12 MW RAURA HYDRO PROJECT

BY DLI POWER.

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Table of Contents

1 Project Details 3
1.1 Summary Description of the Project 3
1.2 Sectoral Scope and Project Type 3
1.3 Project Proponent 4
1.4 Other Entities Involved in the Project 4
1.5 Project Start Date 4
1.6 Project Crediting Period 4
1.7 Project Scale and Estimated GHG Emission Reductions or Removals 4
1.8 Description of the Project Activity 5
1.9 Project Location 5
1.10 Conditions Prior to Project Initiation 6
1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks 6
1.12 Ownership and Other Programs 7
1.12.1 Project Ownership 7
1.12.2 Emissions Trading Programs and Other Binding Limits 7
1.12.3 Other Forms of Environmental Credit 7
1.12.4 Participation under Other GHG Programs 7
1.12.5 Projects Rejected by Other GHG Programs 7
1.13 Additional Information Relevant to the Project 8
2 Application of Methodology 9
2.1 Title and Reference of Methodology 9
2.2 Applicability of Methodology 9
2.3 Project Boundary 10
2.4 Baseline Scenario 11
2.5 Additionality 12
2.6 Methodology Deviations 14
3 Quantification of GHG Emission Reductions and Removals 15
3.1 Baseline Emissions 15
3.2 Project Emissions 19
3.3 Leakage 19
3.4 Net GHG Emission Reductions and Removals 19
4 Monitoring 20
4.1 Data and Parameters Available at Validation 20
4.2 Data and Parameters Monitored 21
4.3 Monitoring Plan 28
5 Safeguards 29
5.1 No Net Harm 29
5.2 Environmental Impact 29
5.3 Local Stakeholder Consultation 30
5.4 Public Comments 30
APPENDIX 1: <Technology Details> 31

1 PROJECT DETAILS

1.1 Summary Description of the Project

The main purpose of the project activity is to generate clean electricity by utilizing renewable electricity from hydropower and to export the generated net electricity to the regional grid for sale. This results in reduction of greenhouse gas emissions (GHGs) into the atmosphere which would have otherwise been occurred due to production of equivalent amount of electricity at the regional grid from other carbon intensive sources. As it is evident that Indian grid[1] is having predominantly coal based[2] thermal power generation share and therefore, is a major source of carbon dioxide emissions in India.

The proposed project activity is a run-of-river Small Hydroelectric Project (SHP) of capacity 12 MW being developed at kinnaur district of Himachal Pradesh. The generated electricity after auxiliary consumption shall be exported to grid via Himachal Pradesh State Electricity Board (HPSEB) for sale. In terms of technology, the project activity converts the potential energy available in water flows to mechanical energy using hydro turbines which drives generators to generate electricity.

The proposed technology involves one 12 MW Francis type turbine to be installed and commissioned. The project activity is developed and owned by DLI Power (India) Private Limited. DLI is part of DLZ Corporation, one of the foremost engineering and water resource companies in the Midwestern United States. The details of the technology and equipment's shall be provided in section 1.8.

The proposed project activity is the installation of a Greenfield power plant. Therefore, the scenario existing prior to the implementation of the project activity is electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources at grid.

As per the applicable methodology AMS-I.D. ver 18, para 19, "*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.*" The project will reduce anthropogenic emissions of greenhouse gases (GHG's) by displacing approximately 61,495 MWh/year of electricity at grid which estimates an emission reduction of approximately 56,726 tCO_{2e} per year. Total estimated GHG emission reductions for the chosen 10 year renewable crediting period will be 5,67,262 tCO_{2e}.

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

The project is not a grouped project.

[1] [1]As per CEA database version 11 (released in April 2016), in previous years the Indian electricity system was divided into two grids, the NEWNE and Southern Grid (SR), which are now integrated as a single 'Indian Grid' covering all the states.

[2] CO_2 Baseline Database for the Indian Power Sector Version- 13, Dated: June 2018. Page 6.

1.3 Project Proponent

Organization name	DLI Power (India) Private Limited.
Contact person	Mr. Prakash Therade
Title	GM Finance
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1.4 Other Entities Involved in the Project

Not Applicable.

1.5 Project Start Date

As per the definition of VCS, the expected project start date of the project is considered as 01 November 2018 as this is the expected date of commissioning of the project.

1.6 Project Crediting Period

The proposed start date of Crediting Period is 01-November-2018 or the date of commissioning of the project, whichever occurs later.

Thus, proposed Crediting Period is: “01 November-2018 to 31 October, 2028”.

