Project design document form for small-scale CDM project activities

(Version 05.0)

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	Small Hydro Power Project in Panwi, Himachal Pradesh
Version number of the PDD	3
Completion date of the PDD	23/06/2015
Project participant(s)	Ascent Hydro Projects Limited (AHPL)
Host Party	India
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	**Sectoral Scope**: 1 , Energy industries (renewable-/non-renewable sources) **Methodology**: AMS-I.D. **Title**: Grid connected renewable electricity generation (Version : 18.0)
Estimated amount of annual average GHG emission reductions	20,812 tCO_{2e}

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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This project activity is a 4 MW (2*2000 KW) run of river small scale hydropower project that utilizes the water of Panwi Gad, a tributary of Sutlej River in Kinnaur District of Himachal Pradesh in India. The project activity is promoted by Ascent Hydro Projects Limited (AHPL). Generated power from the project activity is sold to "Himachal Pradesh State Electricity Board" through "Northern, Eastern, Western, and North-Eastern" (NEWNE) regional grid. The project has been commissioned on 09/05/2013 and has started its commercial production.

Purpose of the project Activity:

The project serves the purpose of producing clean electrical energy in a sustainable manner. The project activity involves implementation of 4 MW (2*2000 KW) hydro turbines which utilize the potential energy available with water for power generation. Therefore, no fossil fuel is involved for power generation in the project activity. The proposed project activity will also reduce the anthropogenic emissions of greenhouse gases in to the atmosphere by displacing an equivalent amount of power at grid, generated from fossil fuels based power plants which are connected to the same NEWNE grid.

Scenario prior to the project:

The project activity is a Greenfield activity. There were no other renewable energy power plants at the project site prior to the implementation of the project. However electricity delivered to the grid by the project activity would have otherwise been generated by the operation of fossil fuel based grid-connected power plants and by the addition of new generation sources in the grid.

Baseline scenario:

Baseline scenario and the scenario prior to the project activity are the same.

Estimated amount of electricity supply and emission reductions over the chosen crediting period:

It is estimated that the project activity will supply 22,038 MWh per year to the NEWNE Grid and in the entire 7 years of first crediting period (renewal crediting period has been opted) project is expected to supply 154,263 MWh electricity to the grid.

Project activity will lead to an annual average GHG emission reduction of 20,812 tCO2e and a total of 145,684 tCO_2e GHG emission reduction during the first 7years of crediting period.

Project promoter background:

The project activity is promoted by Ascent Hydro Projects Limited (AHPL) which is a 100% subsidiary company of Dodson Lindblom International Inc (DLI), an Ohio based company that specializes in the engineering and development of infrastructure projects with particular emphasis on hydroelectric power generation. DLI is part of DLZ Corporation, one of the foremost engineering companies in the Midwestern United States.

Project activity background:

The Panwi project was originally envisaged to be a 3 MW power generation project. However at later stages due to some climatic conditions and other factors, the project participant (PP) submitted a revised Detailed Project Report (DPR) for the Panwi project which advised a capacity of 4 MW (i.e. 2 X 2000 KW) to the H.P Govt. Energy Development Agency (HIMURJA) during May

2004 and obtained Supplementary Implementation Agreement (SIA) for the enhanced/augmented capacity for the project.

Contribution of the project activity to sustainable development

The Designated National Authority for India has identified the following attributes to measure the contribution of the project activity for sustainable development:[1]

i) Social wellbeing
ii) Economical wellbeing
iii) Environmental wellbeing
iv) Technological wellbeing

i) Social well being

The project activity has generated and will generate various scopes of employment to the local inhabitants during the constructional and in the operational phases of the project, thereby improving the socio-economic conditions of the community. Also, the project activity does not involve submergence or rehabilitation as it neither involves dam construction nor displacement of people living nearby thus, implementation of the project does not impact the social stability of the community, and rather it will enhance social well-being as the project operates for years as the project implementation has helped strengthening the regional infrastructure also.

ii) Economic well being

The project activity has generated direct and indirect job opportunities to the local community during construction and will also provide various employment opportunities during its operation. Also, the project has created local business opportunities for villagers and helped local stakeholders to engage into various activities with contractors, manufacturers, equipment suppliers, etc.

iii) Technological well being

- The generation of electricity by the project activity will improve availability of electricity to the state grid and also it will provide more opportunities for industries to invest in such cleaner technologies. Success of such projects shall be an example for other industries to invest in such technologies and further strengthen the energy security of the country.
- The technology selected for the power project, which is based on the conversion of kinetic energy of moving water into electrical energy, is environmentally safe and sound and a proven technology. The project activity would promote the use of such clean technology and thereby promotes the technological wellbeing.

iv) Environmental well being

The following environmental benefits are derived from the project activity:

- Produces renewable electricity without any GHG emissions.
- Run of river hydro power plant with little impact on the surrounding ecology.
- No increase in volume of reservoir and no land inundation, hence no disturbance to the natural habitat.

In light of the above, the project participant substantiates that the project activity contributes and will contribute towards sustainable development**.**

[1] http://envfor.nic.in/cdm/host_approval_criteria.htm

A.2. Location of project activity

A.2.1. Host Party

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India

A.2.2. Region/State/Province etc.

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State: Himachal Pradesh

A.2.3. City/Town/Community etc.

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District : Kinnaur
Tehsil : Nichhar
Village : Panwi

A.2.4. Physical/Geographical location

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Location	Panwi Village in Kinnaur district
Longitude	78 º 01' 30" E
Latitude	31 º 32' 00" N
Nearest big town and distance	Rampur, 61 kilometers
Distance from state capital , Shimla	155 kilometers

The project is accessible by National Highway (NH)-22 which runs from Shimla to Tibet. The nearest town is Shimla. Kalka is the nearest main railway station and is about 80 kilometres from Shimla. Kalka is about 300 kilometres from the capital of India, New Delhi.

The location of project activity is shown in following figures:

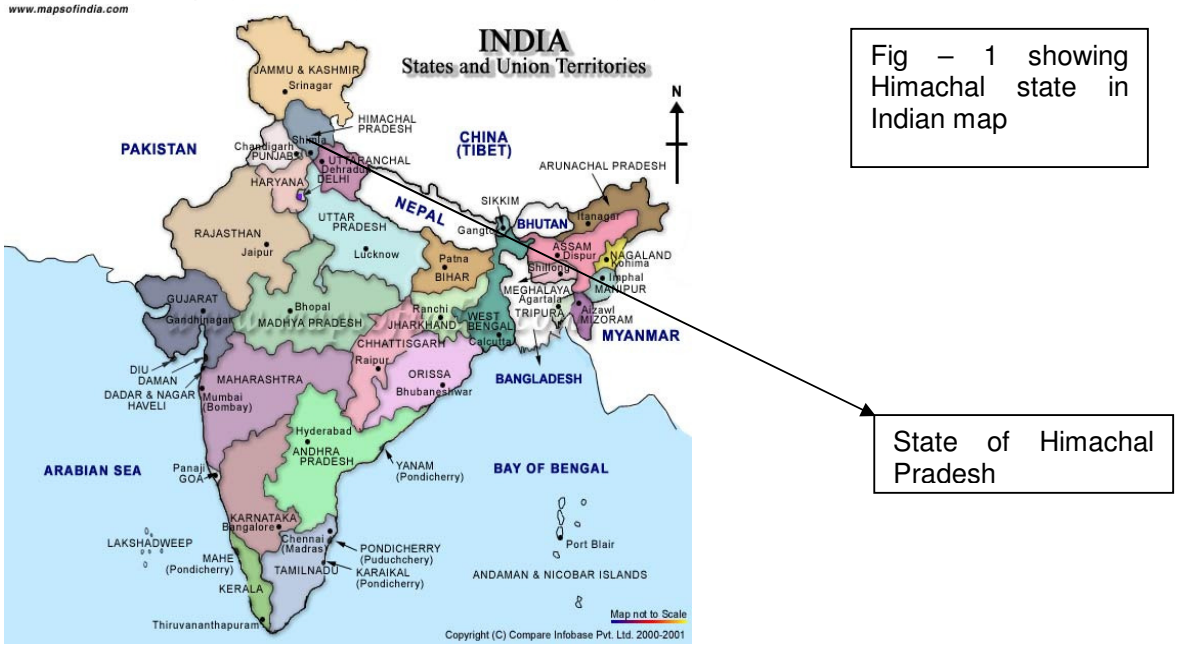

Fig – 1 showing Himachal state in Indian map

State of Himachal Pradesh

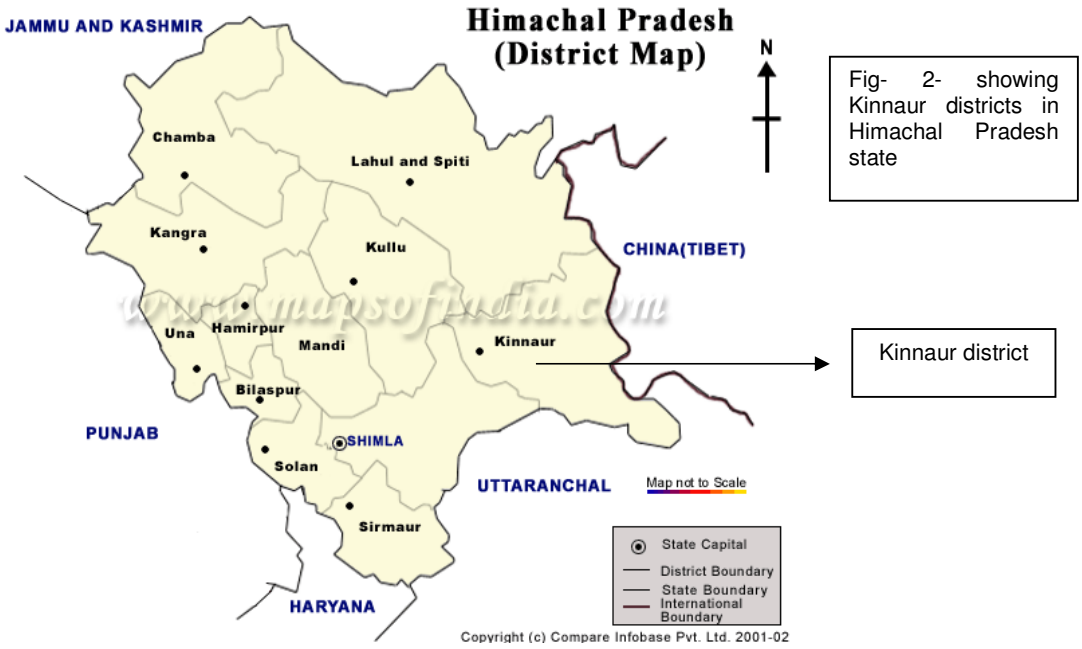

Fig- 2- showing Kinnaur districts in Himachal Pradesh state

A.3. Technologies and/or measures

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The total installed capacity of the project is 4.0 MW (2*2000 KW), which is less than the threshold capacity of 15 MW prescribed for the small scale project activity, hence the project activity is a small scale CDM project activity and UNFCCC indicative simplified modalities and procedures can be applied.

