Project design document form
(Version 11.0)

BASIC INFORMATION	
Title of the project activity	Run-of-the-river Hydroelectric Power Project in Uttarakhand by Alaknanda Hydro Power Company Limited
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	6
Completion date of the PDD	30/10/2020
Project participants	M/s Alaknanda Hydro Power Company Limited
Host Party	India
Applied methodologies and standardized baselines	ACM0002 ver. 12.1 - Consolidated baseline methodology for grid-connected electricity generation from renewable sources Standardized Baseline: Not Applicable
Sectoral scopes	1 : Energy industries (renewable - / non-renewable sources)
Estimated amount of annual average GHG emission reductions	1,203,884 tCO2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

Alaknanda Hydro Power Company Limited (AHPCL) is setting up a 330 MW 'run of the river' hydropower project in Uttarakhand. The 330 MW Shrinagar Hydro Electric Project is located on Alaknanda River, a major tributary of the Ganga River, a perennial river in Uttarakhand. The project site is 110 km from Rishikesh railhead, along Rishikesh - Badrinath highway. A weir has been proposed on Alaknanda River at Shrinagar, about 26 km downstream of Rudraprayag for generation of hydro- electricity. The power project is is commissioned in Year 2015. The project proponent does not own or operate any other renewable energy project.

Pre-project Scenario

This being a Greenfield project, no power generation facility existed at the project site in the pre-project scenario. Taking in to account its impact after the project becomes operational; the pre-project scenario can be generation of equivalent amount of electricity in the grid using the existing fuel mix. This will also mean continuing a short fall of significant electricity leading to frequent load shedding.

Purpose of the project activity

The purpose of the project activity is construction and operation of a grid connected renewable electricity generation hydro electric power plant. The project activity will reduce the GHG emission by use of a clean, renewable (hydro power) source for power generation in place of common fossil fuels. The project activity will reduce the dependence on fossil fuel of the North (new Integrated Northern, Eastern, Western and North Eastern- NEWNE) grid which is dominated by emission intensive coal based thermal power plants.

The project activity involves construction of a concrete gravity diversion weir across the river Alaknanda, and its left bank construction stage diversion tunnel, an intake on right bank consisting of 6 numbers intake tunnels joining two Head Race Tunnels (HRT) through a manifold section, of 9.8 m dia. circular head race tunnel followed by a RCC cut and cover conduit crossing the supana nallah, a desilting basin followed by power channel, fore bay, power house, tail race channel and switchyard. The powerhouse would accommodate 4 generating units of 82.5 MW each. The proposed civil structures of Shrinagar Hydro-Electric Project have been planned and designed to divert and convey maximum design discharge[1] of 560 m^3/s.

The height of the weir will be about 90 meters from the deepest foundation level[2]. The collected water will pass through two numbers 9.8 meter diameter HRTs and about 1.10 length of tunnels and by 3.2 km long Power Channel to the Forebay and Powerhouse. The capacity of powerhouse is 330 (4 x 82.5 MW) Mega Watt. The project is likely to generate a primary and secondary energy of 1397 GWh per annum and 117 GWh per annum respectively.

The project activity would sell 88% of the energy generated to Uttar Pradesh Power Corporation Limited (UPPCL). The remaining 12% will be supplied free of cost to Uttarakhand State. The Power Purchase Agreement (PPA) for the project activity was signed in June 2006 with Uttar Pradesh Power Corporation Limited (UPPCL) and is valid for a period of 30 years from the date of commissioning of the last unit.

[1] EIA study report, vol I, pg.33 (of pdf file)

[2] EIA study report, vol I, pg.34 (of pdf file)

The lifetime of the project activity is estimated as 35 years in accordance with applicable UPERC Guidance[3]. The project activity once operation will supply 1514 GWh per annum to the power deficient grid.

As per the applicable[4] methodology ACM0002, the project activity is the installation of a new grid- connected renewable power plant/unit, the baseline scenario is - electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin. The emission sources and gases included are none for the project activity (as per the applicable methodology) and CO2 emissions from the current fuel mix in the grid in the baseline.

The proposed Project activity will reduce the anthropogenic emissions of greenhouse gases (GHGs) in to the atmosphere by avoiding operation of existing fossil fuel based power plant and future capacity expansion of fossil fuel-based generation by the NEWNE Grid.

Project planning history – A power project at the same site was initially conceived by Uttar Pradesh State Electricity Board for 200 MW (40 MW x 5 units) in 1984. After subsequent review, the techno economic clearance by CEA was accorded for 330 MW (55 MW x 6 units) in 1987. The project proponent considered seeking World Bank assistance and accordingly project planning was started. The project planning was not progressing from 1990 due to the paucity of funds.

In 1994, the Government of Uttar Pradesh decided to execute the project with private sector participation and signed MOU with Duncans Industries Ltd. This company along with the Synergics Hydro Asia (SHA) formed Duncans North Hydro Power Company Ltd. (DNHPCL). As a first step, PPA was signed with the UP State Electricity Board in 1998 and Detailed Project Report was prepared in 2000. Based on the DPR, CEA approved the project (Techno Economic Clearance) on 14/06/2000 at total project cost 17,228.0 million. In 1999, Uttar Pradesh was divided in two states and project area came in new state region Uttarakhand (then Uttaranchal). The project could not move ahead and the Tata Power Company Ltd. (TPC) took over the project (that was a Special Purpose Vehicle Company) in October 2003. The name of the company was then changed to the Alaknanda Hydro power Company Ltd. in April 2004. The company also continued exploratory work and invited civil works and E&M (engineering and Mechanical) works bids. At this stage the following pre project activities have been completed:

- Power Purchase Agreement was signed and DPR was completed in 2000
- Techno Economic Clearance was obtained from Central Electricity Authority in 2000
- Quotations were invited for Civil and Electro Mechanical works in 2004

In November 2005, GVK Group took over Alaknanda Hydro Power Company Ltd. and the process was concluded through a share purchase agreement. After this, the restated implementation agreement between the AHPCL, Government of Uttarakhand and Government of Uttar Pradesh was signed on 10/02/2006. The UPERC approved revised project cost in June 2006.

Subsequent to this, detailed project implementation plan was drawn up and first project activity implementation work (construction of a diversion tunnel) was awarded on 26/04/2006 and started only after the financial closure in 2007.

Contribution of the project activity to sustainable development

[3] Gazette Notification on 18th June 2005. http://www.uperc.org/regulations.htm

[4] As mentioned in section B.1

Ministry of Environment and Forests, Govt. of India has specified the social well being, economic well being, environmental well being and technological well being as the four indicators for sustainable development in the interim approval guidelines of host country approval eligibility criteria for Clean Development Mechanism (CDM) projects[5].

Social well-being:

- The project activity will generate many direct and indirect employment opportunities. It has been estimated that during construction period, the skilled and unskilled labours will be required up to 2500 persons. The operation of this plant also creates new employment opportunities for the region.
- It has increased income security of vulnerable sections of the rural communities in the vicinity of the project site through redistribution of benefits on account of the new direct and indirect employment opportunities associated with the project.
- The project activity will indirectly help in infrastructure development in the neighbouring villages like better roads, telecommunication etc.

Environmental well-being:

- The electricity generated by the project activity will be supplied to NEWNE grid, which otherwise would have been generated by fossil fuel fired power plants in the grid.
- The project activity will help in reduction of the greenhouse gas emissions and air pollutants (especially NOx and SO_2).
- The project activity also helps in conservation of depleting fossil fuels such as coal, oil, natural gas which at present are predominantly used for power generation.
- The project activity being run-of-the-river power project will have minimum environmental impact than a reservoir based hydro power plant

Economic well being

- The construction of the hydro power plant will create employment opportunities and opportunities for the allied sectors that supply services to the local population that is expected to increase once the project is operational. This will eventually raise the economic standards of the people residing near the project activity.
- The stakeholders' in the vicinity of the project site have tourism as a major income source and the project activity of this scale is expected to boost that further[6]

Technological well being

- Clean technology application in renewable hydro electricity generation
- The successful implementation will encourage private entities and finance corporations to enter renewable power generation

The project proponent undertakes to spend an amount equal to 2% of the net realization from out of Carbon Credits on any or all of the following and other sustainable development activities in consultation with the local community either directly or through

[5] http://cdmindia.nic.in/host_approval_criteria.htm

[6] EIA study report, vol I, pg.18 (of pdf file)

the GVK Foundation, which is involved in similar activities. A detailed plan towards this submitted to DNA is given as Annex 1.
Thus, the project activity contributes the sustainable development criteria of the host country. The project activity has been awarded the Host Country Approval on 06/02/2009.

A.2. Location of project activity

Tehri Garhwal and Pauri Garhwal Districts, Uttarakhand, India

The Alaknanda River, on which the project has been proposed, rises in the glacier regions of the Greater Himalayas in the extreme northern part of the border district of Chamoli in Uttarakhand. The Alaknanda is joined by the Mandakini River at Rudraprayag. The length of Alaknanda up to Rudraprayag is 180 km with an average slope of 24.0 m per km. The Mandakini River runs for a length of 80.0 km up to the confluence at Rudraprayag with an average slope of 42.0 m per km.

A weir has been proposed on Alaknanda River at Shrinagar, about 26 km downstream of Rudraprayag for generation of hydro-electricity. The project site is located on the river Alaknanda at a distance of about 110 km from Rishikesh railhead, along Rishikesh - Badrinath highway. This location is towards north east of Pauri and towards Rudra Prayag

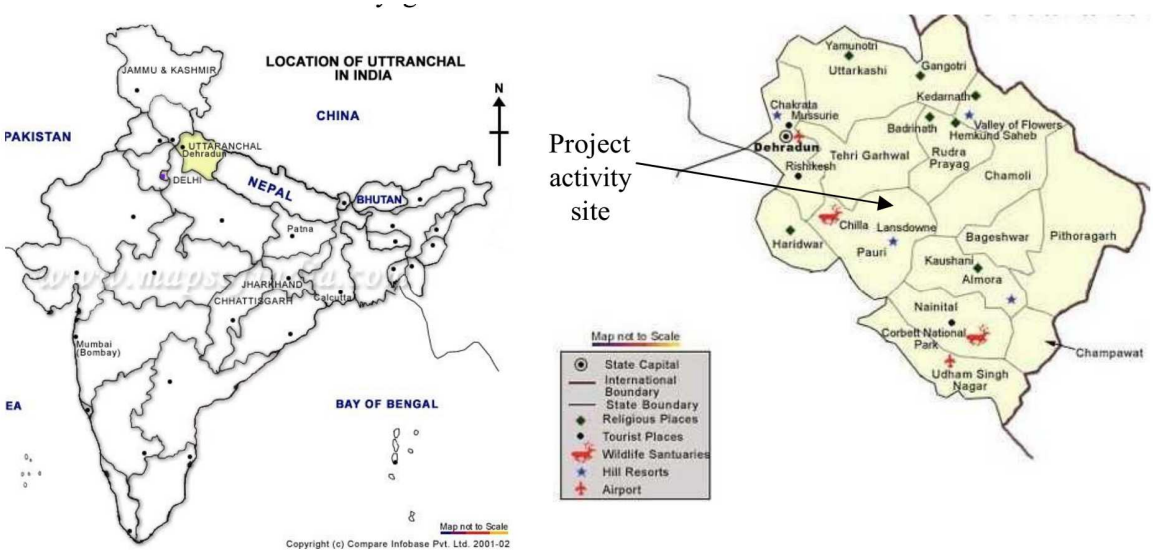


Figure 1: (a) Location of Uttarakhand state in India and (b) site of the project activity

State, District, Tehsil	Uttarakhand, Tehri Garhwal and Pauri Garhwal, Kirtinagar & Pauri
Longitude	78° 50' 01" E
Latitude	30° 14' 20" N
Nearest rail head	Rishikesh
Nearest Airport	Dehradun
Nearest National Highway	NH -58

A.3. Technologies/measures

The project activity is construction and operation of 330 MW hydro electric power plant to supply electricity to the grid. The project activity being a Greenfield project, no power generation facility existed in the *pre-project scenario*. The project activity is commissioned in Year 2015. The project proponent does not own or operate any other renewable energy project. The service provided by the project activity is the generation of electricity to the tune of 330 MW. In the absence of the project activity the equivalent power would have been generated from the existing fuel mix in the grid and the future capacity additions.