The project Crediting Period is considered for a period of 10 years, which shall be renewed for maximum of 2 times depending on the lifetime of the project.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	X
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 1	56,726
Year 2	56,726
Year 3	56,726
Year 4	56,726
Year 5	56,726
Year 6	56,726
Year 7	56,726
Year 8	56,726
Year 9	56,726
Year 10	56,726

Total estimated ERs	5,67,262
Total number of crediting years	10
Average annual ERs	56,726

1.8 Description of the Project Activity

The Project activity is a new facility (i.e. Greenfield project) 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 from other source. The Project Proponent plans to avail the VCS benefits for the Project.

Proposed technology in the project activity will be one Francis turbine. As common in case of run-of-river project, the flowing water is guided through a head race tunnel and penstock gate and jetted on to a turbine. This action rotates the turbine, which is connected to a synchronous generator. The rotation of turbine causes the rotation of the generator thereby producing electricity. The generated electricity is proposed to be stepped up to 132 kV and exported to regional grid, which is part of Indian grid. The technical specifications of the employed technology are provided in Annex 1.

For the project activity, the project boundary is from the point of water tapping to the point of electricity supply to the grid. Thus the project boundary is as follows:

- Trench weir
- Water conductor
- Fore bay
- Penstock
- Powerhouse
- Tail race canal
- Transmission line to grid connection
- Indian Grid

1.9 Project Location

The project activity is located as follows:

Host Part(ies) : India
Region : North India.
State : Himachal Pradesh
District : Kinnaur

The project activity is located[3] at 31^0 35’ 00” N latitude and 76^0 22’ 30” E longitude. The projects are accessible by National Highway (NH)-5 which runs from Shimla to kinnaur. The nearest big city is Shimla. Kalka is the major railway station and is about 80 kilometers from Shimla. Kalka is about 300 kilometers from New Delhi, the capital city of India.

The location of project activity is shown in following map figures:

[3] Exact and final coordinates of the plant shall be confirmed and included in the VCS PD at the time of commissioning of the project.



1.10 Conditions Prior to Project Initiation

The project is a Greenfield run-of river small hydro 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 fossil fuel 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_{2e}. 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 and also in the process of receipt of necessary approvals for development and commissioning of the plant from all the concerned authorities; 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

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

- Power generation using hydro energy is not a legal requirement or a mandatory option.
- There are state and sectoral policies, framed primarily to encourage hydro 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 "DLI Power (India) Private Limited", hence it possess the ownership right of the carbon credits to be generated from the project. The Ownership of the project can be demonstrated through the following documents:

1) Commissioning certificate, to be issued at the time of first commercial production of the plant (i.e. expected by Nov 2018) by respective state nodal agencies /authorities of the state Himachal Pradesh of India.

2) Power Purchase Agreement with State Electricity Board for sale of electricity by the DLI Power (India) Private Limited.

1.12.2 Emissions Trading Programs and Other Binding Limits

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

1.12.3 Other Forms of Environmental Credit

The Project has no intend to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program. Thus, project shall ensure no double accounting of environmental benefits during the entire crediting period.

1.12.4 Participation under Other GHG Programs

The project has not been applied under any other GHG mechanism or programs other than VCS.

1.12.5 Projects Rejected by Other GHG Programs

The project has not been applied under any other GHG mechanism or programs other than VCS. Thus, the project has not been rejected by other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

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

Leakage Management

Not applicable to the project activity.

Commercially Sensitive Information

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

Sustainable Development

Contribution to sustainable development:
Ministry of Environment and Forests, has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. The project shall contribute to sustainable development by means of the following aspects:

Social well-being: The project would help in generating local and broad-spectrum of employment opportunities during the construction and operation phases. The project activity leads to development in infrastructure in the region like development of nearby roads in the project region and also directly and indirectly promotes business of clean energy with renewable power generation.

Environmental 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 reducing the power demand supply gap in the state. The project activity will generate power using only hydro resource thus ensures zero emissions based power generation which directly helps reduction of GHG emissions and specific pollutants like SOx, NOx, and SPM associated with the conventional thermal power generation facilities.

Technological well-being: The successful operation of project activity would lead to promotion of Small Hydro Power (SHP) based power generation and would encourage other entrepreneurs to participate in similar projects. Also, the project is going to be an integral part of national energy security as the plant is expected to be operational for a technical life-time of 30 years.

Economical well-being: SHP being a renewable source of energy, it reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion and currently dependent on huge import. Thus, there would be an indirect significant impact on national economy across the lifetime of the project. Also, project is creating local jobs and general employment opportunity at various levels which ensures economic wellbeing for the people and expecting a gradual improvement in livelihood of the nearby people due to such income generation.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Title of approved baseline and monitoring methodology:
"Renewable electricity generation for a grid" in accordance with approved small scale methodology AMS I.D.

