: Version 18;
Reference: CDM Methodology[4]

The methodology refers to following CDM Tools:

- Tool to calculate the emission factor for an electricity system[5] - (Version 07.0 EB 100, Annex 04)

[4] https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK

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

2.2 Applicability of Methodology

The project activity under the project activity will meets the applicability conditions of the approved baseline and monitoring methodology AMS I.D, Version 18.0, Sectoral Scope 1, as described below:

Applicability	**Project activity vis-à-vis applicability Conditions**
1. This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a) Supplying electricity to a national or a regional grid. (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The project activity is a Renewable Energy Project i.e. Hydro Electric Power Project which falls under applicability criteria option 1(a) or option 1 (b). Hence the project activity meets the given applicability criterion.
2. Illustration of respective situations under which each of the methodology (i.e. "AMS-I.D.: Grid connected renewable electricity generation", "AMS-I.F.: Renewable electricity generation for captive use and mini-grid" and "AMS-I.A.: Electricity generation by the user) applies is included in the appendix[6].	The 1st option or 3rd option (of Table 2 of AMS I.D. Version 18, EB 61 is applicable (please refer footnote) as project supplies electricity to national grid.
3. This methodology is applicable to project activities that: (a) Install a Greenfield plant; (b) Involve a capacity addition in (an) existing plant(s); (c) Involve a retrofit of (an) existing plant(s); (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s).	The project activity instance is installation of new hydro based electricity generation green field plants (not addition to existing system). Option "a" is applicable.
4. Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per	The project is hydroelectric project and thus the criterion is not applicable to this project activity.

6

	Project type	AMS-I.A	AMS-I.D	AMS-I.F
1	Project supplies electricity to a national/regional grid		√	
2	Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			√
3	Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)		√	
4	Project supplies electricity to a mini grid[6] system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			√
5	Project supplies electricity to household users (included in the project boundary) located in off grid areas	√		

definitions given in the Project Emissions section, is greater than 4 W/m^2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	
5. If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project activity involves only renewable component with capacity less than 15 MW. Unit does not co-fire fossil fuels. Hence the criterion is not applicable to the project activity.
6. Combined heat and power (co-generation) systems are not eligible under this category.	The Project activity is a renewable hydro electric energy project and is not a combined heat and power system. Hence the criteria is not applicable to the project activity
7. In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct[7] from the existing units.	The project activity is Greenfield and there is no existing power generation facility at the site. Hence the criteria is not applicable to the project activity
8. In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	Not applicable, this project is a Green field project activity and this project is not the enhancement or up gradation project.
9. In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as "AMS-I.C.: Thermal energy production with or without electricity" shall be explored.	The Project activity is a renewable hydroelectric power project and is not a landfill gas, waste gas, waste water treatment and agro-industries projects or recovered methane emissions project. Hence the criteria is not applicable to the project activity
10. In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	The Project activity is a renewable hydroelectric power project and is not a biomass project. Hence the criterion is not applicable to the project activity.

Tool to calculate the emission factor for an electricity system[8] - Version 07.0 (EB 100, Annex 04)

[7] Physically distinct units are those that are capable of generating electricity without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered "physically distinct".

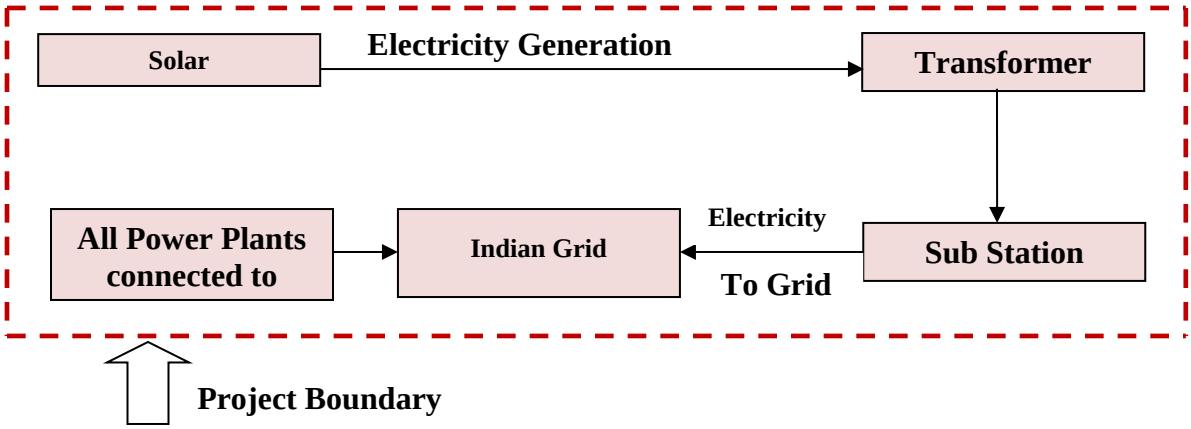
[8] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

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 IIa and option IIb. If option IIa 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 is included in section 2.4 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 located in non-Annex I country and hence the tool is applicable
Under this tool, the value applied to the CO_2 emission factor of biofuels is zero.	The project is a solar project and there is no involvement of biofuels.