The main elements of the concerned project activity are[7]:

Weir and Spillway:
A 90 m high diversion weir with spillway crest elevation at 584.50 m has been proposed to have a live storage of 8.00 mcum between Full Reservoir Level (FRL) of 605.50 m and Minimum Draw Down level (MDDL) of 603.00 m. The weir at the top would be 248 m long comprising 140 m over flow section and 108 m non-over flow section. The spillway located in the middle of the weir would have 8 radial gates of sizes 14 m (width) x 21.15 m (height).

Intake Structure:
The intake structure has been located on the right bank about 100 m upstream of the weir axis and about 12 m inside from the line with the spillway on the right side. The intake works have been planned and designed for taking in 660 m^3/s at the MDDL i.e. EL 603 m. Tunnel type intake structures having 6 openings are proposed to provide 132 m^3/s discharge through each individual 6.5 dia. tunnels which join two numbers 9.80 m diameter HRTs.

Head Race Tunnel (HRT):
The main HRTs would be 2 numbers of about 1100 m long with 9.80 m dia. each.

Supana nallah Crossing:
Beyond HRTs, 2 RCC conduits have been provided for a length of about 185 m.

Desilting Basin:
A desilting basin of size 157 m (width) * 200 m (length) * 29 (depth) is provided at the end of RCC trough section to exclude silt particles of size higher than 0.20 mm. The basin has been divided into two compartments by providing a RCC wall in between.

Power Channel:
The 3.20 km long Power Channel takes off immediately from the desilting basin and terminates into fore bay at the end of its run. The channel would be trapezoidal section in general and would vary depending on the land available and would be provided with cement concrete lining in its entire length.

Fore bay:
The power channel would terminate in a fore bay structure. The width of the fore bay structure (48 m) of the fore bay is designed to accommodate the total width of the intake structure at the upstream side of the penstocks.

By Pass Channel:

[7] EIA study report, Vol I, pg. 34, 35 (of pdf file)

A bypass channel to discharge the surplus water, in case of sudden stoppage of units is provided for a length of about 297 m long and would discharge directly into the river. The crest of the structure is kept at EL 596.8 m and would compromise 3 bays of 15 m width with 2 piers each of 1.5 m thick.

Intake Structure:
The intake structure located at the end of fore bay accommodates 4 penstocks and is spaced at 20 m centre to centre. Bell mouth entry with suitable transitions has been provided at the entry leading to the 5.6 m dia. penstocks. The center line of the penstock at the intake has been kept at EL 593 m.

Penstocks:
4 numbers steel penstocks of 5.6 dia. have been provided to lead the discharge from the fore bay to the power house. The penstocks are spaced 20 m center to center.

Power House and Switchyard:
The size of power house structure is 52.40 m (width) x 131.50 m (length) and would house 4 numbers Francis Turbines (vertical shaft) generating 82.5 MW each. The turbine would operate under a varying maximum head of 68.00 m to minimum head of 63.00m. The runner dia. of inlet/throuat/outlet are 4022/3984.4000 mm respectively. The bottom removal facility for quick maintenance has been provided. The turbines would be fed by individual penstocks from the fore bay and controlled by electro –hydraulic modern type governors.

Switchyard will have four 400 kV outgoing transmission line bays.

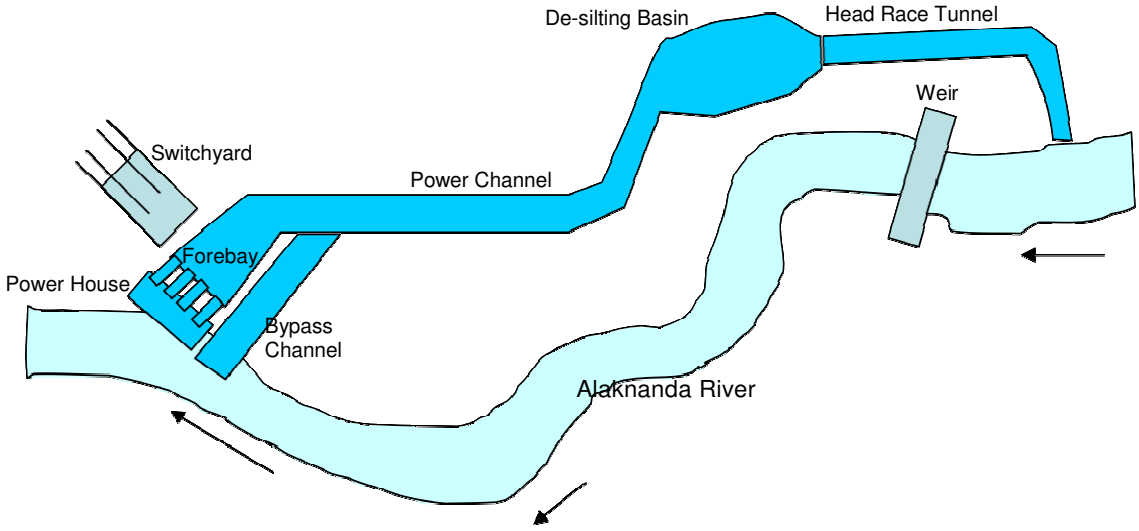


Figure: Schematic representation of project activity

A brief description of the turbine (total 4 No.s) parameters is given below:
Turbine Rating: 82,500 kW

Parameter	Value
Make	BHEL
Rated power	82.5 MW * 4
Average age	0 years (new from OEM)
Average lifetime	35 years
Efficiency	93.36%

Turbine Head Range

Normal:	65.0 m
Maximum:	68.0 m
Minimum:	63.0 m

Considering modern practices for designing of Francis Turbines, particularly in view of susceptibility to erosion of turbine parts due to silt in river water, the essential turbine parts such as runners, guide vanes, facing plates, labyrinth rings shall be coated with a resistance layer of hard ceramic material embedded in a ductile matrix. Each turbine would be fed by individual penstocks from fore bay and controlled by Electro-hydraulic modern type governors. The Runners, Labyrinth seals, Guide vanes are envisaged to be of stainless steel to minimize erosion. Runners and Guide vanes shall be 13/4 Chrome Nickel steel.

Each of the four turbines have rated capacity 82.5 MW with 10% continuous overloading and maximum output of 92.95 MW[8].

The generator is proposed to be a vertical shaft synchronous machine with rated continuous output of 97.06 MVA, having rotational rated speed of 166.66 rpm and run away speed of 315 rpm to match with that of turbine. A brief description of the generator parameters is given below

Generator[9]

Parameter	Value
Make	BHEL
Rated power	82.5 MW * 4
Average age	0 years
Average lifetime	30 years
Efficiency	98%
Rated Voltage	13.8 kV, Range ±10%
Frequency	50 Hz +3% to -5%
Excitation	Static type
Power Factor	Rated PF (lagging) – 0.85

The generators' continuous overload output is 90.75 MW[8]. The generator stator and rotor windings will be provided with epoxy insulation of class 'F'. The generator ventilation system would be of closed recirculation type with air cooled by water. The generator shall be designed to withstand the runaway speed which shall be co-ordinated with the turbine supplier.

The bearing arrangement will comprise a turbine guide bearing and a thrust cum guide bearing below the generator rotor. This bearing arrangement is recommended in view of comparatively low speed of rotation. Generation of power at 13.8 kV is stepped up to 400

[8] Agreement for Generating Units and Auxiliaries May 2007 with Bharat Heavy Electrical Ltd; pg. 171

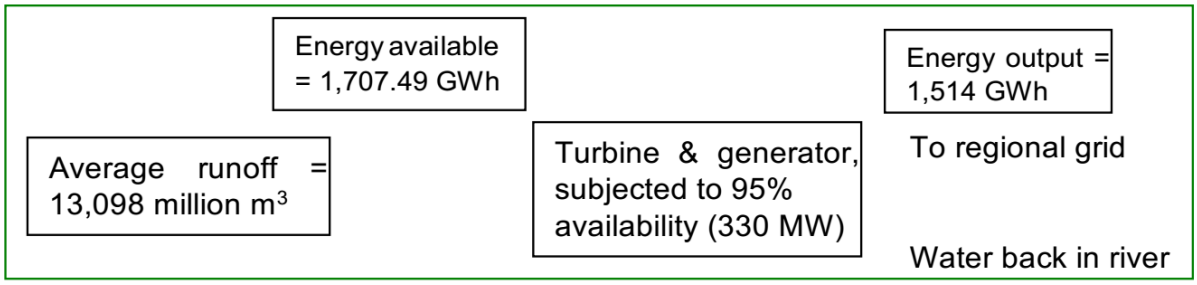
[9] Agreement for Generating Units and Auxiliaries May 2007 with Bharat Heavy Electrical Ltd; pg. 174

kV by a power transformer. The arrangement for Power Evacuation from Shrinagar Hydro Power Station is as below:

1. One circuit of 400 kV Muzaffarnagar-Vishnuprayag line may be made with line in and line out (LILO) at the Switchyard of Shrinagar Power House.
2. One double circuit may be connected from Shrinagar Power House substation to PTCUL substation at Shrinagar.

Based on the estimated generation, the PLF is calculated[10] to be at 52.3% for the project activity. This is the overall load factor of the entire plant and the individual units will contribute accordingly. The lifetime of the project activity is estimated as 35 years. The project activity once operation will supply 1514 GWh to the power deficient grid.

Mass and Energy balance:
The capacity of the concerned project activity is designed based on the hydrological studies conducted by the Central Water Commission (CWC) in the Alaknanda River. The hydrological series of 23 years total unrestricted energy generation is arranged in a descending order and then the 90% of the hydrological year is found out by formula (0.9 x (N+1))th year where N is the number of years for which the data is available.



The level of service provided by the project activity is not dependant on any other manufacturing system outside the project boundary. The power generation depends only on the flow rate of the water in the river. As the project activity is constructed based on the historic flow a condition, the mass balance is not envisaged to be subjected to major changes.

The project activity utilizes hydro power for generation of electricity. The technology consists of conversion of the potential energy available in the water flow to mechanical energy using a hydro turbine and by connecting to a generator, mechanical energy is converted into electrical energy. In this process there is no burning of any fossil fuels and hence no emissions. Thus electricity is generated through sustainable means without causing any negative effect on the environment. Therefore the technology is environmentally safe and sound. The technology employed is best available in the field and environmentally safe and sound. The use of this advanced technology to harness the renewable energy source will avoid emission of GHGs and other pollutants like CO, SOx, NOx and SPM commonly associated with power generation in general. Also, during the construction phase, an approved environmental management plan is being followed as detailed in Section D of the PDD.

Technology transfer from Annex I countries is not involved in the project activity.

As per the applicable methodology, as the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is - electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected

[10] Based on Design Energy (primary and secondary) approved by CEA from hydrology data

power plants and by the addition of new generation sources, as reflected in the combined margin. The emission sources and gases included are none for the project activity (as per the applicable methodology – no CO2 emissions from hydro electric power plants and CO2 emissions from the current fuel mix in the grid in the baseline.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India	M/s Alaknanda Hydro Power Company Limited	No

A.5. Public funding of project activity

Public funding, such as grants from official development assistance (ODA), is not involved in this project. The project cost is met by the project proponents, project developers and in part by debt finance from banks and financial firms

A.6. History of project activity

The registration date of the project activity under CDM mechanism is 09/06/2011. https://cdm.unfccc.int/Projects/DB/BVQI1304680909.79/view

The CDM project activity is registered as a CDM project activity and not included as a component project activity (CPA) in a registered CDM programme of activities (PoA).