Type I : Renewable energy project
Sectoral Scope : 01, Energy Industries
Category I.D : Grid connected renewable electricity generation, version 18
Tool reference : "Tool to calculate the emission factor for an electricity system" (version 06)

2.2 Applicability of Methodology

The project activity involves generation of grid connected electricity from the construction and operation of a new renewable run-off river small hydro power plant. The project activity has a proposed capacity of 12 MW which will qualify for a small scale project activity under Type-I of the Small Scale methodology. The project status is corresponding to the methodology AMS-I.D version 18 and applicability of methodology is discussed below:

Applicability Criterion	Project Case
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; or (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. Small Hydro Power (SHP) generation Project which falls under applicability criteria option 1 (a) i.e., "Supplying electricity to the Indian grid". Hence the project activity meets the given applicability criterion as well as satisfies the applicability illustration mentioned in Appendix of AMS-ID Table 1 – Scope of AMS-I.D version 18.
2. 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) (d)Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) (e) Involve a replacement of (an) existing plant(s).	The option (a) of applicability criteria 2 is applicable as project is a Greenfield plant /unit. Hence the project activity meets the given applicability criterion.
3. Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: (a) The project activity is implemented in existing reservoir, with no change in the volume of the reservoir; or (b) The project activity is implemented in existing reservoir, where the volume of the reservoir(s) is increased and the power density as per	The project is installation of new runoff river SHP electricity generation plants (not a reservoir based hydro power plant). Hence this criterion is not applicable to the proposed project activity.

definitions given in the project emissions section, is greater than 4 W/m^2. (c) (c) 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/m2	
4. 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 proposed project is 12 MW SHP i.e. only component is renewable power project below 15MW, thus the criterion is not applicable to this project activity.
5. Combined heat and power (co-generation) systems are not eligible under this category	The project is SHP power project and thus the criterion is not applicable to this project activity.
6. In the case of project activities that involve the capacity 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 distinct1 from the existing units.	The proposed project is a greenfield 12 MW SHP i.e. only component is renewable power project below 15MW, thus the criterion is not applicable to this project activity
7. In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW.	The proposed project is a greenfield 12 MW SHP i.e. only component is renewable power project below 15MW, thus the criterion is not applicable to this project activity
8. 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 proposed project is a greenfield 12 MW SHP i.e. only component is renewable power project below 15MW, thus the criterion is not applicable to this project activity
9. In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	The proposed project is a greenfield 12 MW SHP i.e. only component is renewable power project below 15MW, thus the criterion is not applicable to this project activity