As per the provisions of Appendix B of Simplified Modalities and Procedures for Small Scale CDM Project Activities, Category I.D - Grid connected renewable electricity generation, Version 18, is applicable for the project activity, which states that "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…….".

The project activity is a hydro power unit which is a renewable energy generation, supplying electricity to grid. Therefore, the project falls under the following category:

Type : I. Renewable energy projects
Category : D. - Grid connected renewable electricity generation

Technology of the project activity:

The run of river Small Hydro Power (SHP) project utilises water from the stream Panwi Gad which is the tributary of the River Sutlej. The water from the stream will be diverted by means of a trench weir. The diverted water from the stream will be conducted by means of a water conductor system into the forebay tank. Water will then leave the forebay and will be guided by penstock into the power house. The power house contains 2 nos. of Pelton Wheel type, horizontal shaft turbines and synchronous generators with alternating current to generate electrical energy. The two units have a longitudinal arrangement parallel to the length axis of the power house. The particulars of the Turbine and Generator are as follows:

Number of Turbines	2
Type	Impulse – Pelton
Number of Jet	Double Jet
Rated output	2000 kW
Rated head	163.5 m
Nominal discharge	1.42 cumecs
Maximum pressure rise	25%
Maximum speed rise	30%

Number of Generators	2
Rated output	2000 kW
Power factor	0.9
Rated voltage	3.3 ±10%
Frequency	50Hz
Range of frequency variation	± 3%
Number of phases	3, star connected

In the project activity power is generated at 3.3 kV which is economical voltage for generators in the capacity range of 2000 kW output. The entire power generated is being transmitted by 22 kV transmission line into the 22 kV system of HPSEB at the proposed control point at Nathpa for further utilization. The details and specifications of the equipment's to be used in the SHP plant are as follows:

Description	**Panwi SHP**
Installed capacity	4.0 MW
<u>Trench weir</u> Design discharge Elevation	 3.48 m^3/s 1784.0 m
<u>Intake to desilting tank</u> Design discharge Length	 3.48 m^3/s 228 m
<u>Desilting tank to forebay</u> Design discharge Length	 2.9 m^3/s 1084 m
Capacity of Forebay Top level of Forebay	450 m^3 1779.5 m
<u>Penstock</u> Number	 1

Description	Panwi SHP
Length and size	280 m of 1.0 m diameter
Number of generating units	2
Capacity of each unit	2.0 MW
Generator floor level	1611 m
Gross head	168.5 m
Net head design	163.5 m
Voltage	22 kV
Connection to grid	Nathpa substation at a distance of 4.5 kilometres
Project Life time[2]	35 Years

As explained above that the project activity is a Greenfield activity. Therefore, the baseline scenario is the continuation of current practice, thus identical to the scenario existing prior to the implementation of the project activity, i.e. "the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of fossil fuel based grid-connected power plants and by the addition of new generation sources in the grid."

The detail of monitoring equipment's and their location in the systems have been provided under Section B.3 - Project boundary and B.7.1. & B.7.3.

The technology used for the project activity is well established and available within the country hence, there is no transfer of technology involved. Also, there is no significant impact on air, water, and land due to the project activity. Thus, an environmentally safe technology is being employed for this project activity.

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A (host) : India	Private entity: Ascent Hydro Projects Limited (AHPL)	No

A.5. Public funding of project activity

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There is no public funding from any Annex-I party for the project activity.

A.6. Debundling for project activity

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In accordance with the Project Standard Para 88 (version 7), Methodological tool on assessment of de-bundling for Small scale project activities –Version 4.0.and Appendix C of "Simplified Modalities & Procedure for Small Scale CDM Project Activities" – 'Debundling is defined as the fragmentation of a large project activity into smaller parts'. As per tool- a proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered

[2] The project technical lifetime is considered as 35 years based on the the CE certified Project addendum report; i.e. an expert evaluation which is also in line with the Central Electricity Regulatory Commissions order available at the time of decision making.

small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

The project participant confirms that there are projects from the same participant in the same project category however; there is no registered project activity within previous 2 years whose project boundary is within 1 km of the project boundary of the proposed small scale project activity. Hence, the project is not a de bundled component of any larger scale project activity.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

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Title : Grid connected renewable electricity generation, AMS-I.D Version 18 (EB 81, Annex 24 dated 28/11/2014).

Type I : Renewable energy project

Category I.D : Grid connected renewable electricity generation

Tools and Guidelines used:

Tool to calculate the emission factor for an electricity system, Version 04.0 EB 75, Annex 15, dated 04/10/2013. http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, Version 02, EB41, Annex 11, dated 02/08/2008. http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

Methodological tool on demonstration of additionality of small-scale project activities, Version 10.0 https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-20-v1.pdf

B.2. Project activity eligibility

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In accordance with the para 81 & 82 of the Project Standard Version 07.0, the proposed project activity falls under Type I & category D. - Grid connected renewable electricity generation and this will be applicable every year of the crediting period.

The applicability of the methodology (AMS-I.D. version 18) to the project activity is addressed below:

Technology /Measure as per AMS I.D	Measure of project activity
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 involves setting up of a renewable energy (hydro) generation plant that exports electricity to the fossil fuel dominated NEWNE electricity grid. Thus, the project activity meets this applicability conditions.
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	According to the point 1 of the Table 2 in the methodology – "Project supplies electricity to a national/ regional grid" is applicable under AMS I.D. As the project activity supplies the electricity to NEWNE grid which is a regional grid, the methodology AMS-I.D. is applicable.

Technology /Measure as per AMS I.D	Measure of project activity
) applies is included in Table 2.	
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); or (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s).	The Project activity involves the installation of new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity. Thus, Project activity is a Greenfield plant and satisfies this applicability condition (a).
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 definitions given in the project emissions section, is greater than 4 W/m2; • 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.	As the project activity is a run-off river type hydro power plant, this criteria is not relevant for the project activity.
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 rated capacity of the project activity is 4.0 MW with no provision of Co-firing fossil fuel. Hence, meeting with this criterion.
6. Combined heat and power (co-generation) systems are not eligible under this category.	This is not relevant to the project activity as the project involves only hydro power generating units.
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[3] from the existing units.	There is no other existing renewable energy power generation facility at the project site. Therefore, this criterion is not applicable.
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 project activity is a new installation, it does not involve any retrofit measures nor any replacement and hence is not applicable for

[3] 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”.

Technology /Measure as per AMS I.D	Measure of project activity
the limit of 15 MW.	the project activity
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.	This is not relevant to the project activity as the project involves only hydro power generating units.
10. In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	This is not relevant to the project activity as the project involves only hydro power generating units.

PP has discussed & justified the applicability criterion of the referenced tools in the respective sections of the PDD appropriately. However, providing a brief justification below for the respective tools:

Tool: Tool to calculate the emission factor for an electricity system, Version 04.0	
Applicability Criterion	**Justification**
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 activity supplies the electricity to the NEWNE grid which is a regional grid. Hence, project activity satisfies this applicability criterion.
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, 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	Project Participant has opted for grid power plants only. Hence, project activity satisfies this criterion.

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.	
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 electricity system is totally located in a non Annex I country. Hence, This tool is applicable for the project activity.
Under this tool, the value applied to the CO_2 emission factor of biofuels is zero.	This applicability condition is not applicable to the project activity as the project activity is a small scale hydro project.
Tool: "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", Version 2.	
This tool provides procedures to calculate project and/or leakage CO_2 emissions from the combustion of fossil fuels. It can be used in cases where CO_2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. Methodologies using this tool should specify to which combustion process j this tool is being applied.	Project activity involves the usage of fossil fuel "Diesel" in DG set which would be used as a failsafe option/ back arrangement for emergency & starts up purpose. Hence, this tool is applicable to calculate the CO_2 emissions from fossil fuel combustion based on the quantity of fuel combusted and its properties. Hence, project activity satisfies the applicability condition.

The above analysis clearly demonstrates that the project activity under consideration meets the applicability criterion of the methodology AMS-I.D, Version 18 and the reference tools.