The CDM project activity is also not a project activity that has been deregistered.

The CDM project activity was not a CPA that has been excluded from a registered CDM PoA.
No registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) exists in the same geographical location as the proposed CDM project activity.

A.7. Debundling

Not Applicable as project is large scale project

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

Title: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"
Reference : Approved consolidated baseline methodology ACM0002
Version : 12.1.0
Sectoral Scope: 01
EB : 58

Title : "Tool for the Demonstration and assessment of additionality"
Version : 05.2
EB : 39

Title : "Tool to calculate the emission factor for an electricity system"
Version : 02
EB : 50

Title : "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion"
Version : 02
EB : 41

B.2. Applicability of methodologies and standardized baselines

As specified in ACM0002, (Version- 12.1.0) the methodology is applicable to grid-connected renewable power generation project activities that involve electricity capacity additions.

The project activity is grid connected renewable power generation from run-of-the-river hydro power plant.

S. No.	Technology/ Measures as per ACM0002, version 12.1.0	Project activity measures
1	This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity is construction and operation of a new, grid connected renewable power generation project (hydro power plant) that (a) installs a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant). Thus, the applicability condition is matched.
2	The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	The project activity is installation of a hydro power plant (run-of-river) [11] . Thus, the applicability condition is matched.
3	In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	The project activity is a Greenfield project and not capacity additions, retrofits or replacements of the existing plant. Thus, this condition is not applicable.

[11] The project activity plant is 'run-of-river power station with pondage' as per UPERC classification (Refer As per UPERC (Terms and Conditions of Generation Tariff) Regulations, 2004; pg. 29).

4	In case of hydro power plants: - 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/m^2. - The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	The proposed project activity is a run-off-the river hydro project. It involves a diversion weir to get required head and thus implementation will result in the formation of a new pondage for maximum 4 hours of operations only at full load 330 MW design capacity. Thus, the applicability condition is matched.
5	The methodology is not applicable to the following: Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants; • Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2.	The project activity installs a new hydro power plant and does not involve fuel switch or biomass fired power plant. Thus, this condition is not applicable.
6	In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	The project activity is a Greenfield project and not capacity additions, retrofits or replacements of the existing plant. Thus, this condition is not applicable.

As the project activity meets all the applicability criteria of the baseline methodology ACM0002, the methodology is applicable and can be used here.

Applicability conditions of Methodological Tools

1) The methodological Tool 'Tool to calculate the emission factor for an electricity system' is applicable as below

'This tool may be referred to in order to estimate the OM, BM and/or CM for the purpose of calculating baseline emissions for a project activity substitutes electricity from the grid, i.e. 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). Note that this tool is also referred to in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" for the purpose of calculating project and leakage emissions in case where a project activity consumes electricity from the grid or results in increase of consumption of electricity from the grid outside the project boundary.'

The project activity supplies electricity to the grid and in turn substitutes electricity from the grid. Thus the project activity can use this methodological Tool for estimation of OM, BM and CM for the purpose of calculating baseline emissions.

2) The methodological Tool 'Tool for the Demonstration and assessment of additionality' is applicable as below

'The document provides a general framework for demonstrating and assessing additionality and is applicable to a wide range of project types. Some project types may require adjustments to this general framework. This tool does not replace the need for the baseline methodology to provide a step-wise approach to identify the baseline scenario.'

The project activity has used this Tool as specified in the applicable baseline methodology. There is no specific applicability and this is a general framework. The project activity has used the Tool with appropriate adjustment as evident in Section B.5.

B.3. Project boundary, sources and greenhouse gases (GHGs)

The project activity is construction and operation of a new 330 MW run-of-the-river hydro power plant. According to ACM0002, for the baseline emission factor, the spatial extent of the project boundary includes the project site and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

Thus, the project boundary is the spatial extent of the Alaknanda Hydro Power Plant and all the power plants in the Integrated NEWNE grid.

Scenario	Source	Gas	Included/ Excluded	Justification/Explanation
Baseline	Fossil fuel fired power plants connected to the grid	CO_2	Included	Main emission source
		CH_4	Excluded	Minor emission source, excluded as per ACM0002 for simplification.
		N_2O	Excluded	Minor emission source, excluded as per ACM0002 for simplification.
Project Activity	330 MW run-of-the- river hydro electric power plant	CO_2	Excluded	The project activity is renewable energy project which will not create any CO_2 emissions itself.
		CH_4	Excluded	The project activity is renewable energy project which will not create any emissions itself.
		N_2O	Excluded	The project activity is renewable energy project which will not create any emissions itself.

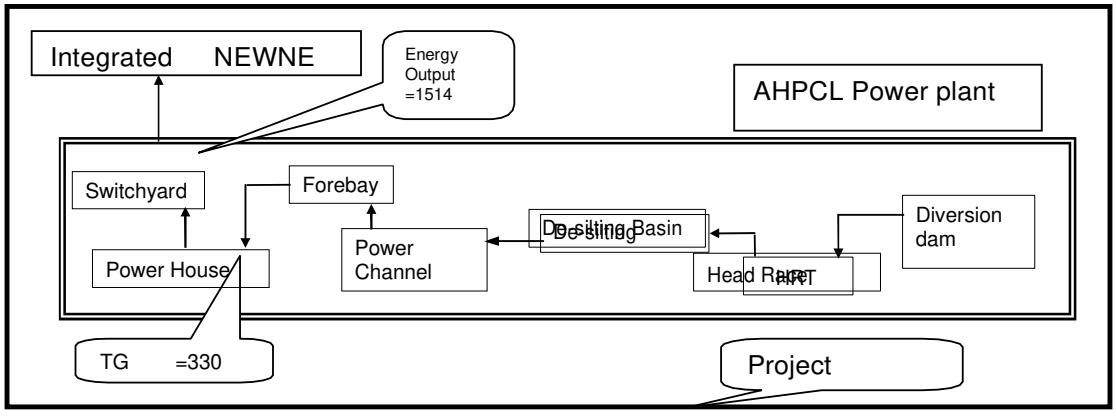


Figure: Flow diagram showing Project boundary

As the concerned project activity is a renewable energy generation facility. It does not result in the production of the greenhouse gases as per the applicable methodology.

B.4. Establishment and description of baseline scenario

The baseline methodology ACM002, Version 12.1.0 gives two scenarios that are applicable to the concerned methodology.

Reference : Approved consolidated baseline methodology ACM0002
Version : 12.1.0
Sectoral Scope : 01
EB : 58

The project concerned has the baseline is identified as below.

"If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

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

Baseline scenario:

In the absence of the project activity, the equivalent power to the grid would have been supplied by the other existing or new power plants that supply the power to the grid. In the host country the main source of the electricity in this region is thermal power plants[12]. Hence in the absence of the project activity the equivalent power would have been supplied by the electricity mix of which the major part would have been contributed by the fossil fuel based power plants. Hence this grid electricity mix can be taken as the baseline scenario.

The identified baseline is in compliance with the existing laws and regulations. As the power generation from the fossil and other renewable energy sources and that can be connected to the grid are allowed under the host country conditions.

The proposed project activity is a run-of-river hydro power project with an installed capacity of 330 MW on the river Alaknanda. In the absence of the project activity, the equivalent amount of electricity would have been generated by the operation of grid connected power plants that are predominantly GHG intensive Thermal power plants. The Project activity will thus reduce the anthropogenic emissions of greenhouse gases (GHG) in to the atmosphere associated with the equivalent amount of electricity generation.

Hence, the emissions in the baseline scenario would be the emissions from the equivalent amount of electricity generated by the prevailing generation mix of the grid. The reference grid is NEWNE Grid to which the electricity generated from the project activity is supplied.

Baseline Emissions:

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

[12] http://www.cea.nic.in/god/opm/Monthly_Generation_Report/18col_A_08_09/opm_02.pdf

Where:

BE_y = Baseline emissions in year y (tCO_2/yr)

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

$EF_{grid,CM,y}$ = Combined margin 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" (tCO_2/MWh)

The project activity is a new, Greenfield hydro electric power plant. Thus, $EG_{PJ,y}$ can be calculated by following equation

$$EG_{PJ,y} = EG_{facility,y}$$

Where:

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

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

The grid emission factor is the combined margin (CM) of the grid, consisting of the combination of operating margin (OM) and build margin (BM) and this is calculated by the Central Electricity Authority (CEA) India according to the procedures prescribed in the approved methodology ACM0002. We have referred the same value for the baseline calculation.

Since the CDM project is connected to the NEWNE grid, it is also preferred to take the NEWNE grid as project boundary than the state boundary. It also minimizes the effect of inter state power transactions, which are dynamic and vary widely

The key parameters and data sources applied for calculation of emission reduction are furnished below.

Variable	Data Source
$EG_{facility,y}$ – Quantity of net electricity displaced & supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)	Calculated from design energy approved by CEA for ex-ante estimation In monitoring period, actual net electricity Supplied by project activity records maintained by project proponent will be used
$EF_{grid,OM,y}$ - Operating margin CO_2 emission factor for the project electricity system in year y (tCO_2/MWh)	Central Electricity Authority (CEA) of India CO_2 Baseline Database for Indian Power Sector , Version 04
$EF_{grid,BM,y}$ - Build margin CO_2 emission factor for the project electricity system in year y (tCO_2/MWh)	
$EF_{grid,CM,y}$ - Combined margin CO_2 emission factor for the project electricity system in year y (tCO_2/MWh)	

Leakage:

The methodology suggest neither to consider leakage on account of power plant construction etc. nor to claim emission reduction from these activities.

Project Emissions

The project emissions for the most renewable power projects are zero. In case of the hydro electric power plants, the projects are required to be considered if the power density of the reservoir is < 10 W/m^2. In the case of this project activity, the power density of the resulting pondage is much higher (101 W/m^2) and the project emissions are zero.

Due to the diversion weir for getting required head for the power plant, a new pondage is generated. The project activity plant is 'run-of-river power station with pondage' as per UPERC classification[13]. This pondage will have a maximum power density of 101.85 W/m^2.

- Reservoir surface area at full at full reservoir level: 324 hectares[14]
- Total installed capacity: 330,000,000 W (i.e. approved capacity = 330 MW)

Emission Reduction

Emission reductions are calculated as follows:

$ER_y = BE_y - PE_y$

Where:
ERy = Emission reductions in year y (t CO_2e/yr)
BEy = Baseline emissions in year y (t CO_2e/yr)
PEy = Project emissions in year y (t CO_2/yr)

Here, PEy =0

Thus,
$ER_y = BE_y$

B.5. Demonstration of additionality

National Scenario:

Private sector contribution in hydro power sector is large untapped. Ministry of Power, Government of India, in August 1998[15] announced Policy of Hydropower Development. The report estimated only 15% potential was tapped nationally (of potential 84,000 MW). The share of hydro power was also found to be declining annually in the total fuel mix. Under the policy, a definite goal was set to be achieved in 9th and 10th Five Year Plans. The Government declared private sector participation, different subsidies and tax incentives. The project activity has considered all applicable incentives in the financial analysis.

Further, during 9th and 10th Five Year Plans, the Policy identified specific hydro power capacity targets with central, state and private sector contribution[16]. The objectives of the policy were

I. Ensuring targeted capacity addition during 9th Plan
II. Exploitation of vast hydroelectric potential at a faster pace
III. Promoting small and mini hydel projects
IV. Strengthening the role of PSUs/SEBs for taking up new hydel projects:
V. Increasing private investment

The policy also identified instruments to achieve the objectives in terms of founding, different promotion schemes, Renovation, Modernisation & Uprating etc.