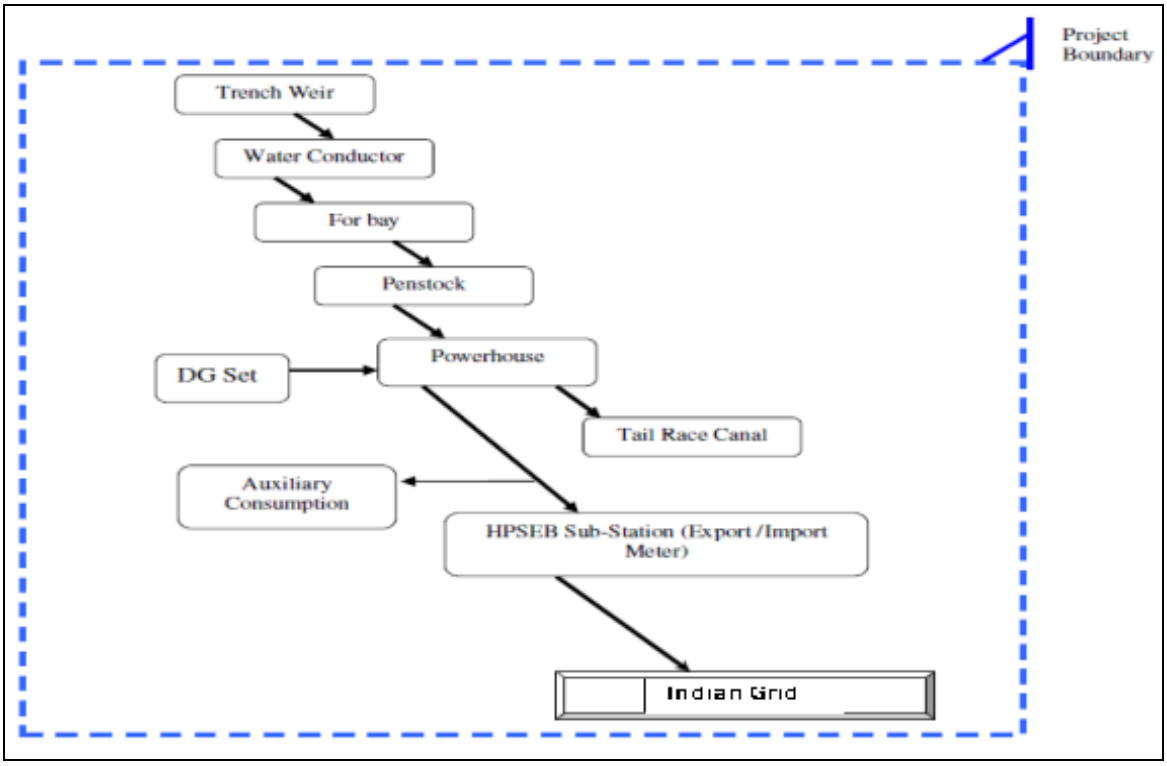
2.3 Project Boundary

As per applicable methodology AMS-I.D. Version 18, "The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the project power plant is connected to."

The project boundary also includes a stand-by diesel generator (DG) set which will be operated only as a failsafe option or stand by power requirements in case the power plant is not operating. The Indian grid is included in the project boundary.

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 SHP Power Project Activity	CO_2	No	No CO2 emissions are emitted from the project
		CH_4	No	Project activity does not emit CH4
		N_2O	No	Project activity does not emit N2O
		Other	No	No CO2 emissions are emitted from the project

Schematic Diagram of the Project Activity:



2.4 Baseline Scenario

As per the approved consolidated methodology AMS-I.D. Version 18, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario 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".

The project activity involves setting up of a new SHP plant to harness the green power from Hydal energy and to supply the produced power 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 produced at grid from the other conventional sources which are predominantly fossil fuel based. Hence, the baseline for the project activity is the equivalent amount of power produced at 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 50%) and build margin (BM) (having weightage 50%). 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
$EF_{grid,CM,y}$	0.92245 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 (0.5) & build margin (0.5) values, sourced from Baseline CO_2 Emission Database, Version 13 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,OM,y}$	0.97257 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 CO_2 Emission Database, Version 13, published by Central Electricity Authority (CEA), Government of India
$EF_{grid,BM,y}$	0.87233 tCO2/MWh	Build margin CO_2 emission factor for the project electricity system in year y	Baseline CO_2 Emission Database, Version 13, published by Central Electricity Authority (CEA), Government of India.

2.5 Additionality

The additionality of the proposed project activity is demonstrated using an investment barrier analysis as according to the steps described in the 'Demonstration of additionality of Small Scale project Activities' (version 12.0.0).

As per the applied methodology AMS-I.D. version 18; Para 19, if the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity delivered to the grid by

the project activity would have otherwise been generated by the operation of grid connected power plant and by the addition of new generation sources.

As the baseline scenario is prescribed by applied methodology, hence no further analysis is carried out to identify alternatives.

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 Participants have considered Post-Tax Equity IRR for investment analysis at the time of decision-making. As Project Participants is only interested in the returns project is generating on the portion of investment costs, which is financed by them in the form of equity.

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."

Accordingly, the post-tax Equity IRR has been considered as the relevant financial indicator for Investment Analysis.

As a conservative approach, benchmark of 20.45% has been selected for this project activity.

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

Considering the input values, Equity IRRs is given below:

Equity IRR	Benchmark (ROE)
9.45%	20.45%

The proposed project activity cannot be considered as financially attractive as the equity IRR for the project activity is less than the Benchmark.

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."

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; the project remains additional even under the most favourable conditions.

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
For small scale project activities same is not required.

The above discussions show that proposed SHP power project is not a financially attractive investment by virtue of its onw; hence the project activity is additional.

2.6 Methodology Deviations

Not Applicable.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Baseline emissions include only CO_2 emissions from electricity generation in 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:

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

BE_y	=	Baseline emissions in year y (t CO2)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{grid,y}$	=	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" (t CO2/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 CO2/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 13, published by Central Electricity Authority (CEA), 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 06.0, EB 97, Annex 7), 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." It also states that "If the

DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used." Keeping this into consideration, the Central Electricity Authority (CEA), Government of India has divided the Indian Power Sector into five regional grids viz. Northern, Eastern, Western, North-eastern and Southern. However, all the 5 zones have now been synchronized and called as Indian Grid.

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 (EFgrid,OM,y) is based on one of the following methods, which are described under Step 4:

(a) Simple OM; or

(b) Simple adjusted OM; or

(c) Dispatch data analysis OM; or

(d) Average OM.

The data required to calculate Simple adjusted OM 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/mustrun resources typically include hydro, geothermal, wind, low cost biomass, nuclear and solar generation.