B.3. Project boundary

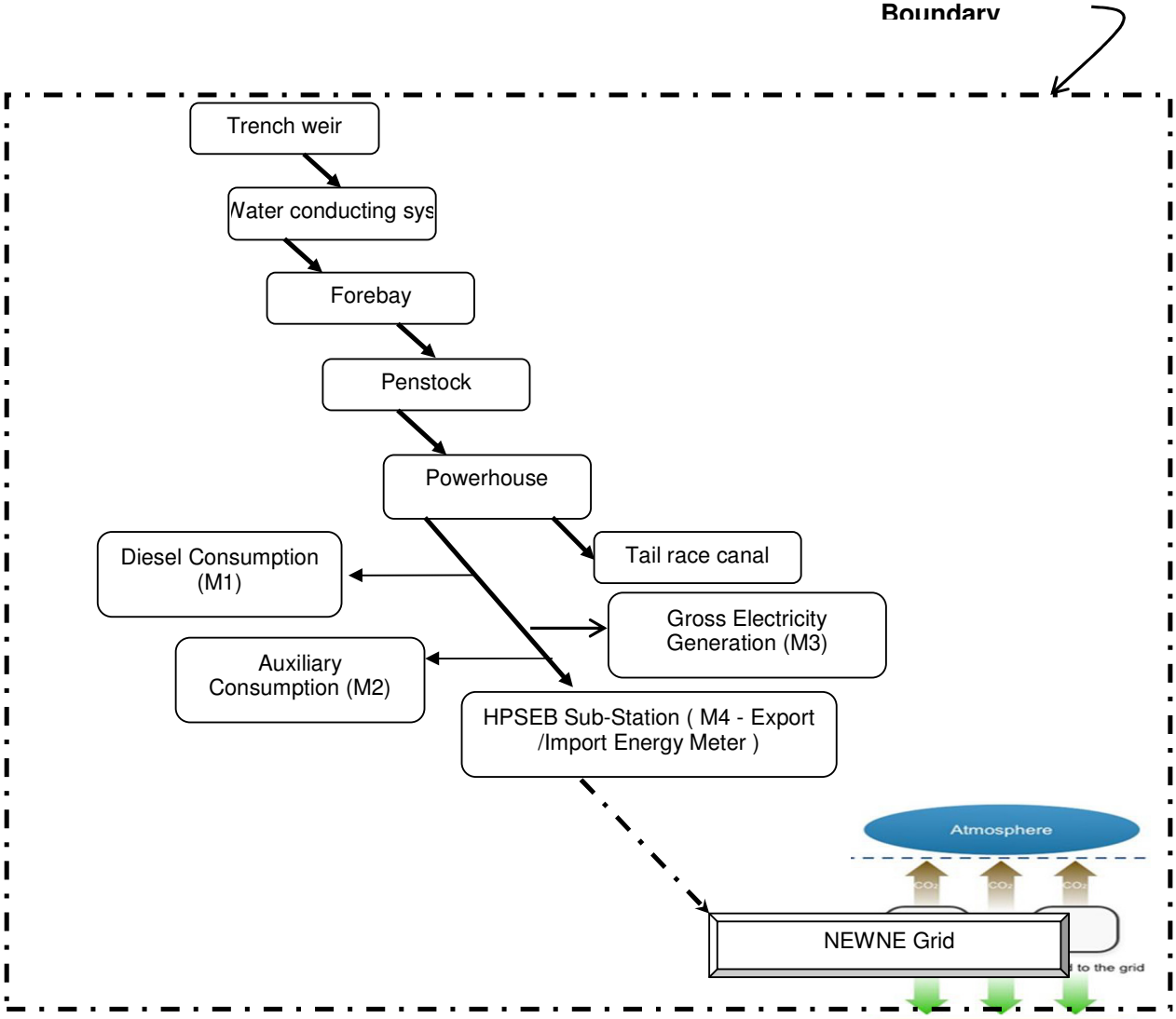
As mentioned under para 18 of the applied methodology AMS-I.D. (Version 18, EB 81), "the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to." Thus the project boundary is as follows:

- Trench weir
- Water conducting system (including open channels, de-silting chamber and cross drainages)
- Forebay
- Penstock
- Powerhouse (containing turbines, generators and transformers.)
- Tail race canal
- Power evacuation or transport system up to the grid substation.

Further, for the purpose of estimation of baseline emissions, the (NEWNE) Regional Grid of India has been considered within the project boundary. Also, the project boundary includes a stand-by diesel generator (DG) set which will be operated only as a failsafe option stand by power requirements emergency situation. The project boundary is demonstrated in the diagram below:

M1 – For Monitoring Parameter DC_y
M2 – For Monitoring Auxiliary Consumption
M3 – For Monitoring of plant Gross Generation
M4 – For Monitoring of the parameters, EG_{Export}, EG_{Import}

The main greenhouse gas that is prevented from being emitted into atmosphere is CO_2 (Carbon dioxide) which would have otherwise been emitted from the fossil fuel fired power plants that are connected to the grid.



Description of the sources and gases included in the project boundary:

Emission sources included in the project boundary

Source		Gas	Included ?	Justification / Explanation
Baseline	**Grid Electricity Generation**	CO_2	Yes	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source

B.4. Establishment and description of baseline scenario

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In accordance with the Project Standard Version 7, Para 42, the baseline scenario for the proposed project activity is established as per the paragraph 19 of the applicable methodology; "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." In the proposed project activity the generated electricity would be supplied to the grid that in the absence of the project activity would have been generated by the operation of the grid connected power plants and by the addition of new generation sources.

Thus, as per the paragraph 22 of the methodology, "the baseline emissions are the product of quantity of net electricity generation that is produced & fed into the grid as a result of the implementation of the project activity multiplied by the NEWNE grid emission factor".

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

Where:

BE_y Baseline Emissions in year *y* (t CO_2)

$EG_{BL,y}$ 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 CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO2/MWh)

As per paragraph 23, the emission factor shall be calculated in a transparent and conservative manner as follows:

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

OR

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

The approach proposed in the "Option (a)" i.e. "Combined Margin" has been used for ascertaining baseline emission reductions. The operating margin and the build margin emission factor have been considered from the information (Baseline Carbon Dioxide Emission Database -Version 8.0)[4] published by the Central Electricity Authority (CEA), Ministry of Power, Govt. of India.

Considering the individual weightings assigned to the operating margin and the build margin emission factors respectively, as prescribed in the 'Tool to calculate the emission factor for an electricity system (Version 04.0)'. The combined margin emission factor for the NEWNE Grid has been estimated at 0.944 tCO_2 /MWh. The detailed stepwise calculation is provided in section B.6.3.

Key assumptions and rationale used to determine the baseline and baseline emission:

S.No	Parameter/Variable	Value	Source
1	Net Electricity exported to grid (MWh)	22,038	**Calculated;** will be calculated as Total Electricity Exported to the Grid – Electricity Imported from the Grid. (Based on the monthly Joint Meter Readings (JMR))
2	($EF_{CO2,grid,y}$) Combined margin CO_2 emission factor for the project electricity system in year y (t CO_2/MWh)	0.944	**Calculated;** As per the 'Tool to calculate the emission factor for an electricity system. (Version 04.0.)' based on the CEA CO_2 Baseline Database for the Indian Power Sector version 8
3	Build margin CO2 emission factor for the project electricity system in year *y* (t CO_2/MWh)	0.916	**Calculated;** As per the 'Tool to calculate the emission factor for an electricity system. (Version 04.0)' based on the CEA CO_2 Baseline Database for the Indian Power Sector version 8
4	Operating margin CO2 emission factor for the project electricity system in year *y* (t CO_2/MWh)	0.972	**Calculated;** As per the 'Tool to calculate the emission factor for an electricity system. (Version 04.0)' based on the CEA CO_2 Baseline Database for the Indian Power Sector version 8
5	Quantity of diesel Consumed (Liter/annum)	Nil	**Assumed**; However, Same will be considered on actual for

[4] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

			calculation of project emission, as per the procedure mentioned in the section B.6.1

B.5. Demonstration of additionality

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CDM consideration and real actions taken towards securing CDM status has been demonstrated in line with Project Standard, Version 7, para 28. There were continuous real actions taken by the project participant for the CDM project activity; and the real actions are in line with the UNFCCC guidelines/clarifications. The details are provided below which will be also available to DOE during the validation.

Starting date of a CDM project activity (P - SSC)

As per the start date definition, the starting date of a CDM project activity is "the earliest date at which either the implementation or construction or real action of a CDM project activity or CPA *begins".* As per the above definition, the start date shall be considered to be the date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity. This, for example, can be the date on which contracts have been signed for equipment or construction/operation services required for the project activity. Minor pre-project expenses, e.g. the contracting of services /payment of fees for feasibility studies or preliminary surveys, should not be considered in the determination of the start date as they do not necessarily indicate the commencement of implementation of the project.

The date of signing of the agreement with Kirloskar Brothers Limited (KBL) for electro-mechanical works (EMS) has been considered as the project start date as it was the earliest real action took place in this project.