The project activity is construction and operation of a hydro electric power plant. In absence of the project activity, the equivalent amount of electricity would have been generated in the

[13] Refer As per UPERC (Terms and Conditions of Generation Tariff) Regulations, 2004; pg. 29

[14] EIA report page 19. (1 hectare = 104 m2)

[15] http://www.powermin.nic.in/whats_new/pdf/hydro_power_policy_developmemt.pdf

[16] http://www.nhpcindia.com/writereaddata/English/PDF/hydro-policy.pdf

existing and future power plants in the NEWNE grid. Thus, the project activity avoids the emission of equivalent amount of GHGs associated with the current fuel mix in the grid.

The project activity plant has a power purchase agreement with Uttar Pradesh Power Corporation Ltd. Lucknow (a Government of Uttar Pradesh undertaking) for a 30 year period. The Power Purchase Agreement (PPA) is for the sale of 88% of the generated electricity and remaining 12% to be given to the Government of Uttarakhand free of cost. Salient terms for the tariff determination that results in revenue to the project activity are explained below.

- capacity index: average of the daily capacity indices over one year
- daily capacity index: the declared capacity expressed as a % of the maximum available capacity for the day and mathematically expressed as

daily capacity index = declared capacity (MW) x 100/ maximum available capacity (MW) This is limited to maximum 100%.

- capacity charges: amounts payable to AHPCL for Capacity under the PPA

The tariff consists of two parts
1) capacity charges
2) (a) primary energy charges (b) secondary energy charges

1. Capacity charges = Annual fixed charges - primary energy charge

• Annual fixed charges consist of – interest on debt due during tariff year; depreciation including advance against depreciation; return on equity for tariff year; O&M expense including insurance; interest on working capital;

2a) Primary energy charge: Primary is the quantum of energy generated up to the Design Energy per year basis at the Project. Primary energy charges for generating unit/ project will be calculated based on the basis of paise[17] / kWh rate on Saleable Primary Energy from the Project. Design Energy is quantum of energy that could be generated in a 90% dependable year (from hydrology study), with 95% installed capacity of the project approved by UPERC. The rate of Primary Energy will be equal to the lowest variable charge of thermal power generating station in the Northern region. The Primary energy charges will be computed based on the basis of the Primary energy rate and Saleable Primary Energy of the project.

Provided that the Primary energy charges recoverable by applying the above Primary Energy Rate exceeds the Annual Fixed Charge then the Primary Energy Rate will be calculated based on the following formula

Primary Energy Rate in Paise / kWh = Annual Fixed Charges / Saleable primary Energy
Primary Energy Charges = Saleable primary Energy x primary Energy Rate

2b) Secondary energy charges: It is the quantum of energy generated in excess of the Design Energy during a year to be approved by UPERC.

Secondary Energy Rate is equal to Primary Energy Rate.
Secondary Energy Charges = Saleable Secondary Energy x Secondary Energy Rate

[17] 1 paise = 1/100th of

Thus, the main tariff component is annual fixed charges. Further details are given in the PPA[18].

Serious consideration of CDM:

Prior CDM awareness: As explained in section A.2 above, the project proponent AHPCL, has underwent share transfers twice during 2003-2005. Both these share transfer agreements[19], have specifically articulated the how the carbon benefits will be shared. However, before the present shareholders (GVK Group) took over the company, they have confirmed from PricewaterhouseCoopers, Mumbai, the quantum of revenue that the project could obtain from carbon benefits. Also, GVK's AHPCL team had conducted an internal study to evaluate the financial feasibility of the project activity and the role of CDM revenue in alleviating any viability gap. Based on this study, the Board of AHPCL has decided to approach for debt and invest in necessary equity.

The following evidences are made available to the DOE to validate the above to demonstrate serious consideration of CDM revenue in planning the project activity:

- Technical Service agreement between SHA, DNHPCL and TPC on 03 October 2003 – including sharing of carbon credits
- Share purchase agreement between GVK Hydel, SHA, AHPCL and TPC in 2005 – including sharing of carbon credits; and the agreement for sharing of monetary value of carbon credits is finalised on 21/07/2007 between AHPCL and SHA
- Minutes of the Board meeting for approval of the investment in project considering CDM revenue, dated 13/11/2005.

The additionality for the project activity has been justified by a detailed analysis of the barriers faced by the project as mentioned below:

Additionality:

As required by the approved methodology, the additionality of the project activity shall be demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" (Version 05.2) agreed by the CDM Executive Board, available at the United Nations Framework Convention on Climate Change (UNFCCC) CDM web site.

According to the "Tool for the demonstration and assessment of additionality" (Version 05.2) the steps that need to be followed to determine the additionality are:

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations
Sub-step 1a. Define alternatives to the project activity:
(1) Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity.

(a) The proposed project activity undertaken without being registered as CDM Project Activity *Construction of a new renewable run of river hydroelectric project connected to the grid, implemented without considering CDM revenues.*

[18] Power Purchase Agreement (Amended and Restated) with UPPCL on 28/06/2006 (submitted to DOE)

[19] Evidences shared with the DOE

This alternative is in compliance with all applicable legal and regulatory requirements and may be a part of the baseline. However, in absence of CDM revenue it would have been difficult for the project proponent to implement the project activity on account financial unviability (please refer to Step 2: Investment Analysis in the following section for details). Hence it cannot be a part of the baseline scenario.
(b) : Continuation of existing situation
In this alternative the project activity would not have been implemented and an equivalent amount of energy (power) would have been produced by the project grid electricity system through its currently running power plants and by new capacity addition to the grid i.e. Continuation of current situation.

Outcome of Step 1a: Both alternatives identified are studied further.

Sub-step 1b. Consistency with mandatory laws and regulations:
The implementation of project activity is a voluntary initiative and it is not mandatory or a legal requirement. For power generation, the Electricity Act 2003 does not restrict or empower any authority to restrict the fuel choice, the applicable environmental regulations do not restrict the use of hydro energy and there is no legal requirement on the choice of a particular technology.

Outcome of Step 1b:
Thus, both the alternatives are in line with the applicable legal and regulatory requirements. These are studied further.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method
This step requires the project proponent to determine the financial analysis method that needs to be applied to carry out the investment analysis for the feasibility of the project activity. The options available with the project proponent include:

1. Simple Cost Analysis
2. Investment Comparison Analysis
3. Investment Benchmark Analysis

The option of Simple cost analysis is not applicable to the project activity as the project proponent proposes to export the electricity generated to the state electricity board and hence obtain economic benefit from the revenue generated through the sale of electricity to the state electricity board. The project proponent proposes to use the option III i.e. benchmark analysis to carry out the investment analysis of project activity.

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

This step requires the project proponent to select a financial tool for the project activity and compare it with the relevant benchmark value. The project proponent proposes to use the 'project IRR' as the financial indicator of the project activity. The project IRR is most extensively used financial indicator and the same was considered in the investment decision by the AHPCL Board as evident form the extracts of the minutes given to the DOE. This will be compared with the weighted average cost of capital (WACC) that has been calculated based on the returns that the investor would have obtained in the prevailing market conditions.

As per the step 2(b) of the additionality tool Version 05.2

"the financial/economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer".

Thus among the enlisted examples in the sub-step 2(b) of the tool, the project proponent proposes to choose the 6(a) i.e. "Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data".

The benchmark has been derived based on the cost of financing and the rate of returns for the investor as mentioned in the paragraph above. The project activity involved an estimated investment of 20,134 Million, which has been financed partly by the equity and remaining by debt. Thus, the returns on the project should reflect the aspirations of the debt creditors and the equity investors as per the prevailing market rates. Thus the selection of WACC as the indicator justifies both the claims as it includes both the fixed returns from the project and the returns as per the additional risk taken in a prevailing market rates. The benchmark is calculated for standard D/E ratio i.e. 70:30 as per financing pattern of power projects in India.

Calculation of WACC:

$$WACC = CoE * \{E/(E+D)\} + CoD_{post\ tax} * \{D/(E+D)\}$$

Where:
E- Percentage of equity in the capital structure
D-Percentage of debt in the capital structure
CoE – Cost of equity
CoD – Cost of Debt

As mentioned in the formula above, the documented rate of interest adjusted to the tax rate is taken as the rate of debt[20]. And the return of equity is calculated using the Capital asset pricing method (CAPM)

CAPM:
The rate using CAPM is arrived as follows,

$$\bar{r}_a = r_f + \beta_a(\bar{r}_m - r_f)$$

Where:
r_f = Risk free rate
β_a = Beta of the security
$\bar{r}_m$ = Expected market return

In the above formula, the risk free return was taken from the government bond rates[21]. This can be considered as the risk free returns of the project.

[20] PP did not have any earlier loan as project company is a SPV and project plant was in planning stage before investment decision. Thus, as per the EB 51, Annex 58, Guidance 11 commercial interest rate is used [RBI Bulletin October 2005 - Prime Lending Rate was 10.25-10.75%. Avg. value is used http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/66743.pdf]

The expected market returns have been arrived using the share prices that prevailed during the period prior to the time when the investment decision was taken. To reflect the true rate of return of the market, the index BSE SENSEX has been taken (from inception till decision making) to calculate the market returns.

The beta value which determines the rate of return of the equity is determined based on the beta values of the companies that are involved on the similar type of the business (Hydro power generation). Equity Beta is the measure of the expected volatility of a particular stock relative to a well-diversified market portfolio. It measures the systematic risk of a stock, i.e. the risk that cannot be eliminated in a well- balanced, diversified portfolio. The beta of equity is calculated as the covariance between its return and the return on a well-diversified market portfolio, divided by the variance of the return on a well- diversified market portfolio.

As the project activity entails hydro power generation, the equity beta to be considered should ideally be of listed hydro power companies. However, since no such companies with hydro power sector only or renewable energy generation portfolio are available, the beta values of following companies in power generation sector have been considered for the five years before the investment decision. Five year beta when available and a minimum of 2.5 years is considered good duration[22]. Here all values are arrived from close to five year performance of these individual shares.

BF Utilities, CESC Ltd., Jindal Steel & Power Ltd., Gujarat Industries and Tata Power Ltd.

It is understood that since these companies are in the business of power generation their beta values on an average would provide an appropriate figure for calculating the benchmark.

Based on the above the cost of financing has been worked out, in which the standard returns in the market considering the specific return of the project type. In this manner the cost of financing works out to be 11.33%. This can be considered as a conservative benchmark for the scale of investment in specific project type (large hydroelectric power plant).

Sub-step 2c. Calculation and comparison of financial indicators

Financial analysis has been carried out for the project activity independently. This section presents the projected financial analysis of the project activity on stand-alone basis.

Generally in the financial analysis of the business plan, certain assumptions on the techno-economic parameters are made. The underlying assumptions for the financial projection have been mentioned below.