The CEA database 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 (tCO2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

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 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 DOE for validation.

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

Step 4: Calculate the operating margin emission factor ($EF_{grid,OMSimple,y}$) 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)

2014-15	2015-16	2016-17
808,417,293	871,753,243	916,277,834

Simple Operating Margin Emission Factors (tCO2/MWh) (incl. Imports)

2014-15	2015-16	2016-17
0.99	0.97	0.96

Weighted Generation Operating Margin (t CO2/MWh) 0.97257

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 06.0, EB 97, Annex 7) para 73:

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 PDD and is fixed for the entire crediting period.

Build Margin (tCO_2/MWh) (not adjusted for imports) –

Indian Grid (2016-17) = 0.8723

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 06.0, EB 97, Annex 7) para 82 :

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 CO2 emission factor in year y (t CO2/MWh)
$EF_{grid,OM,y}$	=	Operating margin CO2 emission factor in year y (t CO2/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 wOMand wBM:

(a) Hydro power generation project activities: W_{OM}= 0.5 and W_{BM}= 0.5 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods W_{OM}= 0.25 and W_{BM}= 0.75

Therefore,

$EF_{grid,CM,y}$	=	0.9726*0.5 + 0.8723*0.5
	=	0.92245 tCO_2/MWh

Baseline emission factor (EF_y) :

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

Therefore,

EFy = $EF_{grid,CM,y}$ = 0.92245 t CO2/MWh.

3.2 Project Emissions

For most renewable power generation projects activities PEy =0. As per applied methodology only emission associated with the fossil fuel combustion, emission from operation of DG Set, would be accounted for the project emission on actuals.

Diesel consumption:
The project also involved consumption of minor quantity of Diesel in standby DG Set. So, the formula used to calculate the project emissions due to diesel consumption is provided below:

$PE_{Diesel} = \sum DCy \times P \times NCV_{Diesel} \times EF\ CO_{2Diesel}$

Where,

PE_{Diesel}	= Project Emission due to use of Diesel consumed during this monitoring period in DG set
DCy	= Diesel Consumption in Liters (L)
P	= Density of Diesel (0.86Kg/Lit)
NCV_{Diesel}	= Net Calorific Value of Diesel
$EF_{CO2Diesel}$	= IPCC 2006 Emission factor for Diesel

3.3 Leakage

As per paragraph 22 of AMS-I.D. version-18, 'If the energy generating equipment is transferred from another activity, leakage is to be considered.' In the project activity, there is no transfer of energy generating equipment and therefore the leakage from the project activity is considered as zero.

Hence, LEy= 0

3.4 Net GHG Emission Reductions and Removals

Thus, ERy = BEy – PEy – LEy

Where:

ER_y = Emission reductions in year y (tCO2/y)

BE_y = Baseline Emissions in year y (t CO2/y)

PE_y = Project emissions in year y (tCO2/y)

LE_y = Leakage emissions in year y (tCO2/y)

.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	56,726	0	0	56,726
Year 2	56,726	0	0	56,726
Year 3	56,726	0	0	56,726
Year 4	56,726	0	0	56,726
Year 5	56,726	0	0	56,726
Year 6	56,726	0	0	56,726
Year 7	56,726	0	0	56,726
Year 8	56,726	0	0	56,726
Year 9	56,726	0	0	56,726
Year 10	56,726	0	0	56,726
Total	**567262**	0	0	**567262**

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid, CM, y}$
Data unit	t CO_2 /MWh
Description	Combined margin emission factor for Indian grid connected power generation in year y calculated using the latest version of "Tool to calculate the emission factor for an electricity system"
Source of data	CO_2 baseline database (Version 13.0) published by CEA on June 2018
Value applied	0.92245
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 6.0 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 Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{grid, OM, y}$
Data unit	t CO2 /MWh
Description	Simple operating margin emission factor for Indian grid
Source of data	CO2 baseline database (Version 13.0) published by CEA on June 2018
Value applied:	0.9726

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 06.0.0
Purpose of Data	For the calculation of baseline emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{grid, BM, y}$
Data unit	t CO2 /MWh
Description	Simple build margin emission factor for Indian grid
Source of data	CO2 baseline database (Version 13.0) published by CEA June 2018
Value applied:	0.8723
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 06.0.0
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	P
Unit	kg/ltr
Description	Density of diesel
Source of data	http://www.fast-tek.com/TM104.pdf http://www.iocl.com/Products/DieselSpecifications.pdf
Value(s) applied	0.860
Justification of choice of data or description of measurement methods and procedures applied	Fixed Value has been taken from the publicly available data source.
Purpose of data	Calculation of project emission
Additional comment	-