Project background: the project activity was considered as a CDM project by AHPL during Sep 2005 on the basis of "Project DPR" and an "Addendum Report" and passed a board resolution on 24/09/2005 to start the project as a CDM Project activity. However, at the initial stage it was decided that project would be executed in CDM as a bundle project along with two more hydro units. Subsequently, AHPL had signed a loan agreement with IFC and had appointed Ecoinvest Carbon as CDM consultant for the bundle. PP had awarded separate work orders (i.e. work orders for constructions, electro mechanical etc.) to all the three projects and for Panwi Hydro the first work order had been signed with KBL on 26/02/2007, which was the first and earliest real action for the project. Hence it is considered as the Start Date of the CDM Project Activity. However, due to delay in construction timelines, finally the bundle was split and the three projects were developed separately under CDM. The subsequent chronological events of the project are detailed below:

Period	Project Timeline	Evidence
February -2007	Contract with Kirloskar Brothers Limited (KBL) for Electro-mechanical Works. This is the earliest real action considered for the project and hence is the **start date of the CDM project activity**.	Contract Copy between KBL & AHPL, Dated: 26/02/2007

Period	Project Timeline	Evidence
May-2007	Supplementary Implementation Agreement for the project	Copy of implementation agreement, Dated: 18/05/2007
October-2007	Bureau Veritas Certification India Private Limited (BVC) issued proposal to perform validation and signed contract with PP	contract copy, Dated: 25/10/2007 (this is also the date of contracting)
March-2008	Panwi Project activity, was formed as a part of 13 MW bundled project, and submitted for webhosting (28 Mar - 26 April 2008)	UNFCCC website[5]
	Application to DNA for Host Country Approval for bundle project activity.	Copy of letter to MoEF Dated: 17/03/2008.
May-2008	Meeting with National CDM Authority regarding HCA for 13 MW bundle project activity.	Date of DNA Meeting: 26/05/2008, Copy of letter from MoEF
July -2009	Decision to disintegrate the existing 13 MW project activity into three project activities. The three projects are: Sechi 4.5MW capacity (registered in CDM), Panwi 4MW capacity (currently project) and Melan 4.5MW capacity (yet to be started).	Email correspondence with DOE, Dated: 09/07/2009
October - 2009	Confirmation to DOE for termination of 13 MW bundled CDM project validation and regarding splitting of the bundle 13 MW into 3 separate projects .	Letter from AHPL to BVC for termination and separate contract for 3 projects, Dated: 29/10/2009
January - 2010	Management decision to proceed with Sechi Hydro because of its advance timeline and execution of separate contract with DOE.	Discussion letter, Dated: 27/01/2010
February 2010	Execution of separate validation contract with DOE for other hydro unit (Sechi 4.5MW SHP).	Validation contract signed for Sechi Hydro Project , Dated : 04/02/2010

[5] http://cdm.unfccc.int/Projects/Validation/DB/4YX3ETDPQQJWN7B3EMAE1TWAKD63AW/view.html

Period	Project Timeline	Evidence
January -2011	Re-consideration of CDM activity for Panwi Hydro and execution of CDM Advisory Agreement with new CDM Consultant	Contract copy. 19/01/2011
March -2012	Submitted proposal for ERPA (Indicative term sheet) for 4 MW Panwi Project by previous CDM consultant	Copy of Signed Proposal ERPA Dated: 14/03/2012
April-2013	Completed the NCDMA PCN and PDD version 01 and submitted for internal review.	NCDMA PCN & PDD.
May-2013	Termination of CDM advisory contract	Termination letter Dated: 06/05/2013
May-2013	Date of Commissioning of the hydro plant	Commissioning Certificate Dated: 09/05/2013
June-2013	CDM Advisory contract signed with Ecoinvest Carbon SA for 4 MW Panwi Hydro	Copy of advisory Contract Dated: 19/06/2013
July -2013	AHPL has submitted the online request for filling PCN form and received the Username & login password.	Letter from AHPL Dated : 29/07/2013
August 2013	AHPL has received the Username & login password from MOEF India through email dated: 28th August 2013.	Email From MOEF Dated :20/08/2013
September-2013	DOE proposal for the project	30/09/2013
November - 2013	Signed contract with KBS Certification Services Pvt Ltd.	07/11/2013

Justification for additionality of the project

In accordance with Project Standard (version 7) para 96 (a), project participant has demonstrated the project additionality as per "Methodological tool on demonstration of additionality of small-scale project activities", Version10. The referred guideline has stipulated the following barriers and it requires explanation to justify that the project activity would not have occurred due to at least any one of these barriers:

(a) Investment barrier

(b) Technological barrier

(c) Barrier due to prevailing practice:

(d) Other barriers

Project participant has identified the Investment barrier to demonstrate the project additionality.

Investment analysis

In order to evaluate the profitability of the present project activity an investment analysis of the project activity has been conducted. As the project activity generates income other than the CDM benefits revenues from the sale of electricity to the grid), Option I that is the Simple Cost Analysis cannot be applied in this case. Among the other two options-Investment Comparison analysis (Option II) and Benchmark analysis (Option III); benchmark analysis has been applied for investment analysis in conformity with the guidance 19 of Annex 5, EB62. As the baseline to the project activity is 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 which does not require investment or is outside the direct control of the project developer. Hence a benchmark approach is considered appropriate. Post tax benchmark has been considered for the project activity; therefore the project Internal Rate of Return (IRR), post tax, has been considered as the most suitable financial indicator for the project activity, as the same financial indicator i.e. internal rate of return was considered in the government approved project DPR and the CE certified project addendum report (Dated: August 2005) available at the time of decision making. The addendum Report was assessed and approved by Independent Chartered Engineer as well as techno economic clearance given by HPSEB dated 30/06/2006 based on this report. The financial analysis has been conducted based on the parameters available at the time of investment decision considered for the project, i.e. sep-2005.

Selection of Benchmark

The benchmark of the project activity has been established in accordance with the guidance 12 & 15 of the "Guidelines on the assessment of investment analysis", version 5[6].

As per the guidance 12 note issued by CDM EB at its 62nd meeting "*In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity are appropriate benchmarks for equity IRR. Benchmarks supplied by relevant national authorities are also appropriate if the DOE can validate that they are applicable to the project activity and the type of IRR calculation presented.*"(page No.3 of annex 5, EB 62).

Accordingly referring to the guidance(s) above, Weighted Average Cost of Capital (WACC) has been chosen as the benchmark. The WACC is the appropriate benchmark since the project is financed by both equity and loan and WACC is the average of the costs of these sources of financing, each of which is weighted by its respective use in the given situation. WACC represents the weighted average of the costs of various sources of financing in the financial structure of the project.

The Weighted Average Cost of Capital (WACC) has been calculated based on parameters that are standard in the market and available at the time of invest decision for the project, considering the specific characteristics of the project type. The benchmark has been arrived at based on the applicable parameters and the investment decision date.

The WACC has been calculated as demonstrated below:

WACC = CoE * {E/(E+D)} + (1-t) * CoD * {D/(E+D)}

[6] Annex 05 of EB62

Where:
CoE – Cost of equity
CoD – Cost of Debt
E – Equity
D – Debt
t – Tax rate

To calculate WAAC, cost of equity (CoE) has to be determined.

As per guidance 15 ***"If the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors. The values in the table in Appendix A may also be used, as a simple default option, if a company internal benchmark is used.***

Accordingly, the cost of equity is being determined using approach (a) wherein a value of cost of equity is provided in Appendix A. However, as per paragraph 7 of the appendix to the guidelines, the default values provided in the appendix are real term values that can be converted to nominal values by adding the inflation rate.

The default value for expected return on equity for energy industry in India in real term rates as per appendix to the Guidelines on the assessment of investment analysis is 11.75%.

The inflation rate expected for 2005 is 4.0%[7]. Central Bank of India (i.e. Reserve Bank of India) publishes 10 years average Wholesale Price Index based Inflation figures for 2004-05 (annual report, August 2005), which is 5.2%. PP has considered value of 4.0% based on average forecasted inflation rate for the host country published by the IMF (International Monetary Fund World Economic Outlook) for 2005 (Refer footnote 16), which is on lower side.

Therefore, the expected cost of equity in nominal terms is 11.75% + 4.00% = 15.75%

The ***Cost of Debt*** has been considered for the calculation of benchmark is the average Prime Lending Rate (PLR) at the time of investment decision of the project activity. The rate available at the time of investment decision is 10.50%[8].

The tax rate considered for the project activity at the time of investment decision is 8.42%[9].Minimum Alternate Tax (MAT) rate has been applied for calculating the cost of debt (post tax) as in the IRR computation, MAT rate is applicable for the first 15 years on account of tax holidays and the loan repayment period also falls within first 15 years only.

[7] http://www.imf.org/external/pubs/ft/weo/2005/01/data/dbcoutm.cfm?SD=2002&ED=2006&R1=1&R2=1&CS=3&SS=2&OS=C&DD=0&OUT=1&C=534&S=PCPIPCH&CMP=0&x=80&y=8

[8] http://www.rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=6919

[9] MAT tax rate - 7.5%, Surcharge 10% and Educational cess 2%

Hence, after accounting for all the variables discussed above the benchmark i.e. Weighted Average Cost of Capital (WACC) of the project activity has been ascertained at 11.46%[10].

All the relevant information and assumption towards project IRR (Post -tax) computation are given in following table. The Addendum Report, which was the re-assessment of the initial Master DPR, was prepared on August -2005 for management consideration and approval. The addendum Report was assessed and approved by Independent Chartered Engineer as well as techno economic clearance given by HPSEB dated 30/06/2006 based on this report. It was prepared to re-assess the relevancy and validity of financial assumptions considered in original DPR-2004. Invest decision was considered based on the Addendum Report. Since the addendum report was the most updated and latest source of financial assumptions and was available to the management at the time of investment decision, hence the input values for project IRR calculation are considered from Addendum Report which is also in line with paragraph 6 of investment guidelines EB62, Annex 5.

S. No	Assumptions	Units	Value	Reference
1	Project Capacity	MW	4	Addendum Project Report (Dated: August 2005), Pg no 13 & 16/ Commissioning certificate.
2	Total Project Cost	Rs in lakhs[11]	4542.34	Addendum Project Report (Dated: August 2005), Pg - 22,
3	Debt	Rs in lakhs[12]	3179.64	Addendum project Report (Dated: August 2005), Pg -23
4	Equity	Rs in lakhs[13]	1362.70	Addendum project Report (Dated: August 2005), Pg -23
5	Interest Rate	% (per annum)	10.50	RBI-PLR; Date of Publish : Sep 14, 2005 http://www.rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=6919
6	Loan tenure	Years	10	Addendum Project Report (Dated: August 2005), Pg- 23
7	Repayment period	Years	7.5	Addendum Project Report (Dated: August 2005), Pg-23
8	Moratorium	Years	2.5	Addendum Project Report (Dated: August 2005), Pg-23
9	Gross Generation	Units in MWh-Gross	23,910	Addendum Project Report (Dated: August 2005), Pg - 15
10	(After Losses: 5% Outage, 1% Auxiliary consumption,	Net Salable Units (for the first 15 years) MWh	22,038	Addendum Project Report (Dated: August 2005), Pg-15

[10] Benchmark Calculation sheet.