Techno Economic parameters of the project activity			**Reference[23]**
Installed Capacity	330	MW	Design capacity approved by CEA – TEC, 20/04/2000

[21] Weighted Average Yield on Central Government Dated Securities 2004-2005; Reserve Bank of India, Annual Report Aug. 2005 (http://rbidocs.rbi.org.in/rdocs/AnnualReport/PDFs/65516.pdf) pg. 155

[22] Quoted from Reuters.com (http://www.bu.edu/library/management/tutorials/beta/index.html)

[23] Copies of all documentary evidences are made available to the DOE

Total Investment	20,134	Million `	'Note of Project Cost and Financial Viability' to Board of Directors at the time of decision making, 13 /11/2005
Operational and Maintenance cost including insurance per annum	1.5% of the capital cost	-	As per UPERC (Terms and Conditions of Generation Tariff) Regulations, 2004[24]. pg. 37
Life-time of Project Activity	35	Years	Depreciation Norms for Generating Companies, Ministry of Power, Notification, 29/03/1994
Electricity Generation	1,514	GWh	Project approval by CEA – Techno-economic clearance on 20/04/2000; renewal on 20/07/2005
Design Energy (The term defined in the Power Purchase Agreement brief in A.2 Section)	1,397	GWh	
Secondary Energy (The term defined in the Power Purchase Agreement brief in A.2 Section)	117	GWh	
Auxiliary Consumption + Transformation Loss	(0.5 + 0.5 =) 1.0	%	As per UPERC (Terms and Conditions of Generation Tariff) Regulations, 2004. pg.31-32
Free Power (The term defined in the Power Purchase Agreement)	12	%	Project Implementation Agreement for Srinagar Hydro Electric Project dt. 28/08/1998 (pg. 18)
Price of CER	21	Euro	Estimate (discussion with CDM consultant)
rate of Primary Energy	0.95	`/kWh	As per UPERC Tariff Regulations, 2004, equal to the lowest variable charge of thermal power generating station in the Northern region[25]
Equity /Debt ratio	20/80		Note of Project Cost and Financial Viability to Board of Directors at the time of decision
Term loan	16, 107.12	Million `	

[24] UPERC, 2004. Gazette Notification on 18th June 2005. http://www.uperc.org/regulations.htm

[25] Evidence before decision making is shared with DOE and a higher estimate considering COD in 2012 as per 'Note of Project Cost and Financial Viability' to Board of Directors at the time of decision making

Interest rate	10.5	%	making, 13 /11/2005[26]
Equity	4,026.78	Million `	
Depreciation Rate (Straight Line Method basis)			The Companies Act and As per UPERC (Terms and Conditions of Generation Tariff) Regulations, 2004. pg.15 Appendix II, pg. (i)
Civil Works	1.63	%	
Plant and Machinery	5.28	%	
Depreciation up to (% of asset value)	90	%	
Income Tax			The Indian Income Tax Act,1961 (rates prevalent at investment decision year)
Corporate tax	30	%	
Minimum Alternate Tax	7.5	%	
Surcharge	10	%	
Cess	2	%	
Working capital			
Receivables	60	days	As per UPERC (Terms and Conditions of Generation Tariff) Regulations, 2004. pg. 38
O & M expenses	30	days	
Working capital interest rate	10.5	%	
Working Capital Margin	25%	of the working capital	
Working Capital Loan	75%		

The analysis shows that the project IRR is 9.70%. This is lower than the benchmark returns calculated based on the WACC, which is 11.33%. Considering the CDM revenue the project IRR improves to 11.93% thereby making the project financially viable.

The investment decision was taken by the AHPCL Board of Directors in November 2005. The Revenue from the CER has been seriously considered by the project proponents before approving investment in the project activity. The CER revenue would increase the cash flow of the project activity and hence would make the project financially viable.

[26] Note of Project Cost and Financial Viability to Board of Directors at the time of decision making, 13 /11/2005; D/E matches with financial closure; for interest rate - PP did not have any earlier loan as project company is a SPV and project plant was in planning stage before investment decision. Thus, as per the EB 51, Annex 58, Guidance 11 commercial interest rate is used [RBI Bulletin October 2005 - Prime Lending Rate was 10.25-10.75%. http://rbidocs.rbi.org.in/rdocs/Bulletin/PDFs/66743.pdf]

Sub-step 2d. Sensitivity analysis (only applicable to options II and III):

Sensitivity analysis needs to be conducted on the parameters which will have an impact on the financial analysis of the project activity. The sensitivity analysis determines the robustness of the financial analysis of the project activity.

As per guideline provided by EB in meeting no. 41 annex 45 the criteria for choosing the sensitivity analysis parameter is:
Sensitivity analysis

16. Guidance: 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 (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets.. Where a DOE considers that a variable which constitute less than 20% have a material impact on the analysis they shall raise a corrective action request to include this variable in the sensitivity analysis.

In the project activity, the sensitivity analysis has been conducted for energy generation, capital cost and O&M cost. The commonly used parameter PLF is not referred in the PPA and has no significance. However, change in energy generation will also take care of the equivalent change in PLF. Tariff of the project activity is not set in absolute terms and has to be calculated as explained in Section A.2 of PDD. This will depend on project cost, interest rate etc. Thus, tariff alone will not change without change in these input parameters. However, for conservativeness, this is also studied for sensitivity.

Parameter Varied	**Project IRR (%)**				**Benchmark**
	Energy Generation	Capital cost	O&M cost	Tariff	11.33%
+10%	10.93	8.63	9.50	11.25	
-10%	8.37	10.95	9.89	8.06	

The above analysis shows that even a 10% increase in the important parameters does not make the project activity cross the benchmark value in the absence of CDM. Hence, it can be concluded that the financial viability of the project activity is not sensitive to these variables. Based on the sensitivity analysis, it remains quite clear that the project will not be able to cross the benchmarking without the assistance of revenue from carbon credits.

Outcome of Step 2
The project activity has lower returns than the conservative benchmark returns calculated at the time of investment decision. Even the 10% increase in the important parameters that affects the returns on the project do not make project financially viable in the absence of the CDM revenue. Thus, the CDM revenue is critical for the financial viability of the project activity.

In the absence of financial viability as discussed, the natural choice of 'no project activity' and equivalent power generation in grid connected fossil fuel dominated power plants is realistic baseline.

Step 4: Common Practice Analysis

As per the "Methodological Tool for Demonstration and Assessment of additionality" Version 05.2, a "credibility test" to compliment the investment analysis to demonstrate additionality, is to be conducted. The credibility test is based on the analysis of the extent to which the proposed project type (e.g. technology or practice) has already diffused in the relevant sector and region.

The first step in the tool is to - Analyze other activities '*that are operational and that are similar to the project activity*' viz., projects that are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing etc. (but excluding the other CDM project activities). Accordingly, we are to analyze the following project activities (that are similar):

1) Technology: Hydro Power Generation based on run of the river schemes
Only run-of-river projects have been considered as the project activity is run-of-the river. Dam based projects reduce the risk of unavailability of water and serve as storage areas, thereby ensuring a continuous supply of water to generate power, hence are not similar to run-of-river hydro power projects which face a higher hydrological risk. This ensures that the comparison is done with projects of similar scale and nature.

2) Scale: A comparison is made to similar run-of-the river projects with capacity range varying from ±50% of the project capacity[27] i.e. Generation Capacity above 165 MW and below 500 MW.
3) Comparable Environment (regulatory framework, investment climate, access to technology and finance): Non Government projects owned by Independent Power Producers are considered. Government implemented projects can not be considered similar as they come under different investment climate such as special debt terms. Also, the central and state governments have additional drivers for the development of projects, such as ensuring the reliable supply of electricity to the community[28]. Further the tariff is determined by UPERC and Statutory approvals are also given by the state level agencies. Thus, only projects commissioned in UP and Uttarakhand will need to be considered. However, no similar projects were found and hence for conservativeness, all of India projects are considered for analysis here.
4) Time line: Projects conceptualized prior to 2003 are excluded from analysis. The Electricity Act came in India in 2003[29] and CERC tariff regulations were published in 2004. Subsequently, UPERC tariff regulations were published in 2005. In the period prior to 2003, tariffs were considered on project to project basis and later on when CERC tariff regulations came into force in 2004, it detailed procedure to compute tariff based on capital cost, depreciation, income tax, interest rate etc.

Hence to compliment the investment analysis and to pass the project activity through the credibility test, we have to:

- Find the similar project activities, that are operational (at the time of decision

[27] In line with the review comments on a hydro electric project. http:// cdm. unfccc. int/ Projects/ DB/ DNV- CUK 1218186379 . 41 / Review/ 3 TJH2 TJ 7 RN 4 X5 NST 0 Q7 FFB 1 EQVMEKT/ display

[28] http://www.powermin.nic.in/whats_new/national_electricity_policy.htm

[29] http://www.powermin.nic.in/acts_notification/electricity_act2003/preliminary.htm

making and to be further conservative at the time of project validation), from a reliable information source that is available in the public database.

- Exclude if any are CDM project activities
- If still some project activities are left, analyze and demonstrate why the existence of these activities does not contradict the claim that the proposed project activity is financially/economically unattractive by pointing out serious changes in circumstances.

A database of all operating power plants in India is maintained by Central Electricity Authority and plants operating till the latest available database version 04[30] is analysed.

On selecting hydro power plants operated by private sector and capacity > 165 MW, only three projects are found to be matching these criteria as listed in the following Table.

Sr. No.	Project name	Developer	Capacity (MW)	Whether in CDM process
1	Baspa Stage-II HEP	Jai Prakash Industries Ltd. New Delhi Located in Himachal Pradesh the project was commissioned in 2003	300	In an announcement, PP has declared that projects are under the CDM process and already earning VCUs[31]
2	Bhira	Tata Power Located Maharashtra, Project was Commissioned from 1927 in stages	300	The CEA database also shows that the project was commissioned from 1927 and is not run-of-the river type[32]. Also this plant is not located in the two states (UP and Uttarakhand) being considered here. Thus, it is excluded from the analysis.
3	Visnuprayag HEP	Jai Prakash Industries Ltd. New Delhi Located Uttarakhand, Project was commissioned in 2006	400	The PP has declared that projects are under CDM[31]

Another reference on hydro projects commissioned in Uttar Pradesh and Uttarakhand, shows that in India's 10th Five Year Plan (2002-2007), only two hydro projects were commissioned[33]. Of these two, Tehri Stage -1 is a Government project and Vishnuprayag is already discussed in Table above. The difficulty in obtaining financial appraisal from the

[30] http://www.cea.nic.in/planning/c%20and%20e/government%20of%20india%20website.htm

[31] http://carbonyatra.com/news_detail.php?id=3587

http://www.jppowerventures.com/communication/jpvl-presentation-jan-10.pdf (pg. 28)

[32] http://www.tatapower.com/services/power-projects.aspx

[33] http://www.cea.nic.in/hydro/project_monitoring/Hydroelectric%20Projects%20Commissioned%20in%2010th%20Plan.pdf

investors and financial institutions is the major reason due to the lack of private sector participation in hydro power sector. Moreover, the hydro power projects are associated with high capital costs and large dams in the WCD Knowledge Base have demonstrated a marked tendency towards schedule delays and cost overruns.

Part of the difficulty in developing accurate projections for construction costs of large dams is that the geotechnical conditions at a site (the quality of the rock for the foundations of the major structure and for tunnels), and the quality of the construction materials cannot be determined precisely until construction is under way. Discovery during construction of less favorable site conditions than those assumed in the engineering designs and construction plans can be a significant contributor to cost overruns and delays in time schedules. All these factors account for the increase in difficulties in arranging the finance for the project activities. Due to all these barriers, the hydro power capacity is only 23% explored of the total potential in India[34]. Given this background, most private investors are wary of venturing into hydro power development in India and this is not a common practice for IPPs.

CDM consideration

As per the Guidance of EB 49, Annex 22, clause No. 7 and 8,

'7. Assessment of real and continuing actions shall be validated by the DOE and the validation should focus on real documented evidence as indicated in paragraph 6 (b), including an assessment by the DOE of the authenticity of the evidence.

8. In validating proposed CDM project activities where:

(a) there is less than 2 years of a gap between the documented evidence the DOE shall conclude that continuing and real actions were taken to secure CDM status for the project activity;'

The project timeline and CDM milestones of the project activity are summarized in following table.