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{BL,y}$
Data unit	MWh
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the project activity in year y (MWh)
Source of data	Monthly Joint Meter Readings (JMRs)
Description of measurement methods	Data Type: Measured Monitoring equipment: Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly

and procedures to be applied	recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: 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 obtained from joint meter reading certificates/credit notes issued as per below equation: $EG_{PJ,y} = EG_{Export} - EG_{Import}$ The calculation is done by HPSEB 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. 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 HPSEB in the presence of PP or representative of PP. Cross Checking: Quantity of net electricity supplied to the grid will be cross checked from the invoices raised by the project participant to the grid
Frequency of monitoring/recording	Monthly
Value applied	61,495
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 to be applied	This figure can be cross verified using the Invoices raised by the company and also from the payment received by the company from HPSEB for the month.
Purpose of data	Calculation of baseline emission
Calculation method	$\mathbf{EG_{BL,y}} = EG_{Export} - EG_{Import}$ The calculated value of this parameter is indicated in the JMR which is prepared by HPERC as per PPA. Quantity of net electricity supplied to the grid in year y is the

	difference between the measured quantities of the grid export and the import.
Comments	PP shall archive all the JMRs and plant record books pertaining to the electricity exported for at least two years after the end of the crediting period.

Data / Parameter	EG_{Export}
Data unit	MWh
Description	Quantity of Total electricity supplied to the grid as a result of the implementation of the project activity in year y (MWh)
Source of data	Monthly Joint Meter Readings (JMRs)
Description of measurement methods and procedures to be applied	Data Type: Measured Monitoring equipment: Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: 5 years Electricity exported/imported to the grid is in kWh. However for the calculation purpose electricity exported is converted in MWh. 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 HPSEB in the presence of PP or representative of PP. Cross Checking: Quantity of Total electricity Export to the grid will be cross checked from the invoices raised by the project participant to the grid
Frequency of monitoring/recording	Monthly
Value applied	61,495
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 to be applied	This figure can be cross verified using the Invoices raised by the company and also from the payment received by the company

	from HPSEB for the month.
Purpose of data	Calculation of baseline emission
Calculation method	Measured The units exported will be measured at the main meter and check meter at the substation interconnection point. Monthly joint meter reading of main meters installed at the substation shall be taken and signed by authorised officials of PP and HPSEB. Joint meter reading shall be the basis for monthly invoice of net energy exported to the grid.
Comments	PP shall archive all the JMRs and plant record books pertaining to the electricity exported for at least two years after the end of the crediting period.

Data / Parameter	EG_{Import}
Data unit	MWh
Description	Quantity of Total electricity Import from the grid as a result of the implementation of the project activity in year y (MWh)
Source of data	Monthly Joint Meter Readings (JMRs)
Description of measurement methods and procedures to be applied	Data Type: Measured Monitoring equipment: Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: 5 years Electricity exported/imported to the grid is in kWh. However for the calculation purpose electricity exported is converted in MWh. 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 HPSEB in the presence of PP or representative of PP. Cross Checking: Quantity of Total electricity Export to the grid will be cross checked from the invoices raised by the project participant to the grid
Frequency of monitoring/recording	Monthly
Value applied	0

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 to be applied	This figure can be cross verified using the Invoices raised by the company and also from the payment received by the company from HPSEB for the month.
Purpose of data	Calculation of baseline emission
Calculation method	Measured The units exported will be measured at the main meter and check meter at the substation interconnection point. Monthly joint meter reading of main meters installed at the substation shall be taken and signed by authorised officials of PP and HPSEB. Joint meter reading shall be the basis for monthly invoice of net energy exported to the grid.
Comments	PP shall archive all the JMRs and plant record books pertaining to the electricity exported for at least two years after the end of the crediting period.

Data / Parameter	DC_y
Data unit	Litres
Description	Diesel consumption by the standby DG set in year y
Source of data	Plant Records
Description of measurement methods and procedures to be applied	The diesel quantity available in the diesel storage tanks is recorded daily by PP in the plant log book. The diesel consumption would be recorded in the logbook in litres. However, based on the density of diesel of about 0.86 kg/litre, the diesel consumption in tons would be calculated
Frequency of monitoring/recording	Continuously and recorded monthly basis.
Value applied	0
Monitoring equipment	Calculated
QA/QC procedures to be applied	The measured data will be cross checked with total diesel procurement using payment receipts.
Purpose of data	Calculation of project emissions
Calculation method	Data Type: Measured & Calculated