[11] **Note:- 1Lakhs =0.1 Million

[12] **Note:- 1Lakhs =0.1 Million

[13] **Note:- 1Lakhs =0.1 Million

	2% Transmission Losses)	Net Salable Units (from 15th year to 30th year) MWh	19,834	Addendum Project Report (Dated: August 2005), Pg -15
11	Tariff	Rs. / Unit	2.5	Addendum Project Report (Dated: August 2005), Pg-22
12	Royalty	for first 15 years from COD	0%	Addendum Project Report (Dated: August 2005), Pg-17
		% of deliverable energy from 16th year	10%	From 16th Year Onwards - Addendum Project Report (Dated: August 2005), Pg -17
13	O&M;	% of Project Cost	2 %	Addendum Project Report (Dated: August 2005), Pg-22
		Annual escalation	5.00%	Addendum Project Report (Dated: August 2005), Pg-22
14	Interest on Working capital	%	10.50%	RBI-PLR; Date of Publish : Sep 14, 2005 http://www.rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=6919
15	Rate of Depreciation	SLM	3.40%	Addendum Project Report (Dated: August 2005), Pg-24 http://taxclubindia.com/simple/depreciation%20rates%202009-10.pdf
16	WDV depreciation	Building	10.0%	http://taxclubindia.com/simple/depreciation%20rates%202009-10.pdf
17		Plant & Machinery	15.0%	http://taxclubindia.com/simple/depreciation%20rates%202009-10.pdf
18	Total permissible depreciation on Capital cost (excluding land cost)	%	90%	Addendum Project Report (Dated: August 2005), Pg- 46 General practice adopted within the Host Country. Refer CERC Order; Dated March-2004 Page 19 http://cercind.gov.in/13042007/Terms_and_conditions_of_tariff.pdf
19	Salvage Value	%	10%	Addendum Project Report (Dated: August 2005), Pg- 46; Refer CERC Order, Dated - March 2004, Page 19 http://cercind.gov.in/13042007/

				Terms and conditions of tariff .pdf
20	Working Capital (2months Receivables & 1month O&M)	Days – Generation Revenue	60	General practice adopted within the Host Country. Refer CERC Order; Dated March-2004, Page 44 http://cercind.gov.in/13042007/ Terms and conditions of tariff .pdf
21		Days - O&M Expenses	30	General practice adopted within the Host Country. Refer CERC Order; Dated March-2004, Page 44 http://cercind.gov.in/13042007/ Terms and conditions of tariff .pdf
22	Spares	%	1%	General practice adopted within the Host Country. Refer CERC Order; Dated March-2004, Page 44 http://cercind.gov.in/13042007/ Terms and conditions of tariff .pdf
23	MAT	%	8.415%	Income tax Act Source: http://www.ajaygarg.com/RATES%20OF%20INCOME%20TAX.doc 7.5%, Surcharge 10% and Educational cess 2%
24	Corporate Tax	%	33.66%	Income Tax for A.Y. 1997-98 To 2006-07- http://www.ajaygarg.com/RATES%20OF%20INCOME%20TAX.doc (Base Rate 30%, Surcharge- 10%, EC - 2%)
Note: 1Lakh = 0.1 Million				

Summary of Investment analysis:

The project IRR (Post-tax) without CDM funds is 6.44%.

Comparison against the benchmark return of 11.46%

The project IRR (Post - tax) for the project activity without CDM revenue has been found to be much less than the benchmark value of 11.46 %.

The project IRR (Post-tax) will increase after accounting for the CDM revenue in its cash flow. Therefore, CDM revenue has been seriously considered as the supporting aid to the project cash flows to alleviate the financial risk and hence to approach the expected benchmark.

In accordance with the EB 62 Annex 5, 'Guidelines on the assessment of Investment analysis' para 20 & 21*, "Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation…..".* & "As a general point of departure variations in the sensitivity analysis should at least cover a range of +10% and -10%…". Sensitivity analysis for tariff has been done based on actual tariff as per PPA (INR 2.95/ kWh against INR 2.5/kWh considered in IRR analysis i.e.18% higher than the tariff considered for IRR determination).

Hence, a sensitivity analysis has been carried out on the following variables and the results of this variation are presented below:

Parameters	**-10%**	**+10%**
Generation	4.82%	7.88%
Project Cost	7.68%	5.40%
O & M Cost	6.89%	5.94%
Parameters	**-10%**	**+18%**
Tariff	4.82%	7.88%

However, to make the assessment more transparent and explicit a detail analysis has been carried out in the IRR spread sheet for different range of variations to check the limits (for each sensitive parameter) at which the IRR touches or crosses the benchmark.

The project IRR crosses the expected benchmark in the scenarios as shown below:

Parameter	% Variation
Generation	Increased by 38.15%
Project Cost	Reduced by 31.67%
O&M Cost	Reduced by 147%
Tariff	Increased by 38.15%

But the above scenarios are highly optimistic.

It is to be noted that the generation from the project activity as estimated during DPR preparation is 22,038 MWh which is equivalent to 62.89% PLF of project activity. The actual PLF achieved after commissioning till April 2015 is 38%, as per the generation records. As per HPERC tariff order of 2007, the PLF of small hydro projects in the states of Himachal Pradesh is 45%. Hence electricity generation from the project activity is already estimated on higher side and therefore +/-10% sensitivity on generation parameter is justified.

The IRR will cross the benchmark only when the project cost goes below –31.67 % (i.e. INR. 3109.78 Lakhs[14]) but the same is not possible as the project has already got commissioned and the actual project cost is INR. 4637.88 Lakhs.

The variation of -147.0% in O&M cost will cross the benchmark however this is an unrealistic scenario for any project.

The increase in tariff by 38.15% (i.e. Rs. 3.5/kWh) is also an optimistic scenario, since actual tariff as per supplementary PPA is INR 2.95/kWh which is fixed for the tenure of PPA (i.e. 40 years).

Hence, in view of the above it is concluded that project activity is unlikely to be the most financially attractive proposition without availing the CDM benefits.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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The Central Electricity Authority (CEA) under the Ministry of Power, Government of India, has estimated the simple operating margin and build margin emission factor for the NEWNE regional grid. For the purpose of estimation of emission reductions from the project activity, the combined margin emission factor has been estimated at 0.944tCO_2/ MWh. The combined margin emission factor has been derived from the simple operating margin and build margin emission factor, calculated according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system" (Version 04.0.).

Emission Reduction Calculation:

As per paragraph 43 of AMS-I.D. (version 18, dated 28/11/2014), emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y	Emission reductions in year *y* (t CO_2/y)
BE_y	Baseline Emissions in year *y* (t CO_2/y)
PE_y	Project emissions in year *y* (t CO_2/y)
LE_y	Leakage emissions in year *y* (t CO_2/y)

Baseline Emission:

As per the paragraph 22 of the methodology, "the baseline emissions are the product of quantity of net electricity generation that is produced & fed into the grid as a result of the implementation of the project activity multiplied by the combined margin CO_2 emission factor for grid connected power generation in year Y".

[14] **Note:- 1Lakhs =0.1 Million

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

Where:

BEy = 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)

$EFgrid,y$ = 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)

BE_y Baseline Emissions in year *y* (t CO_2)

$EG_{BL,y}$ 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 CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO2/MWh)

Further, the Emission Factor can be calculated in a transparent and conservative manner as follows:

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

OR

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

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

Further, the Emission Factor can be calculated in a transparent and conservative manner as follows:

Calculation of electricity baseline emission factor (Combined Margin Approach**)**

The baseline emission factor has been calculated as a combined margin (CM), following the baseline methodology procedure of the 'Tool to calculate the emission factor for an electricity system'. The steps as defined under the Baseline Methodology Procedure and the application to the project activity are detailed below:

Step 1: Identify the relevant electric power system

A regional grid definition is used and for the project activity, the simple operating and build margin emission factors estimated by Central Electricity Authority (CEA) for the NEWNE Regional grid have been used to derive the combined margin emission factor for the project activity.

The tool defines the project electricity system as the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints. Keeping this into consideration, the Central Electricity Authority (CEA), Government of India (Host Country) has given the delineations of the project electricity system and the connected electricity system in India. As per CEA, the Indian Power System is divided into two Regional Grids, viz. NEWNE Grid and Southern Grid.

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

Since 2007-08, the four regional grids except the Southern Grid have been synchronized and they are now being considered as one and named as NEWNE Grid.

The project activity falls in Himachal Pradesh which is a part of the NEWNE Grid, therefore, emissions generated due to the project activity equivalent electricity generated by the NEWNE Grid, will serve as the baseline for this project activity.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

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

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

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

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

Step 3: Select an operating margin (OM) method:
As per Step 3, the calculation of OM emission factor (EF_{grid}, $OM_{,y)}$ is based on one of the following methods:

(a) Simple OM or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM

Out of four methods mentioned defined in the Step 3, the Simple OM approach has been chosen for calculations since in the regional grid mix the low-cost/must run resources constitute less than 50% of total grid generation[15].

Sector- wise installed capacity (MW) as on 31.03.2012.