Date	Project Milestone	CDM Milestone	Description of the evidence
July 2005	SHA invited proposal for take over of AHPCL project	Proposal included carbon credit revenue sharing condition	Email from SHA to GVK
16/10/2005	GVK submitted proposal to SHA for AHPCL take over	Proposal included carbon credit revenue sharing condition	Proposal from GVK to SHA
30/10/2005	SHA finalized draft proposal with GVK for AHPCL take over	Final proposal carbon credit sharing	Proposal from SHA to GVK
12/11/2005	Share Purchase Agreement between The Tata Power Company Ltd. and PP	Share purchase agreement (pg. 22) refers to Technical Services agreement between TPC and SHA which includes carbon credit sharing. Further the same Technical Services agreement is revised (21/07/2007) and 50% carbon credit sharing is valid as per	Copy of Share Purchase Agreement and Technical Services agreements

[34] http://www.cea.nic.in/hydro/Status%20of%20Hydroelectric%20Potential%20Development.pdf

13/11/2005	Board meeting of Alaknanda Hydro Power Company Ltd. for the investment decision in project considering prospect of CDM revenue	Board considered CDM revenue for the investment approval	Minutes of the Board meeting that decided to go for the concerned project activity seriously considering the project activity
26/04/2006	Letter of Intent for construction of diversion tunnel	Starting date of CDM project activity	LOI with SHRING Construction Company Pvt. Ltd. Dehradun
10/08/2006	-	LOI for CDM consultancy services	Copy of LOI
28/06/2006	Amended and Restated Power Purchase Agreement	-	PPA with Uttar Pradesh Power Corporation Ltd.
04/01/2007	-	Appointment of the CDM consultants for CDM registration process	Copy of the agreement between the project proponent and the consultant.
May 2007	Construction Services agreement	-	Agreement with BHEL
June 2007	Construction of Civil works contract	-	Agreement with NCC-GVKPL consortium
05/07/2007	-	Proposal for CDM validation services from DNV Climate Change Services, Bangalore	Copy of email from DNV
17/07/2007	Notice to Proceed to EPC contractor and start of the construction	-	Agreement between the EPC contractor and the project proponent.
31/07/2007		Local Stakeholders' consultation meeting	Minutes of the meeting
03/08/2007	Financial closure of the project activity	-	Project Financing Document executed with the lenders, dated 03/08/2007
16/08/2007	-	Appointment of first validator[35]	Documents and the agreements showing the occurrence of the events.
21/08/2008	-	Submission of PDD for Host Country Approval	Copy of the cover letter with application for HCA
25/09/2008	-	Present validator appointment	Copy of agreement with BVCI
16/10/2008	-	Meeting of the NCDMA for HCA	Copy of invitation letter from NCDMA
14/01/2009 to 12/02/2009	-	PDD web hosted for global stakeholder comments	CDM website[36]

[35] Validation Agreement Terms could not match, so another validator was appointed

[36] http://cdm.unfccc.int/Projects/Validation/DB/3A5UYHPO8SISCX8T4BJ1AMN6SO780J/

06/02/2009	-	HCA award NCDMA	HCA award letter from NCDMA
March 2012	-	Expected completion of the construction and start of the commercial operation	Estimated

As can be seen from the chronology above, the Board of Directors had clear awareness and had considered CDM revenue in the investment approval. Later, within 4 months of the starting date, CDM consultant was contracted and within two years DOE was appointed for the registration of the project activity. Later, meeting for the Host Country Approval meeting was held and PDD was webhosted for the global stakeholders' comments within two years. Thus, as per the EB 49, Annex 22, clause No. 7 and 8 Guidance, project activity has taken real and continuous measures to secure CDM registration.

Thus, the project activity proves to be additional.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

The methodology concerned deals about two baseline scenarios

1. The installation of a new grid-connected renewable power plant/unit
2. The modification/retrofit of an existing grid-connected renewable power plant/unit

The concerned project activity is the construction and operation of a new hydro electric power plant. The first baseline scenario is suitable for the project activity as this is the installation of new grid-connected renewable power plant. As only a single baseline option is given under the described scenario, it has been applied to the project activity for calculating the emission reductions.

According to the methodology, ACM0002, baseline emissions (BE_y in tCO2) are the product of the baseline emissions factor ($EF_{grid\ CM\ y}$ in tCO2/MWh), times the electricity supplied by the project activity to the grid ($EG_{PJ,y}$ in MWh) minus the baseline electricity supplied to the grid in the case of modified or retrofit facilities ($EG_{baseline}$ in MWh), as follows:

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

The project activity is not a case of modified or retrofit facility, hence EG baseline = 0

Baseline calculations:

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

$EG_{PJ,y}$ = Net quantity of electricity supplied, to the grid by the project during the year y in MWh
and
EF_y = Emission Factor of the grid (tCO2/MWh)

$EF_{grid\ CM\ y} = w1 \times EF_{OM,\ y} + w2 \times EF_{BM,y}$

$EF_{OM,y}$ = Operating Margin Emission Factor (tCO2/MWh)
$EF_{BM,y}$ = Build Margin Emission Factor (tCO2/MWh)

w1 = 0.50
w2 = 0.50

The grid emission factor is the combined margin (CM) of the grid, consisting of the combination of operating margin (OM) and build margin (BM) and this is calculated by the Central Electricity Authority (CEA) India according to the procedures prescribed in the approved methodology ACM0002. We have referred the same value for the baseline calculation.

The step wise calculation of emission factor is presented below.

STEP 1: IDENTIFY THE RELEVANT ELECTRICITY SYSTEMS

Historically, the India Power System was divided into five regional grids viz. Northern, Eastern, Western, Southern and North-Eastern. Each grid covered several states. Since August 2006, all the regional grids except Southern are integrated (refer table below) and are operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids are treated as a single grid and named as NEWNE grid from FY 2007-08 onwards for the purpose of CO2 Baseline Database. Each grid covers several states. In addition, the emission factors for the preceding fiscal years (FY) 2005-06 and 2006-07 have also been back-calculated as per new definition of the grids.

As the grids are interconnected, there is inter-state and inter-regional exchange. Power generation and supply within the regional grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional problems relating to the grid. Each state meets its demand with their own generation facilities and also with allocation from power plants owned by the central sector such as NTPC and NHPC etc. Specific quotas are allocated to each state from the central sector power plants. Depending on the demand and generation, there are electricity exports and imports between states in the regional grid.

Table: Geographical scopes of the two electricity grids

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

The regional grid thus represents the largest electricity grid where power plants can be dispatched without significant constraints and thus represents the project electricity system for the project activity. As the project activity is located in Uttarakhand state covered in NEWNE grid, the 'project electricity systems' covers NEWNE grid.

STEP 2: CHOOSE WHETHER TO INCLUDE OFF-GRID POWER PLANTS IN THE PROJECT ELECTRICITY SYSTEM (OPTIONAL):

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:
Option I: Only grid power plants are included in the calculation.
Option II: Both grid power plants and off-grid power plants are included in the calculation.

As per this database (Ver. 04, pg. 7) 'The following power stations are currently not accounted for in the database:

- *Stations or units installed in Andaman and Nicobar Islands and Lakshadweep.*
- *Captive power stations: As on 31 March 2008, the installed capacity from captive stations was 24,680.70 MW. The generation of these stations in 2007-08 was 85431GWh, equalling 12.12% of total generation in India.*
- *Non-conventional renewable energy stations: These include power generation from wind, biomass, solar photovoltaic, and hydro below 3 MW capacity. The installed, grid-connected capacity of these sources was approx. 12194.57 MW as on 31. 03. 2008.*
- *Small decentralised generation sets.'*

Thus, option I is chosen i.e. only grid power plants are included in the calculation.

STEP 3: SELECT A METHOD TO DETERMINE THE OPERATING MARGIN (OM)

For calculation of operating margin four options are available:

a) Simple operating margin
b) Simple adjusted operating margin
c) Dispatch data analysis operating margin
d) Average operating margin

Any of the four methods can be used, however, the simple OM method (option a) can only be used if low-cost/must-run resources[37] constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

The share of Low cost/Must run (% of Net Generation) in the generation profile of the different grids in India in last five years.

Table: Share of Low cost/ Must Run in the generation profile of Indian grid

	2005-06	2006-07	2007-08
NEWNE	18.0%	18.5%	19.0%
India	20.1%	20.9%	21.0%

Reference: CO_2 Baseline Database for the Indian Power Sector – Central Electricity Authority (Version 4.0)

In this database version (04), data for NEWNE Grid is not available for total five years (as it is only recently formed). Thus, an earlier version of the database (version 03) is used for the previous two years for the North grid, where the project activity is located.

[37] Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants

	2003-04	2004-05
North	28.1%	26.8%
East	10.3%	10.5%
West	9.1%	8.8%
North-East	41.9%	55.5%
India	17.1%	18.0%

Reference: CO_2 Baseline Database for the Indian Power Sector – Central Electricity Authority (Version 3.0)

As evident from the data above the percentage of the total grid generation by low cost/must run (on the basis of average of recent five years) for the NEWNE grid is less than 50% of the total generation. Hence simple OM can be used to calculate the operating Margin Emission Factor.

The project proponents choose an ex ante option for calculation of the OM with a three year generation weighted average, based on most recent data available at the time of submission of CDM PDD to the DOE for validation, without requirement to monitor and recalculate the emission factor during the crediting period.

STEP 4: CALCULATE THE OPERATING MARGIN EMISSION FACTOR ACCORDING TO THE SELECTED METHOD

The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated as:

Option A: Based on the net electricity generation and a CO2 emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

The CEA- CO2 Baseline Database (Ver. 04) provides information about the Combined Margin Emission factors of all the electricity grids in India. The combined margin in CEA database is calculated ex ante using the guidelines provided by the UNFCCC in the "Tool to calculate the emission factor for an electricity system". We have therefore used the combined margin data published in the CEA Database, for calculating the baseline emission factor.

The CEA Database uses Option B, i.e. data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit, to calculate the OM of different grids.

The simple operating margin is calculated based on net electricity generation of each power unit and an emission factor for each power unit, as follow:

The emission factor of each power unit m is calculated using Option A1[38] :

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$$

[38] "Tool to calculate the emission factor for an electricity system", Version 02, Page 8.

Where:
$EF_{EL,m,y}$ is CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,m,y}$ is Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$ is Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,I,y}$ is CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$ is Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
m is All power units serving the grid in year y except low-cost / must-run power units
i is All fossil fuel types combusted in power unit m in year y
y is The relevant year as per the data vintage chosen in Step 3.

STEP 5: IDENTIFY THE GROUP OF POWER UNITS TO BE INCLUDED IN THE BUILD MARGIN

The sample group of power units m used to calculate the build margin consists of either:

a. The set of five power units that have been built most recently, or

b. The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use the set of power units that comprises the larger annual generation. Accordingly, the CEA Database calculates the build margin as the average emission intensity of the 20% most recent capacity addition in the grid based on net generation.

The build margin emission factor has been calculated ex-ante based on the most recent information available on the units already built for sample group m at the time of CDM PDD submission to the DOE for validation. This option does not require monitoring of the emission factor during the crediting period.

STEP 6: CALCULATE THE BUILD MARGIN EMISSION FACTOR

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

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:
$EF_{grid,BM,y}$ is Build margin CO2 emission factor in year y (tCO2/MWh)
$EG_{m,y}$ is Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$ is CO2 emission factor of power unit m in year y (tCO2/MWh)
m is Power units included in the build margin
y is Most recent historical year for which power generation data is available

The CO2 emission factor of each power unit ($EF_{EL,m,y}$) is determined as per the procedures given in step 3a for the simple OM, using option B1using for y the most recent historical year for which power generation is available, and using for m the power units included in the build margin.

STEP 7: CALCULATE THE COMBINED MARGIN EMISSIONS FACTOR

The combined margin emissions factor is calculated as follows:

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

Where:
$EF_{grid,BM,y}$ is Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ is Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM} is Weighting of operating margin emissions factor (%)
w_{BM} is Weighting of build margin emissions factor (%)

As per the tool, w_{OM} is 0.5 and w_{BM} is 0.5.