	1) The diesel quantity available in the diesel storage tanks is recorded as initial and final reading as and when used on the basis of level gauge by PP in the plant log book. 2) PP also maintain the record of DG set running hours and the kWh generated by the DG set. 3) The level gauge has marking of 10 lit (Least Count) up to the 300 Lit (Total Capacity of diesel tank) which is calibrated manually every year. The Level Gauge of DG set is a standard scale and mounted inside the cap of fuel tank. Annually, the calibration of level gauge is carried out by checking the standard marking of 10 Lit (Least Count) up to the 300 Lit (Total Capacity of diesel tank) and comparing the level of tank by filling the measured quantity of Diesel (litre as mentioned in purchase receipt) in to tank. The records of filling of tank is maintained in DG set log book at Project site. 4) The diesel consumption would be recorded in the plant logbook in liters. The values will be converted to tons using a factor 0.86 kg/liters (density of diesel), for the purpose of calculation. 5) The diesel will be consumed only in the rare situation only when the power plant is not operational. 6) This value is used for project emission calculation. Data Archiving: Paper/ Electronic.
Comments	The data would be archived upto two years after the end of crediting period.

Data / Parameter	$NCV_{diesel,y}$
Data unit	GJ/Ton
Description	Net calorific value of the Diesel in year y
Source of data	As options a,b & c are not available, the project proponent chooses option d i.e IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories and is fixed Ex-ante. This is in accordance to the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" version 02,
Description of measurement methods and procedures to be applied	IPCC Default Value is considered
Frequency of monitoring/recording	IPCC Default Value is considered
Value applied	43.30

Monitoring equipment	IPCC Default Value. As per the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", any future revision of the IPCC Guidelines should be taken into account. As the value considered in the registered version is conservative, hence same has been considered here.
QA/QC procedures to be applied	IPCC latest guideline.
Purpose of data	Calculation of project emission
Calculation method	Not Aplicable
Comments	The data would be archived upto two years after the end of crediting period.

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Data / Parameter	$EF_{CO2,diesel,y}$
Data unit	tCO_2e / TJ
Description	CO_2 emission factor of diesel in year y
Source of data	IPCC default value
Description of measurement methods and procedures to be applied	As options a,b & c are not available, the project proponent chooses option d i.e. IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories and is fixed Ex-ante. This is in accordance to the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" version 02.
Frequency of monitoring/recording	IPCC default value has been considered
Value applied	74.8
Monitoring equipment	IPCC default values. As per the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", any future revision of the IPCC Guidelines should be taken into account. As the value considered in the registered version is conservative, hence same has been considered here.
QA/QC procedures to be applied	IPCC Latest guideline
Purpose of data	Calculation of project emission
Calculation method	The data would be archived upto two years after the end of crediting period.
Comments	

4.3 Monitoring Plan

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

Since the baseline emission factor is based on an ex-ante determination, monitoring of this parameter is not required.

The general principles for monitoring above parameters are based on:

- Frequency
- Data recording
- Reliability
- Experience and training

Frequency
Monthly joint meter reading (JMR) of main meters installed at the substation are taken and signed by authorised officials of PP and HPSEB. Daily data recording by the shift in-charge of PP are available at the generation end and interconnection point. JMR are the basis for monthly invoice of net energy exported to the grid.

Data recording
Records of the monthly joint meter reading of net energy exported to the grid are maintained by PP and HPSEB. Daily and monthly reports stating the generation, auxiliary consumption, Total electricity export and import, diesel consumption are prepared by the shift in-charge in PP.

Reliability
For measuring the net energy exported to the grid, one main meter and one check meter is maintained. Main meter reading is the basis of billing and emission reduction calculations. During this monitoring period the meter is found to be within prescribed limits of accuracy during half yearly check. Monthly JMR of main meters are taken and signed by authorised officials of PP and HPSEB once in every month. Records of the JMR are maintained by PP and HPSEB.

Procedure for data uncertainty:
The main and check meter are test/checked for accuracy every six months and sealed by HPSEB in presence of representative of PP. The calibration of meters is as per IS standards. Both billing and check meters have separate set of CT/PT units to avoid chances of both going out of order simultaneously.

If during half yearly test checks, the main meter and check meter are both found to be beyond permissible limits of error, then both meters shall be replaced with calibrated meters by PP under the supervision of HPSEB. All the tests on the main and check meters shall be conducted by the electricity authority in presence of the representatives of project proponents. In this case when both the meter found faulty simultaneously, which is very unlikely; then as per the PPA Clause Energy exported will be computed on a mutually agreeable basis between the Company and the Board for that particular period.

Data archiving and safe storage responsibility
PP archives and preserves all the monthly invoices raised against net saleable energy parameters. Managing director and Plant Manager shall be responsible for the safe storage of the archived data.