Sector	Hydro	Thermal				Nuclear	Renew.	Total
		Coal	Gas	Diesel	Total			
State	27380.00	49457.00	4965.32	602.61	55024.93	0.00	3513.72	85918.65
Central	9085.40	39115.00	6702.23	0.00	45817.23	4780.00	0.00	59682.63
Private	2525.00	23450.38	6713.50	597.14	30761.02	0.00	20989.73	54275.75
All India	38990.40	112022.38	18381.05	1199.75	131603.18	4780.00	24503.45	199877.03

Source: CO_2 Baseline Database for the Indian Power Sector, User Guide-Version 8
It is evident from above Table that the installed capacity is predominantly coal based and therefore, is a major source of carbon dioxide emissions in India. The share of Hydro is only 24% and total share of low-cost/must run resources constitute 37% of the total grid generation.

Further as per Step 3, the emission factor can be calculated using either of the two data vintages:

- ***Ex-ante option***: If the ex- ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the five most recent calendar years prior to the time of submission of the CDM-PDD for validation.

- ***Ex post option***: If the *ex post* option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year *y* is usually only available later than six months after the end of year *y*, alternatively the emission factor of the previous year *y-1* may be used. If the data is usually only

[15] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver5.pdf

available 18 months after the end of year *y*, the emission factor of the year proceeding the previous year *y-2* may be used. The same data vintage (*y*, *y-1* or *y-2*) should be used throughout all crediting periods.

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

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

STEP 4: Calculate the Operating Margin emission factor ($EF_{grid,OM,y}$) according to the selected method:

The simple OM emissions 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.

Of the three options provided under Step 4 (a), Option A has been used for calculating the Simple OM.

As per Option A, the simple OM emission factor is calculated as below:

$$EF_{Grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} \, x \, NCV_{i,y} \, x \, EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

Where,

$EF_{grid,OMsimple,y}$ - Simple operating margin CO2 emission factor in year y (tCO2/ MWh)

$FC_{i,m,y}$ - Amount of fossil fuel type *i* consumed by the power plant/ unit m in year y (mass or volume unit)

$NCV_{i,y}$ - Net calorific value (energy content) of fossil fuel type i in year y (GJ/ mass or volume unit)

$EF_{CO2,i,y}$ - CO_2 emission factor of fossil fuel type i in year y (tCO2/ GJ)

$EG_{m,y}$ - Net electricity generated and delivered to the grid in year y by power plant/ unit m in year y (MWh)

M - All power plants/ units serving the grid in year y except low-cost / must run power plants/ units

I - All fossil fuel types combusted in power plant/ unit m in year y

Y - Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex -ante option) or the

In order to facilitate adoption of authentic baseline emissions data and also to ensure uniformity in the calculations of CO2 emission reductions by CDM project developers, Central Electricity Authority (CEA) has compiled a database containing the necessary data on CO2

emissions for all grid-connected power stations in India. This version of the Database is designed to be consistent with version 4.0 of the "Tool to calculate the emission factor for an electricity system" published by CDM Executive Board. The database is an official publication of the Government of India for the purpose of CDM baselines.

The purpose of this database is to provide a ready reference to the underlying calculations and assumptions used in the CO_2 database and to summarise the key results. This database (Version 8, January 2013) is based on the most recent data available with the Central Electricity Authority.

It is confirmed that ex-ante vintage is considered in the project activity and cannot be changed during the crediting period.

The simple OM emission factor (generation-weighted average CO_2 emissions per unit net electricity generation (tCO2/MWh) is **0.972 tCO_2/ MWh.**

CEA data used in the calculation and detailed calculation is provided in the emission reduction excel sheet.

STEP 5: Calculate the build margin emission factor

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

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

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

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

The build margin emission factor ($EF_{grid,BM,y}$) is the generation-weighted average emission factor (tCO_2/MWh) of a sample of power units during the most recent year y for which power generation data is available calculated as follows:

$$EF_{Grid,BM,y} = \frac{\sum_{m} EG_{m,y} \; x \; EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

$EF_{grid, BM,y}$ - Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ - Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ - CO_2 emission factor of power unit m in year y (tCO_2/ MWh)

M - Power units included in the build margin

Y - Most recent historical year for which power generation data is available

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) should be determined as per the guidance in Step 4 (a) for the simple OM, using options A1, A2 or A3, using for *y* the most recent historical year for which electricity generation data is available, and using for *m* the power units included in the build margin.

As per the CEA CO_2 Baseline Database, the BM for the **2011-12** has been calculated to be $EF_{grid, BM,y}$ = **0.916 tCO_2/MWh.**

CEA data used in the calculation and detailed calculation is provided in the emission reduction excel sheet.

STEP 6: Calculate the combined margin emissions factor
The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y} = EF_{grid,y}$) is based on one of the following methods:

(a) Weighted average CM; or

(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

The project participant has chosen option A for the calculation of the combined margin (CM) emission factor. The baseline emission factor of the Northern Eastern Western and North Eastern (NEWNE) grid ($EF_{grid, CM, y}$ in tCO_2/ MWh) is calculated as the weighted average of the Operating Margin emission factor ($EF_{Grid, OM, y}$) and the Build Margin emission factor ($EF_{Grid, BM, y}$)

$$EF_{CO2,grid,y} = EF_{grid, CM, y} = EF_{Grid,OM, y} \times W_{OM} + EF_{Grid, BM, y} \times W_{BM}$$

$EF_{grid, OM, y}$ - Simple operating margin CO_2 emission factor in year y (tCO_2/ MWh)

$EF_{grid, BM, y}$ - Build margin CO_2 emission factor in year y (tCO_2/MWh)

W_{OM} - Weighting of operating margin emission factor (%)

W_{BM}, - Weighting of build margin emission factor (%)

For hydro power projects, the default values of W_{OM} and W_{BM} are 50 % (i.e. W_{OM} =W_{BM} = 0.5).
As per the published data of the Central Electricity Authority (CEA), Ministry of Power, Government of India (CO2 baseline database, version 08, January 2013):

$EF_{grid, OM,, y}$ i.e. the Simple Operating Margin emission factor of the NEWNE Grid is **0.972** tCO_2/ MWh (three years average)

$EF_{grid, BM, y}$ i.e. the Build margin CO2 emission factor of the Northern Eastern Western and North Eastern (NEWNE) grid is **0.916** tCO_2/MWh

The $EF_{grid, CM, y}$ i.e. the combined margin baseline emission factor of NEWNE grid works out to **0.944** tCO_2/ MWh based on the weights used for the second crediting period. The Emission Factor details are provided in CER sheet.

Project Emission:

As per paragraph 39 of AMS-I.D. (version 18, dated 28/11/2014, *for most renewable energy project activities, PE_y = 0. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of ACM0002.*[16]

- *Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption);*
- *Emissions from water reservoirs of hydro power plants.*

Since, the project is only a run of river small hydro project there would be no emissions due to the implementation of the project; the project emissions are estimated to be zero.

Thus, $PE_y = 0$

However, as per paragraph 40 of AMS-I.D. (version 18)CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion[17]".

Therefore, if it is not possible to import electricity from the grid, a DG set may be used as a failsafe option at project site. Thus, emission due to combustion of fossil fuels (diesel) usage at the plant site will be calculated by the equation provided below:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$

Where:

$PE_{FC, j, y}$ - Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr);

$FC_{i, j, y}$ - Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr);

$COEF_{i, y}$ - Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)

[16] ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

[17] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

I - Are the fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{Diesel,y}$ will be calculated based on net calorific value and CO_2 emission factor of Diesel, as mentioned in option B of Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (version 2).

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$EF_{grid,CM,y} = EF_{grid,y}$
Unit	tCO_2 / MWh
Description	Combined margin CO_2 emission factor for the project electricity system in year *y*
Source of data	Central Electricity Authority (CEA), CO_2 baseline database, Version 8.0, January 2013
Value(s) applied	0.944
Choice of data or Measurement methods and procedures	This value is the combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) and calculated according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system". (Version 04.0) The database is Government of India's official publication; CEA has estimated the baseline emission factor for the NEWNE Grid based as per applicable EB guidance.
Purpose of data	Calculation of baseline emissions
Additional comment	This parameter is fixed ex-ante for the entire crediting period

Data / Parameter	$EF_{grid,OM,y}$
Unit	tCO_2 / MWh
Description	Operating Margin CO_2 emission factor for project electricity system in the year y
Source of data	Central Electricity Authority "CO2 Baseline Database for the Indian Power Sector" Version-8
Value(s) applied	0.972
Choice of data or Measurement methods and procedures	Simple OM method (Option a) is used for the calculation; calculated as per the weighted average emissions (in tCO_2/MWh) (3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.) (2009-10, 2010-11, 2011-12.) The CEA database is Government of India's official publication based on the "Tool to calculate the emission factor for an electricity system". http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Purpose of data	Calculation of baseline emissions
Additional comment	This parameter is fixed ex-ante for the entire crediting period

Data / Parameter	$EF_{grid,BM,y}$
Unit	tCO_2 / MWh
Description	Build margin CO_2 emission factor for the project electricity system in year *y*
Source of data	Central Electricity Authority "CO2 Baseline Database for the Indian Power Sector" Version-8
Value(s) applied	0.916
Choice of data or Measurement methods and procedures	Option 1 in Step5 of "Tool to calculate the emission factor for an electricity system" is used for the calculation of Build Margin emission factor. Central Electricity Authority (India) is a government body and data published is in line with the methodological requirement. http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm
Purpose of data	Calculation of baseline emissions
Additional comment	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
Choice of data or Measurement methods and procedures	Fixed Value has been taken from the publicly available data source.
Purpose of data	Calculation of Project Emission
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$NCV_{diesel,,y}$
Unit	GJ/ton
Description	Net calorific value of the Diesel
Source of data	Taken from Central Electricity Authority website (Data on Petroleum Fuels used by various Gas Turbines & Diesel Engine Power Plants in the Country during 2003-04).
Value(s) applied	42.25
Choice of data or Measurement methods and procedures	Fixed Value has been taken from the publicly available data source. **http://www.cea.nic.in/reports/articles/thermal/data_petroleum_fuels.pdf**
Purpose of data	Calculation of project emissions
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{CO2,diesel,y}$
Unit	tCO_2/TJ
Description	CO_2 emission factor of Diesel in year y

Source of data	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
Value(s) applied	74.8
Choice of data or Measurement methods and procedures	Fixed Value has been taken from the publicly available data source.
Purpose of data	Calculation of project emissions
Additional comment	This parameter is fixed ex-ante for the entire crediting period.