Further, the 'Ex ante' option will be used i.e. 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, without requirement to monitor and recalculate the emissions factor during the crediting period.

The Operating Margin as calculated by CEA[39] for the NEWNE Grid is 1.0086 tCO_2/MWh (last three years generation weighted average) and the build margin for the NEWNE grid is 0.5977 tCO_2/MWh (2007-08).

By putting these values in the equation above, the combined margin emission factor of the grid is $EF_{grid\ CM\ y}$ = 0.8032 tCO_2/ MWh

Project Emissions

According to the methodology, ACM0002,
For new hydro electric power projects with reservoirs, project proponents shall account for project emissions, estimated as follows:

a. if the power density of project is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

$$PE_y = \frac{EF_{Res} \cdot TEG_y}{1000}$$

where,
PEy is the Emission from reservoir expressed as tCO_2e/year
ES_{Res} is the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 kg CO_2e /MWh.
TEG_y is total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh).

[39] CO2 Baseline Database for the Indian Power Sector- User Guide, Version 4.0; October 2008

As the power density of the pondage in the project activity is more than 10 W/m^2, this project emission need not be considered. During the annual monitoring of the power density, if found less than 10 W/m^2, the project emissions will be considered.

b. If power density of the project is greater than 10 W/m^2

$PE_y = 0$

As described in section B.3, the power density of the project activity is much greater than 10 W/m^2. Hence for the project activity:

$PE_y = 0$

Leakage

The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects – see applicability conditions above).

As per the methodology, the leakage need not be considered. Thus, leakage is not considered in the project activity.
$LE_y = 0$

Emission Reduction

Emission reductions are calculated as follows:
$ERy = BEy - PEy - LEy$

Here, PEy = 0
LEy = 0

Thus,
$ER_y = BE$

B.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{OM,y}$
Data unit	tCO2/MWh
Description	The Operating Margin emission factor
Source of data	This is calculated as the weighted average of the recent 3 years (2005-06, 06-07, 07-08) OM data which is been provided by Central Electricity Authority (CO2 Baseline database for the Indian power sector, Version 4.0).
Value(s) applied	1.0086
Choice of data or measurement methods and procedures	The database is Government of India's official publication based on the 'Tool to calculate the emission factor for an electricity system'.
Purpose of data	To determine Baseline Emissions
Additional comment	The yearly Operating Margin emission factor of NEWNE grid is as follows 2005-06: 1.0195; 2006-07: 1.0083; 2007-08: 0.9992; Yearly Net Generation (GWh) in Operating Margin (GWh) as follows 2005-06: 359,270.98; 2006-07: 379,470.60; 2007-08: 401,641.59; 3 years generation weighted Average = 1.0086

Data/Parameter	$EF_{BM,y}$
Data unit	tCO2/MWh
Description	The Build Margin emission factor
Source of data	The OM data for NEWNE grid for 2007-08 which has been provided by Central Electricity Authority (CO2 Baseline database for the Indian power sector, Version 4.0).
Value(s) applied	0.5977
Choice of data or measurement methods and procedures	The database is Government of India's official publication based on the 'Tool to calculate the emission factor for an electricity system'.
Purpose of data	To determine Baseline Emissions
Additional comment	Latest available value used for year 2007-08

Data/Parameter	$EF_{electricity}$
Data unit	tCO2/MWh
Description	The Combined Margin Emission factor of the grid
Source of data	Calculated
Value(s) applied	0.8032
Choice of data or measurement methods and procedures	Calculated as the weighted average of the build margin emission factor and operating margin emission factor
Purpose of data	To determine Baseline Emissions
Additional comment	Ex-ante value will be used for the entire crediting period

Data/Parameter	EF_{Res}
Data unit	kgCO2e/MWh
Description	Default emission factor for emissions from reservoirs.
Source of data	The default value as per EB23 is 90 kgCO2e/MWh.
Value(s) applied	90
Choice of data or measurement methods and procedures	The used is default emission factor suggested in the methodology applied
Purpose of data	To determine Project Emissions
Additional comment	-

Data/Parameter	$EF_{diesel,CO2}$
Data unit	tCO2/GJ
Description	CO2 emission factor of the diesel
Source of data	CEA CO2 Baseline Database for the India Power Sector, version 4.0
Value(s) applied	0.0726
Choice of data or measurement methods and procedures	The value is taken from the database developed by Central Electricity Authority (CO2 Baseline database for the Indian power sector, Version 4.0). The database is Government of India's official publication based on the 'Tool to calculate the emission factor for an electricity system'.
Purpose of data	To determine Project Emissions
Additional comment	CEA CO2 Baseline Database[40], Assumptions sheet, Cell H7

Data/Parameter	ρ_{diesel}
Data unit	kg/m^3
Description	Density of fossil fuel used in DG set for back up power (diesel)
Source of data	Specifications of diesel in country as per latest Bharat Stage IV/ Euro IV Vehicular Emissions Norms[41]
Value(s) applied	845.0
Choice of data or measurement methods and procedures	This is national level default (as part of fuel specifications) and PP is likely to use same quality fuel for the DG set.
Purpose of data	To determine Project Emissions
Additional comment	The value is available publicly above[41].

B.6.3. Ex ante calculation of emission reductions

According to the methodology, ACM0002 baseline emissions (BE_y in tCO2) are the product of the baseline emissions factor (EF_y in tCO2/MWh), times the electricity supplied by the project activity to the grid (EG_y in MWh) minus the baseline electricity supplied to the grid in the case of modified or retrofit facilities ($EG_{baseline}$ in MWh), as follows:

$BE_y = (EG_y - EG_{baseline}) \times EF_{electricity,y}$
The project activity is not a case of modified or retrofit facility, hence $EG_{baseline} = 0$

Baseline emissions calculations is as follows

[40] http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

[41] http://www.iocl.com/Products/HSD_BS_IV_Specification.pdf (pg. 2, point xiv)

$BE_y = EG_y \times EF_{electricity,y}$

EG_y = Net quantity of electricity supplied, to the grid by the project during the year y in MWh and

$EF_{electricity,y}$ = Emission factor of the grid (tCO2/MWh)

The Operating Margin calculated as the 3-year generation-weighted average from data provided by CEA for the NEWNE Grid is 1.0084 tCO2/MWh and the build margin for the NEWNE Grid is 0.5977 tCO2/MWh.

EFy = 0.50× 1.0086 + 0.50 × 0.5977 tCO2e/MWh = 0.8032 tCO2e/MWh

Installed capacity of the Project activity (IC): 330 MW
Design Energy (Electricity generated, EGy) = 1,514 x 10^6 kWh
= 1,514,000 MWh

From this total generation, following two components will be deducted to get net export to the grid.
Auxiliary consumption[42] = 0.5% of total generation
transformation loss[42] = 0.5% of total generation

Thus this 1% electricity generated is deducted to get net dispatch to the grid.
This Auxiliary consumption and Transformation losses are assumed just for Net Electricity Generation estimation. In actual net electricity generation is monitored and it covers auxiliary consumption and transformation loss. Thus separate monitoring of Auxiliary consumption and Transformation losses is not required.
$EG_{,y}$ = 1,514,000 x (1-1%)
= 1,498,860 MWh

BE_y = 1,498,860 × 0.8032 = 1,203,884 tCO2e

Project Emissions
According to the methodology, ACM0002,
For new Hydro electric power projects with reservoirs, project proponents shall account for project emissions, estimated as follows:

a) if the power density of project is greater than 4 W/m2 and less than or equal to 10 W/m2:

$$PE_y = \frac{EF_{Res} \cdot TEG_y}{1000}$$

where,
PEy is the Emission from reservoir expressed as tCO2e/year
EFRes is the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 kg CO2e /MWh.
EGy Electricity produced by the hydro electric power project in year y, in MWh

b) If power density of the project is greater than 10 W/m^2 PEy = 0
As described in section B.3 the power density of the project activity is greater than 10 W/m^2 Hence for the project activity:
PE_y = 0

[42] As per UPERC (Terms and Conditions of Generation Tariff) Regulations, 2004, pg. 31, 32

The project activity power plant will use DG sets for back up electricity requirement and this fossil fuel consumption will be accounted to calculate project emission as below in line with the 'Tool to calculate project or leakage CO2 emissions from fossil fuel combustion' Ver. 02, Equation No. 1.

$PEy = FF_{diesel,y} \times NCV_{diesel,y} \times EF_{diesel,CO2}$

Where,

$FF_{i,y}$: Quantity of diesel combusted in the backup power plant (DG set) in year *y*

$NCV_{i,y}$: Weighted average net calorific value of diesel in year *y*

$EF_{diesel,CO2}$: Emission factor of diesel

Presently this estimation is not made as any estimate for the diesel consumption is not available as it will vary based on demand and absence of grid electricity for import.

Leakage emissions:

As the project activity does not involve any leakage emissions it is taken as 0 (in accordance with the applicable methodology, ACM0002). As the project activity does not involve inundation of a larger area and the power density is greater than 10 W/m^2.

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)
2012	1,203,884	0	0	1,203,884
2013	1,203,884	0	0	1,203,884
2014	1,203,884	0	0	1,203,884
2015	1,203,884	0	0	1,203,884
2016	1,203,884	0	0	1,203,884
2017	1,203,884	0	0	1,203,884
2018	1,203,884	0	0	1,203,884
2019	1,203,884	0	0	1,203,884
2020	1,203,884	0	0	1,203,884
2021	1,203,884	0	0	1,203,884
Total	12,038,840	0	0	12,038,840
Total number of crediting years	10			
Annual average over the crediting period	1,203,884	0	0	1,203,884

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{facility,y}$
Data unit	MWh
Description	The net electricity supplied by the project activity to grid in year y
Source of data	Electricity supply to grid log book
Value(s) applied	1,498,860

Measurement methods and procedures	The electricity supplied by the project activity will be measured using electricity meter (3 phase 4 wire meter and of an accuracy of 0.2s) installed at the project site (switch yard/ site sub-station). The measurement also has a check meter installed and owned by the power purchaser. If during calibration, main meter is not within permissible ±0.2% error, then check meter will be used for the billing and monitoring. This form of measuring is in accordance with the best practices of the power industry in the host country. measurement equipment – electricity meter (on 400 kV side at project switch yard) measurement process – electronic logging of the hourly meter reading calibration procedure – National Test House or equivalent – third party testing accuracy of the measurement - ±0.2% responsible person for measurement – recording by electrical operator, daily log sheet to be signed by supervisor measurement interval – continuous monitoring and monthly record
Monitoring frequency	Hourly measurement and monthly recording
QA/QC procedures	The data will be used directly to calculate the emission reduction; hence the data will be checked for accuracy with the electricity supply invoice[43] obtained from the grid. The electricity reading will be taken by operator and monthly a joint meter reading or JMR will be signed by PP and power purchaser. This will be used to confirm the net electricity supplied to grid. The electricity meter will be calibrated annually.
Purpose of data	To determine Baseline Emissions
Additional comment	Value used is the Design Energy as per the CEA letter dt. 20/04/2000 – primary =1397 + secondary 117 GWh and then auxiliary consumption and transformation loss is subtracted

Data/Parameter	CapPJ
Data unit	MW
Description	Installed capacity of the hydro power plant after the implementation of the
Source of data	project activity
Value(s) applied	Approved project capacity as per the Techno-economic clearance for the CEA
Measurement methods and procedures	330
Monitoring frequency	The project capacity will be monitored annually by a third party chartered engineer with test as per the appropriate National Standard of testing
QA/QC procedures	Yearly – Electrical Head will ensure the measurement as per applicable standard. This is a third party test as per the appropriate National Standard (and will not vary from the Design Capacity), thus will not require any other QA/ QC. This data will be used to confirm that the power density of the project is greater than the minimum requirement specified by the ACM0002

[43] As per Appendix 5 of PDD "The power generated from the project will be supplied to UPPCL (88%) and 12% free power to Uttarakhand", thus for emission reduction calculations 100% electricity is considered as baseline emissions.