Interruptions
Number of trippings due to grid failure shall be recorded.
The operational and management structure of the project activity is given below:

Managing Director of PP is based in head office in Pune, Maharashtra state, India and periodically visits the plant. A Shift engineer shall be available in each shift. Shift engineers are involved in operation and maintenance of hydroelectric plants and are assisted by technicians. Senior Engineer shall be assisted by a fitter who shall be responsible for on-site maintenance of the equipment, preventive maintenance etc.

Monitoring measurements and reporting:
The shift engineer records the readings from main meter and check meter daily and these readings are counter-checked by the Plant Manager. Daily reports are sent to respective head office electronically and Monthly reports are generated and maintained at the plant and head office.

Records of JMR are maintained by plant manager. Monthly invoices are prepared based on JMR which can be cross checked from the payment received against the invoice.

Procedures for maintenance of monitoring equipment and installations:
In the context of the identified project activity, energy meter is the only equipment which is required to track the monitoring parameters as per the registered monitoring plan. As per standard power purchase agreement (PPA) practices, the energy meters and the meter boxes are owned and kept sealed by the HPSEB and hence shall be maintained by HPSEB.

Procedure for internal audits & project performance review:
The internal audit team will comprise Managing Director, General Manager (OM), Plant Manager and Engineer of PP. The internal audit will be conducted once in a year. The internal audit team will also be responsible for the review and follow-up of corrective actions.

Procedure for data apportioning:
In the event when verification period dates and billing cycle dates in the project activity, do not coincide:

In the event when the verification period dates and billing cycle dates (JMR dates) do not coincide, daily export and import reading from main and check meter would form the source of emission reduction calculation for that period. The daily export and import readings are taken manually from the main and check meter on the daily basis in the presence of representative of PP and HPSEB.

5 SAFEGUARDS

5.1 No Net Harm

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

5.2 Environmental Impact

According to Indian regulation, the implementation of the renewable energy power project does not require an Environmental Impact Assessment (EIA).

As per the Ministry of Environment and Forests (Government of India) notification dated September 14, 2006 regarding the requirement of environmental Impact Assessment (EIA) studies as per the Environmental Protection Rule, 1986 (Published in the Gazette of India, Extraordinary, Part-II, and Section 3, Sub-section (ii) Ministry of Environment and Forests), any

project developer in India needs to file an application to the Ministry of Environment and Forests (including a public hearing and an EIA) in case the proposed industry or project is listed in a predefined list. The renewable energy power Projects are not included in this list and thus an EIA is not required. Hence, environmental impact analysis is not required for the groped project activity and also for the project activity instances.

5.3 Local Stakeholder Consultation

The local stakeholder's consultation for the project activity will be conducted on 10th August 2018 at project site and as per the guideline and invitations will be sent to the 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.

Identified local stakeholders at the project site:

- Local villagers,
- Panchayat members,
- Shopkeepers, suppliers, vendors and representatives of PPs.

The stakeholders will be made aware of the project activity and the various benefits arising out of the project activity. A discussion will be held in which the views of the local stakeholders will be addressed.

Summary of comments received will be documented & provided in the VCS PD.
Report on consideration of comments received will be documented & provided in the VCS PD.

5.4 Public Comments

The project will be listed on VCS registry and the further details & comment will be documented.

APPENDIX 1: <TECHNOLOGY DETAILS>

Intake

Full supply level	: 744.73 m
Minimum draw down level for power	: 720.7 m

Power house

Type	: Surface, RCC and masonry
Size	: 21.5 m x 29.25 m
Floor level	: 674.15 m
Level of CL of turbine	: 665.5 m
Capacity of OH crane	: 65/15 tonnes

Turbine unit

Max gross head	: 77 m
Net design head	: 69 m
Design discharge	: 19.25 m3/s
Type of generating unit	: Vertical, Francis, top mounted thrust bearing
Number	: 1
Installed capacity	: 12.564 MW
Serial No.	: V – 0037/1
Excitation	: Static

Generator unit

Guaranteed output	: 12 MW
Rated power factor	: 0.9
Efficiency at 0.9 power factor	: 97.62 % at 100 % load 97.38 % at 75% load 96.69 % at 50% load 94.90 % at 25% load
Rated voltage	: 11 kV
Serial No.	: C21 /001

Connection to grid

Transformer capacity	: 132kV,17.5MVA, 3 phase, OMAN

Protection System	: Multi functional digital relay system
Control & monitoring operation	: Computer based c/w interface for remote operation

The project activity produces electricity with very little impact on the environment. There is no significant impact on air, water, and land due to the project activity. A brief impact on the environment due to project activity is discussed in section D. Thus, an environmentally safe technology is transferred to the Host Party.