2.3 Project Boundary

As per AMS I.D. version 18.0 - "The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to".

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 CO_2 emissions are 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 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".

As per AMS I.D. version 18.0; *"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, the baseline for the project activity is the equivalent amount of power from the INDIAN grid.

The combined margin ($EF_{grid,y}$) 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 of CEA database (where available) and made publically available.

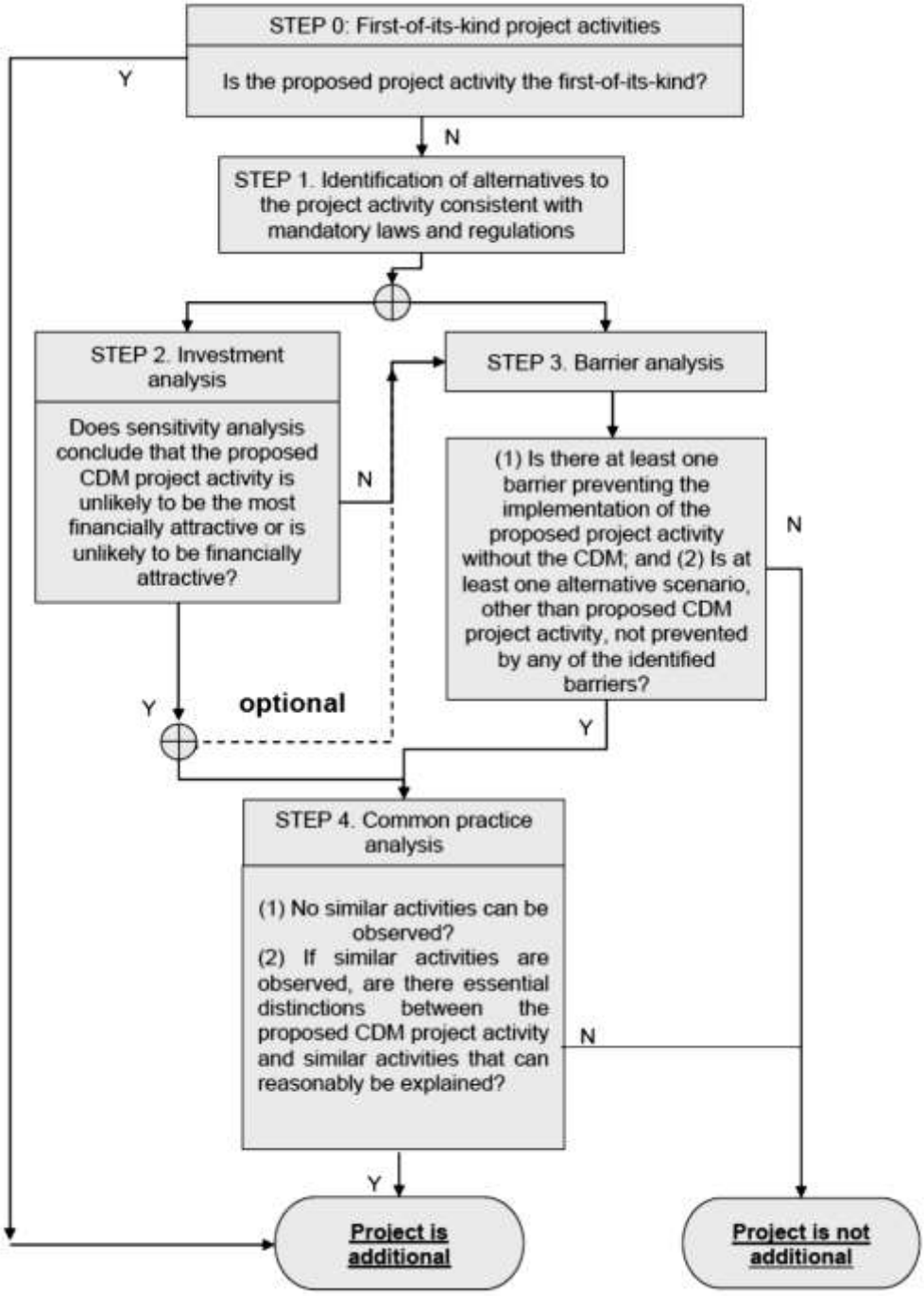
The combined margin of the INDIAN National Grid used for the project activity is as follows:

Parameter	Value	Nomenclature	Source
$EF_{grid,CMy}$	0.9368 tCO_2/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 CO_2 Emission Database, Version 14.0, December 2018 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,OM,y}$	0.9610 tCO_2/MWh	Operating margin CO_2 emission factor for the project electricity system in year y	Calculated as the last 3 year (2015-16, 2016-17, 2017-18) generation-weighted average, sourced from Baseline CO_2 Emission Database, Version 14.0, December 2018 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,BM,y}$	0.8644 tCO_2/MWh	Build margin CO_2 emission factor for the project electricity system in year y	Baseline CO_2 Emission Database, Version 14.0, December 2018 published by Central Electricity Authority (CEA), Government of India

2.5 Additionality

Additionality Assessment for large scale project activities

The present VCS project generates power using solar energy which is a renewable, zero emission source of energy. Baseline considerations for the project are based on approved baseline methodology AMS I.D. (Version 18.0). The methodology requires the project investor to determine the additionality based on “Methodological Tool- Tool for the demonstration and assessment of additionality”, Version 7.0.0. The step-wise approach to establish additionality of the project activity has been followed, details of which are provided in the following paragraphs:



In line with VCS Standard version 3.7, the additionality of the Project activity is ascertained in line with the applicable guidance from the UNFCCC. The demonstration of additionality for the proposed Project activity is being carried out in accordance with the additionality tool provided by the UNFCCC i.e. “Tool for demonstration and assessment of Additionality” Version 07.0.0,. The tool provides a step-wise approach to demonstrate additionality which is displayed below:

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

The proposed project activity is not the first-of-its-kind. Hence not applicable.

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

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

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

The purpose of the project activity is to generate electrical power using solar energy and feed the electricity generated to the grid. Hence, the following alternatives are considered:

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

The PP could proceed with the implementation of the project without Carbon credit benefits. The electricity produced from the renewable energy project would have been sold to the grid. This is in compliance with all applicable legal and regulatory requirements and can be a part of the baseline. However, the Project activity is not feasible without revenues from sale of Carbon Credits. This argument has been discussed in step 2 of the Additionality section.

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

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

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

Thus though two alternatives are mentioned above as per step of additionality tool, the first alternative is not possible as project activity is not viable without carbon credit benefits and second alternative is the baseline scenario for the project activity as per methodology as mentioned in section 2.4 of joint VCS PD & MR.

It is to be noted that being the green field project activity, “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”.

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

The alternative(s) shall be in compliance with all applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air

pollution. (This sub-step does not consider national and local policies that do not have legally-binding status.).

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

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

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

- Power generation using 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.

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

Step 2: Investment analysis

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

Sub-step 2a: Determine appropriate analysis method

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

In the absence of the project activity grid electricity would have been the obvious choice for the Project which requires no investment. Hence investment comparison analysis (Option II) is also not appropriate for the project activity.

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

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

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

Choice of Financial Indicator:

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

Choice of Benchmark:

As per Investment Analysis tool, Required/expected returns on equity are appropriate benchmarks for an equity IRR. The Equity IRR is considered as the financial indicator and the benchmarks used is cost of equity. Hence the benchmarks used are applicable to the project activity and the type of IRR calculation presented

At the time of decision made of project activity, version 09 of methodological tool "Investment Analysis" was the latest available tool for respective calculations, hence PP has considered the same tool for default value of return on equity. The default value of Return on Equity for Group-1 projects in India is 9.79%.

As per paragraph 7 of Appendix A of the above mentioned document, "In situations where an investment analysis is carried out in nominal terms, project participants can convert the real term values provided in the table below to nominal values by adding the inflation rate. The inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period. If this information is not available, the target inflation rate of the central bank shall be used. If this information is also not available, then the average forecasted inflation rate for the host country published by the IMF (International Monetary Fund World Economic Outlook) or the World Bank for the next five years after the start of the project activity shall be used".

Default Value Benchmark:

The investment analysis has been carried out in Nominal terms. Accordingly, Default value has been adjusted by adding suitable forecasted inflation rate taken from RBI (Central Bank, India).
PP has calculated Benchmark based on WPI mean inflation rate. As per Para 17 of Appendix of EB101, Annex 11, the inflation forecast should be for the duration of the crediting period. However, since RBI provides forecast inflation only for 5 & 10 years, the project investor has calculated benchmark using 10 years durations and the same is considered as Benchmark for the project activity.