B.6.3. Ex ante calculation of emission reductions

>>

As per the paragraph 22 of the methodology, "the baseline emissions are the product of quantity of net electricity generation that is produced & fed into the grid as a result of the implementation of the project activity multiplied by the combined margin CO_2 emission factor for grid connected power generation in year Y".

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

Where:

BEy = 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)

$EFgrid,y$ = 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)

For ex-ante estimation of net electricity supplied to the grid the values has been considered from the DPR and the addendum report. However, during the monitoring period actual net exported electricity will be monitored at the substation main & check meter and will be used for the baseline emission calculation.

Annual Generation	23,910	MWh/year
Losses:		
After 5% Outages	22,715	MWh/Year
After 1% Auxiliary Consumption	22,487	MWh/Year
After 2% Transmission Losses	22,038	MWh/Year
Thus, total Net Electricity Export (MWh/Year)	**22,038**	**MWh/Year**

Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y ($EG_{BL,y}$)

= Total Electricity Exported to the grid -Total Electricity Import from the grid

= 22,038 – 0

= 22,038 MWh

Import of Electricity

For ex-ante calculation, the import of electricity for the project is assumed as Nil.
In the project scenario, the electricity imported would be monitored through the meter installed at the plant site and will be deducted as explained above for the calculation of Net electricity exported to the grid.

The total power exported to the grid per annum by the project activity is estimated to be about 22,038 MWh/year.

The baseline emissions for each year of the crediting period, is estimated to be as follows:

$BE = EGy * EF_{CO2, grid, y}$

BE = 22,038 MWh/year * 0.944 tCO_{2eq}/ MWh = 20,812 tonnes CO_{2eq}/year

Project Emissions

According to para 20 of AMS-I.D. (version 17), for most renewable energy project activities, PEy = 0. The project activity is a run of the river small hydroelectric plant and does not result in new reservoirs or increase of existing reservoirs. As there would be no emissions due to the implementation of the project, the project emissions are estimated to be zero.

However, as explained in section B.6.1, the emission due to “diesel usage” will be accounted as a project emission and shall be calculated as per the latest version of "Tool to calculate project or leakage CO2 emission from fossil fuel combustion, Version 2". For proper monitoring separate log book will be maintained at the plant for recording annual diesel consumption by the DG set (monitoring parameters are tabulated in the section B.7 of the PDD). The emission calculations will be done on actual basis, as follows.

Calculation for the estimation of emission due to diesel consumption

- Capacity of DG Set = X kVA
- Quantity of diesel consumption (Qd)= Y Lit (based on actual plant records)
- Density of diesel (ρ) = 0.860 kg/ltr[18] (Publicly available source; IOCL)
- Quantity of diesel combusted in DG set during the year y ($FC_{diesel,DGset,y}$) = Y * 0.860/1000 = ‘Z’ MT
- Net Calorific value of diesel (NCV_{diesel}) = 42.25 GJ/Tonne (Reference: **http://www.cea.nic.in/reports/articles/thermal/data_petroleum_fuels.pdf**)
- Emission factor of diesel (EF_{diesel}) = 0.0748 tCO2/GJ (Reference: 2006 IPCC Guidelines for National Greenhouse Gas Inventories)
- The CO2 emission coefficient of diesel in the year y ($COEF_{diesel,y}$) = 42.25 X 0.0748 = 3.1603 tCO2/Tonne

Emission from Diesel Consumption = ‘Z’ X 3.1603
= ‘Y’ tCO_2/year

[18] http://www.fast-tek.com/TM104.pdf

For ex ante estimation, the diesel consumption are assumed to be zero.

Thus,
$PE_y = 0$

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.

Formula used to determine Emission Reductions:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y Emission reductions in year *y* (t CO_2/y)

BE_y Baseline Emissions in year *y* (t CO_2/y)

PE_y Project emissions in year *y* (t CO_2/y)

LE_y Leakage emissions in year *y* (t CO_2/y)

ER_y = 20,812 – 0 – 0

= 20,812 tCO_2 e/year

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1	20,812	0	0	20,812
Year 2	20,812	0	0	20,812
Year 3	20,812	0	0	20,812
Year 4	20,812	0	0	20,812
Year 5	20,812	0	0	20,812
Year 6	20,812	0	0	20,812
Year 7	20,812	0	0	20,812
Total	**1,45,684**	**0**	**0**	**1,45,684**
Total number of crediting years	7 years			

Annual average over the crediting period	20,812	0	0	20,812

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$\mathbf{EG_{PJ,y}}$
Unit	MWh
Description	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)
Source of data	Calculated (Monthly Joint Meter Reading)
Value(s) applied	22,038
Measurement methods and procedures	Data Type: Calculated: $\mathbf{EG_{PJ,y}} = EG_{Export} - EG_{Import}$ 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.
Monitoring frequency	Continuous monitoring and recoded monthly basis
QA/QC procedures	The net electricity export 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 emissions
Additional comment	AHPL 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}
Unit	MWh
Description	Total Electricity Export to the Grid by the Project Activity in year *y* (MWh)
Source of data	Monthly Joint Meter Reading (JMR)
Value(s) applied	22,038
Measurement methods and procedures	Data Type: 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 AHPL and HPSEB. Joint meter reading shall be the basis for monthly invoice of net energy exported to the grid.

Monitoring frequency	Monitoring & Recording Frequency: The parameter will be monitored continuously on a real time basis[19] and recorded monthly basis. Data Archiving: Paper/ Electronic; Records of the joint meter reading of net energy exported to the grid shall be maintained by AHPL. Daily and monthly reports stating the net power export shall be prepared by the shift in-charge and verified by the plant manager of AHPL. Calibration Frequency: Once in every 6 months.
QA/QC procedures	For measuring the net energy exported to the grid, one main meter and one check meter, of accuracy class 0.2s, will be maintained. Main meter reading is the basis of billing and emission reduction calculations, so long as the meter is found to be within prescribed limits of accuracy during half yearly check. As per the PPA, the calibration of meters shall be done in every six months. Both main and check meters have separate set of CT/PT units to avoid chances of both going out of order simultaneously.
Purpose of data	Calculation of baseline emissions
Additional comment	AHPL 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}
Unit	MWh
Description	Total Electricity Import from the Grid by the Project Activity in year *y* (MWh)
Source of data	Joint Meter Reading (JMR)
Value(s) applied	0
Measurement methods and procedures	Data Type: Measured, The units imported will be measured at the main meter and check meter at the interconnection point at the substation. Monthly joint meter reading of main meters installed at the substation shall be taken and signed by authorised officials of AHPL and HPSEB. Joint meter reading shall be the basis for monthly invoice of net energy exported to the grid.
Monitoring frequency	Monitoring & Recording Frequency: The parameter will be monitored continuously on a real time basis[20] and recorded monthly basis Data Archiving: Paper/ Electronic; Records of the joint meter reading of net energy exported to the grid shall be maintained by AHPL. Daily and monthly reports stating the net power export shall be prepared by the shift in-charge and verified by the plant manager of AHPL. Calibration Frequency: Once in every 6 months.

[19] Electricity export and import values are monitored on a continuous basis through dedicated energy meter of 0.2s accuracy class installed at grid substation. The export and import values are measured automatically on a real time basis which ensures hourly measurement as per methodology requirement of the methodology.

QA/QC procedures	For measuring the net energy exported & Import, one main meter and one check meter, of accuracy class 0.2s, will be maintained. Main meter reading is the basis of billing and emission reduction calculations, so long as the meter is found to be within prescribed limits of accuracy during half yearly check. As per the PPA, the calibration of meters shall be done in every six months. Both main and check meters have separate set of CT/PT units to avoid chances of both going out of order simultaneously.
Purpose of data	Calculation of baseline emissions
Additional comment	AHPL 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**
Unit	Liters
Description	Diesel consumption by the standby DG set in year *y*.
Source of data	Plant log book.
Value(s) applied	0
Measurement methods and procedures	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 AHPL in the plant log book. 2) AHPL also maintains 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. 2) 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. 3) The diesel will be consumed only in the rare situation only when the power plant is not operational. 4) This value is used for project emission calculation.
Monitoring frequency	Annually
QA/QC procedures	The measured data will be cross checked with total diesel procurement using payment receipts.
Purpose of data	Calculation of project emissions

[20] Electricity export and import values are monitored on a continuous basis through dedicated energy meter installed at grid substation. The export and import values are measured automatically on a real time basis which ensures hourly measurement as per methodology requirement of the methodology.

Additional comment	The data would be archived upto two years after the end of crediting period.

B.7.2. Sampling plan

>>
Not applicable as there is no sampling for any data parameters.

B.7.3. Other elements of monitoring plan

>>
The general principles for monitoring above parameters are based on:

- Frequency
- Data recording
- Reliability
- Experience and training

Frequency

Monthly joint meter reading of main meters installed at the substation shall be taken and signed by authorised officials of AHPL and HPSEB. Daily data recording by the shift in-charge of AHPL shall be available at the generation end and interconnection point. Joint meter reading shall be 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 shall be maintained by AHPL and HPSEB. Daily and monthly reports stating the generation, auxiliary consumption, Total electricity export and import, diesel consumption would be prepared by the shift in-charge and verified by the plant manager of AHPL.