The benchmark has been computed in the following manner:

Nominal Benchmark[9] = {(1+Real Benchmark)*(1+Inflation rate)}-1

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

Where,
Real Benchmark = 9.79% (as per Appendix of EB 101, Annex 11)
Inflation rate = Projected Inflation Rate for India in next 10 years (RBI Forecast)

Based on decision made for the large scale project activity, the inflation rate are taken from RBI forecast. Large scale project activity with investment decision date will be updated at the time of validation of the project activity is tabulated below:

SL No.	SPVs	Decision Date
1	Gaur Hydro Power Pvt. ltd.	15-03-2017
2	Gopal Hydro Power Pvt. ltd.	28-04-2017

The calculations of benchmark and IRR calculations are prepared in excel spreadsheet and same is submitted to DOE. The Appendix 1 mentioned the result of IRR, Benchmark and sensitivity analysis.

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

The Post tax Equity IRR is evaluated for the entire lifetime of the project activity, i.e. 25 years. It is calculated based on the cash outflows from and cash inflows into the project activity.
The IRR and Benchmark analysis are calculated in excel spreadsheet and same will be submitted to DOE during validation of project activity.

Gaur Hydro Power Pvt. ltd.	Equity IRR without CDM	Benchmark (Equity IRR)
	4.57%	14.18%

Gopal Hydro Power Pvt. ltd.	Equity IRR without CDM	Benchmark (Equity IRR)
	4.28%	14.18%

Based on result of IRR excel spreadsheets, equity IRR is less than Benchmark.
This substantiates that the investment is not financially attractive (Equity IRR for the project activity is less than the Benchmark). Thus it can be easily concluded that project activity is additional & is not business as usual scenario.

Sub-step 2d: Sensitivity Analysis

Addressing Guidance of EB 101, Annex 11, following factors has been subjected to sensitivity analysis:
1. PLF
2. O&M Cost
3. Project Cost
4. 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."

The results of sensitivity analysis show that even with a variation of +10% & -10% in project cost, O&M cost, PLF and Tariff Rate Equity IRR is significantly lower than the benchmark. And it is evident from the results given above; the project remains additional even under the most favourable conditions.

Probability to breach the benchmark:
Sensitivity Parameter 1 : PLF
PLF considered in financials for is as per Third Party PLF report in line with **"Guidelines for the reporting and validation of Plant load factors" stated in EB48 Annex11 option 3(b)**. Hence, variation in PLF of more than 10% is unlikely to happen as the PLF has been reported as per the Third Party Report based on long term data.
Sensitivity Parameter 2 : O&M
The sensitivity analysis reveals that O&M will breach the benchmark at negative values and is hypothetical case. Since the O&M cost is subject to escalation (as evidence by the O&M agreement) and also subject to inflationary pressure, any reduction in the O&M costs is highly unlikely. Hence, the reduction in the O&M cost is highly unlikely.
Sensitivity Parameter 3 : Project Cost
Project Cost for financial analysis is considered from DPR of the project activity, being available at the time of investment making decision to go ahead with the project activity. The actual project cost is lower than the DPR cost. Since the Purchase Order cost is firm, there is no possibility of project cost going below this level. However, Sensitivity is carried out for threshold level below which benchmark is not breached.
Sensitivity Parameter 4 : Tariff Rate
The tariff is determined by PPA which is fixed for entire lifetime of the project activity. Hence, there is no probability to get variation for the same. However, Sensitivity is carried out for +/-10% even then the benchmark is not breached.

Outcome of Step 2:

This substantiates that the investment is not financially attractive (Equity IRR for the project activity is less than the Benchmark Equity IRR) for any of 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

CPA is not required for small scale project activity.

2.6 Methodology Deviations

Not Applicable

3 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Will be updated.

3.2 Project Emissions

Will be updated.

3.3 Leakage

No other leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport etc.) are neglected.

3.4 Estimated Net GHG Emission Reductions and Removals

Will be updated.

4 MONITORING

4.1 Data and Parameters Available at Validation

Will be updated.

4.2 Data and Parameters Monitored

Will be updated.

4.3 Monitoring Plan

Will be updated.

5 SAFEGUARDS

5.1 No Net Harm

Will be updated.

5.2 Environmental Impact

Will be updated.

5.3 Local Stakeholder Consultation

Will be updated.

5.4 Public Comments

Will be updated.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Will be updated

6.2 Baseline Emissions

Will be updated.

6.3 Project Emissions

Will be updated.

6.4 Leakage

Will be updated.

6.5 Net GHG Emission Reductions and Removals.

Will be updated.