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, so long as the meter is found to be within prescribed limits of accuracy during half yearly check.

Monthly joint meter reading of main meters are taken and signed by authorised officials of AHPL and HPSEB once in every month. Records of this joint meter reading will be maintained by AHPL and HPSEB.

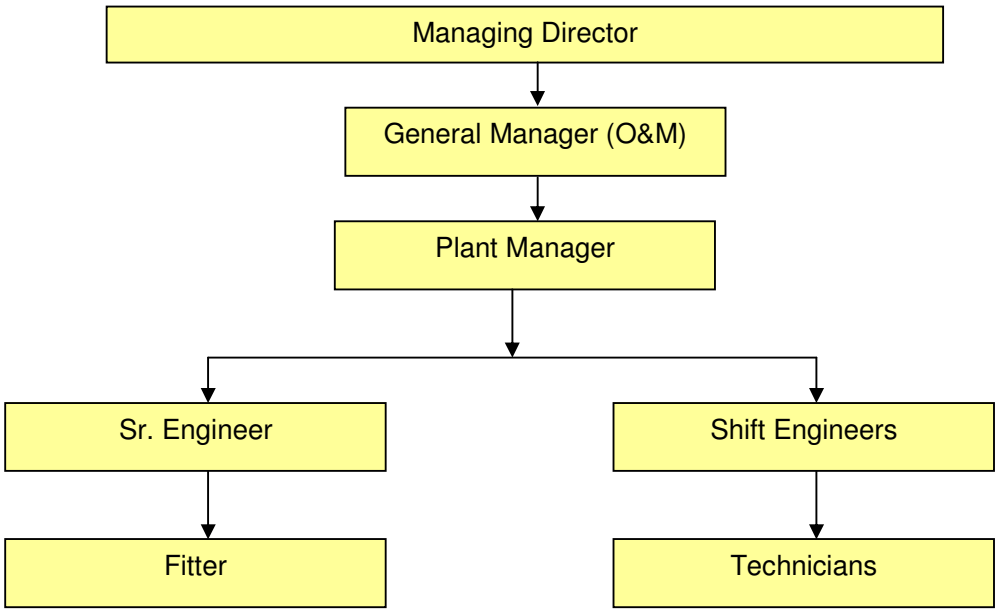
Procedure for data uncertainty:

The main and check meter shall be test checked for accuracy every six months and sealed by HPSEB in presence of representative of AHPL. 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 participant. In this case when both the meter found faulty simultaneously, which is very unlikely, then as per the PPA, Energy exported will be computed on a mutually agreeable basis between the Company and the Board for that period.

Data archiving and safe storage responsibility

AHPL shall archive and preserve all the monthly invoices raised against net saleable energy parameters stated in section B.7.1, on paper for at least two years after end of the crediting period. Managing director and Plant Manager shall be responsible for the safe storage of the archived data.



Managing Director of AHPL 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 onsite maintenance of the equipment, preventive maintenance etc.

Monitoring measurements and reporting:

The shift engineer will record the readings from main meter and check meter daily and these readings will be counter-checked by the Plant Manager. Apart from these, the readings of gross generation meter in the panel will be recorded hourly. All the above data are archived in paper form. Daily reports are sent to respective head office electronically and Monthly reports are generated and maintained at the plant and head office.

Records of joint meter reading shall be maintained by plant manager. Monthly invoices are prepared based on Joint meter readings which will crosschecked 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 mentioned in section B.7.1 of this document. As per the power purchase agreement (PPA) with HPSEB, the energy meters and the meter boxes shall be 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 AHPL. 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 AHPL and HPSEB. The method of calculation is as explained below:

For example, if the JMR date is 30th of a month whereas the crediting period starts on 25th of that month. The net energy supplied to the grid will be calculated as below:

Export reading on 30th	X
Export reading on 25th	Y
Total export between 25th to 30th	Z = X – Y
Import reading on 30th	A
Import reading on 25th	B
Total import between 25th to 30th	C = A – B
Total net electricity between 25th to 30th	E = Z – C

All the monitored data will be archived for at least two years after end of the crediting period.

B.7.4. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

>>
Date of completion of application of methodology:
04/05/2015

Contact information of responsible persons/ entities:

(For Ascent Hydro Projects Limited (AHPL))
Deepjyoti Borah
Ecoinvest Carbon S.A.
C/o Bunge India Pvt Limited, India.
(The Person/entity is not a project participant in this Project)

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>
26/02/2007. (Agreement with Kirloskar Brothers Ltd for electro mechanical works).

C.1.2. Expected operational lifetime of project activity

>>
35 y-0m[21]

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>
Renewal

C.2.2. Start date of crediting period

>>
15/08/2015, or the date of registration of the project activity, whichever is later.

C.2.3. Length of crediting period

>>
7 years

[21] Project life time has been considered as CE certificate & approved addendum report.

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
As per para 99 of Project Standard " If required by the host Party, project participants shall carry out an analysis of the environmental impacts of the proposed small-scale CDM project activity, and provide a summary of the analysis and the reference to all related documentation".

As per the EIA Notification[22] by the Ministry of Environment and Forests (MoEF), Government of India (MoEF) the project activity does not fall under the list of projects that require prior environmental clearance and therefore need not conduct Environmental Impact Assessment (EIA) studies. Hence as per the host party requirements, it is not required to carry out EIA studies for the project activity. However, the project participant has obtained consent to establish the project activity from the state environmental authorities i.e. the state pollution control boards.

[22] http://envfor.nic.in/legis/eia/so1533.pdf

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

The Local Stakeholder Meeting (LSM) has been conducted by project participant's at project site on 22nd July, 2008 in Panwi village in Kinnaur district of Himachal Pradesh. The stakeholders has been identified and invited for the stakeholder's consultation meeting via the personal invitation, such as an announcement at the local area, and personal communication through telephonic calls. In addition, an public invitation letter was sent also sent on 14th July 2008 to Gram Panchayat head to invite the local stakeholders for the meeting. The list of LSM participants are provided below.

Participants:

1.	Mr. S.K. Mukherjee	-	Resident Manager
2.	Mr. V.S.V.A Rao	-	Manager Commercial
3.	Mr. Manoj Kumar Sah	-	Project Engineer

From Panwi village (Panwi SHP)

1.	Mr. Nahayal Singh	-	Villager
2.	Mr. Sohan Lal	-	Villager
3.	Mr. Balvant	-	Villager
4.	Mr. Hans Raj	-	Villager
5.	Mr. Rajesh Kumar	-	Villager
6.	Mr. Rakesh	-	Villager
7.	Mr. Shamsher	-	Villager
8.	Mr. Rakesh Kumar	-	Villager

E.2. Summary of comments received

>>

The minutes of the meeting were recorded in local vernacular language, details of which are provided below translated into English (the original stakeholder consultation details pertaining to each project site have been provided to the DOE):

1. AHPL representative asked villagers about the project which is under construction in the Panwi Khad. The villagers informed that one 4 MW Hydroelectricity project is under construction. They indicated that they are well aware about hydroelectricity projects as in Kinnaur District, during last 10 years, many big hydro projects have been constructed and many are under construction like 120 MW Sanjay Hydro Electric Project and 1500 MW Nathpa Jakhri project.

2. AHPL asked the villagers what benefit the villagers will get on construction of the project. The villagers informed that the local people will get employment and the local experienced contractors shall get the job in the project. The fund which is being paid by the Company under the Local Area Development, the same funds shall be used for providing drinking water, road, hut etc. With the project, Government of Himachal Pradesh shall also be benefited by which they will get the electricity in cheap rates.

3. AHPL asked about the losses due to construction of the project. Villagers replied that practically there are no losses due to construction of such small hydro projects. No private land has been acquired in the project and there is no private property in the project area.

4. AHPL asked what type of difficulties villagers may face due to construction to which villagers replied that there may be sound pollution and small problems may occur.

It was also assured by AHPL representative in the meeting that due to construction of the project if any losses occur to the villagers or any problems are faced by them, those will be resolved immediately. After commission of the power plant company will pay more attention towards the development of village.

The meeting ended with a vote of thanks.

E.3. Report on consideration of comments received

>>

No negative comments were raised during the LSM from any stakeholder which mandated an action on the part of the project participant. All the LSM supportive documents will be submitted to DOE for validation.

SECTION F. Approval and authorization

>>
Project participant has obtained the LOA from host country designated national authority.

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Ascent Hydro Projects Limited
Street/P.O. Box	Regd. Office: 6, Shiv-Wastu,
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Project participant and/or responsible person/ entity	☐ Project participant ☒ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
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Appendix 2. Affirmation regarding public funding

There is no public funding of project activity from Annex1 Parties.

Appendix 3. Applicability of methodology and standardized baseline

The applicability of the methodology is described in section B.2 of this PDD. There is no further background on applicability of the methodology.

Appendix 4. Further background information on ex ante calculation of emission reductions

As mentioned in section B.6.2

Appendix 5. Further background information on monitoring plan

As mentioned in section B.7.2

Appendix 6. Summary of post registration changes

Not Applicable

Document information

Version	*Date*	*Description*
05.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the project design document form for small-scale CDM project activities (these instructions supersede the "Guidelines for completing the project design document form for small-scale CDM project activities" (Version 01.1)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from *F-CDM-SSC-PDD* to *CDM-PDD-SSC-FORM*; • Editorial improvement.
04.1	11 April 2012	Editorial revision to change history box by adding EB meeting and annex numbers in the Date column.
04.0	13 March 2012	EB 66, Annex 9 Revision required to ensure consistency with the "Guidelines for completing the project design document form for small-scale CDM project activities"
03.0	15 December 2006	EB 28, Annex 34 • The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.
02.0	08 July 2005	EB 20, Annex 14 • The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
01.0	21 January 2003	EB 07, Annex 05 Initial adoption.

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