The monthly tariff invoices are being raised based on the UPERC Generation Tariff Regulations in force. Invoices are being done for Energy Charges based on Schedule Generation certified by the UPSLDC for that month. The Invoices are based upon the scheduled energy and after deducting 12% of JMR electricity as free energy for Govt of Uttarakhand. Therefore Electricity as per Invoice should be added with 12% of actual JMR electricity to derive the scheduled energy (no of units exported as per Monthly Energy Account issued by UPSLDC). There is difference between Scheduled Energy and Actual JMR Energy. Finally Deviation Settlement Mechanism (DSM) statements settles out the difference between Scheduled and Actual Energy as per Electricity Board regulations. As a conservative approach, Minimum of Net electricity supplied by the project activity to grid as per JMR (MWh) and Scheduled Energy (invoice Electricity +12% JMR electricity Value) (MWh) will be considered for ER calculations

Purpose of data	To determine Project Emissions
Additional comment	Based on CEA TEC, 2000 – capacity is 4 turbines, 82.5 MW each. This matches with the actual turbine capacity - 82.5 x 4 No.

Data/Parameter	A
Data unit	m^2
Description	Surface area of the pondage at the full volume
Source of data	Design data from the project report - EIA report page 19
Value(s) applied	3,240,000
Measurement methods and procedures	The surface area is calculated using the design schematics. This form of measuring is in accordance with the best practices of the power industry in the host country.
Monitoring frequency	Yearly – civil head will ensure the measurement as per applicable standard
QA/QC procedures	The surface area of the pondage at full volume will be measured at project commissioning from a detailed topographical survey. This data will be used to confirm that the power density of the project is greater than the minimum requirement specified by the ACM0002.
Purpose of data	To determine Project Emissions
Additional comment	The surface area measurement will also be done and certified by independent third party Certified Engineer.

Data/Parameter	$FF_{i,y}$
Data unit	ton/year
Description	Quantity of fuel type i combusted in the back up power plant (DG set) in year y
Source of data	The diesel inventory records at the plant will be used to calculate diesel consumption in DG set for back up power generation
Value(s) applied	0
Measurement methods and procedures	Data type: Calculate Responsibility: Manager (Stores) along with the inventory staff Recording Frequency: Monthly Archiving procedure: Paper and Electronic Calibration Frequency: not required as purchase records/ inventory is used to calculate diesel consumption
Monitoring frequency	Continuously
QA/QC procedures	-
Purpose of data	To determine Project Emissions
Additional comment	In case inventory records, supplier data is in volume terms, density will be used to get mass of the fuel consumed. Data archived will be kept 2 years beyond the Crediting period.

Data/Parameter	NCVi,y
Data unit	GJ/Tonnes
Description	Weighted average net calorific value of fuel type i in year y
Source of data	Value provided by the fuel suppliers in invoices
Value(s) applied	0
Measurement methods and procedures	Data type: Calculate Recording Frequency: monthly Archiving procedure: Paper and Electronic
Monitoring frequency	Continuously The NCV will be obtained for each fuel delivery, from which weighted average annual values will be calculated

QA/QC procedures	Values of net calorific value obtained for each delivery will be counterchecked with IPCC default values as provided in the Table 1.2, Vol(2), Energy of the 2006 IPCC Guidelines on National GHG inventories to ensure the consistency.
Purpose of data	To determine Project Emissions
Additional comment	In case supplier invoices has GCV record, NCV will be calculated sing default delta conversion factors by CEA data. Also, if the fuel suppliers' invoices do not given calorific value record, the default of CEA database will be used for project emission calculations. Data archived will be kept 2 years beyond the Crediting period.

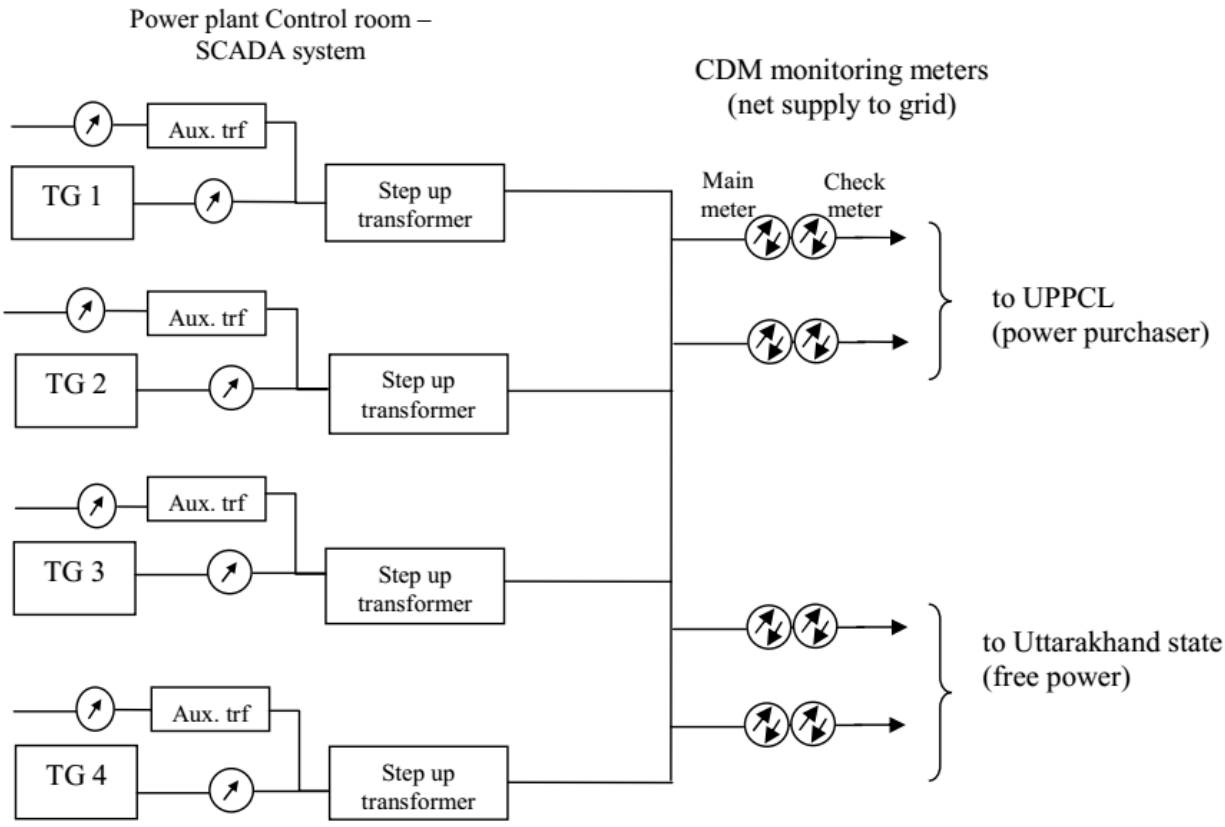
B.7.2. Sampling plan

Not Applicable

B.7.3. Other elements of monitoring plan

The project activity has four generators and individual total generation can be metered. The electricity is stepped up to 400 kV and individual four feeder lines have meters. There are two electricity lines each from Uttar Pradesh (UPPCL) and Uttarakhand state (PTCUL). The total electricity generation can be measured at the power house/ control room. Auxiliary consumption and transformation loss can be calculated from the difference between total generation and net dispatch. The net dispatch to the grid metered by main dispatch meters will be used for the calculation of emission reduction.

The project activity is operated and managed by the project proponent. The hydro power project abides and will abide by all regulatory and statutory requirements as prescribed under the state and central laws and regulations. A CDM project team will be established at the plant site. The project team will be entrusted with the responsibility of recording the electricity generated by the project activity which will be measured from the meters installed at the plant site. The meters will be calibrated and sealed before being installed. The project team will also be responsible for calculation of actual creditable emission reduction in the most transparent and relevant manner. Installed meter/s used to measure the net electricity exported will be calibrated annually.



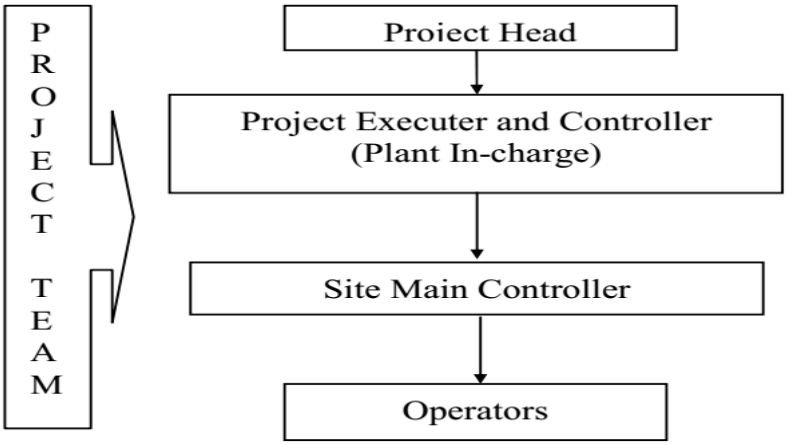
All the monitoring data will be recorded and stored electronically (spread sheets) by the Project Executor and Controller at the plant site for a period of Crediting Period + 2 years. As the important data that needs to be measured are the quantity of electricity supplied by the project activity to the grid, there is no case of data uncertainties and the generation data will be cross-checked with the export details to the grid (available from power purchaser). Only three parameters need monitoring in the project activity. The electricity dispatch will be measured by export meter and cross checked with a check meter. If any inconsistency observed in daily reading, the meters will be checked and replaced with pre-calibrated spare meter. The power sale invoice/ bills will be used to correct the CDM monitoring requirements as that will be conservative (as approved by the power purchaser).

Designation	Responsibilities
Project Head	• Project Registration • Overall monitoring plan Execution with a special emphasis to the data archival
Project Executer and Controller plant site	• Operation • Verification of data • Inspection of data whenever necessary to independently check the authenticity of data and take corrective actions wherever required. • Storage of data • Monitoring of the data archiving
Site Main Controller	• Operation, Monitoring and Verification of Data • Data Recording • Storage of data • Data archiving
Operation and Maintenance Contractor	• Operation and Maintenance • Calibration of measuring equipments

Data archiving:

As data archival is an important component of the monitoring process in the CDM, the project proponent will take a special care for this process. The entire data that is monitored will be maintained in the electronic format and also in the Log books for a period of crediting period or last issuance whichever later + 2 years as required.

Data Uncertainty:
In case main electricity meter is reported for error more than ±0.2%, the check meter reading will be used for the CER calculations and maximum error will be applied to the readings from last calibration or zero check of the main meter.



QA and QC:

As per clause 4.4 of the PPA, if during test checks, the main meters are not within permissible limits of error, but the check meters are within permissible limits of error, the check meters will be used for monitoring and main meters will be recalibrated.

If during the test checks, both the main and check meter are found to have error beyond permissible, both the meters will be calibrated and calibration factor for the main meter will be applied to main meter readings for one month's readings for monitoring.
If both the main meter and check meter fail to record, or if the power transformer fuses are blown out, the monitoring will be based on meter readings recorded by the main meter plus the Design Energy Pro-rata for the period excluding outages in the generation.

The monitored net electricity export to the grid will be cross checked with the payment receipts from the power purchaser and free electricity supplied to the state in those records.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

26/04/2006 – (LOI for the construction of diversion tunnel)
The financial closure[44] of the project activity was achieved on 03/08/2007. The share purchase agreement (12/11/2005) and LOI for the construction of diversion tunnel (26/04/2006) were other expenses by PP before the financial closure.

By the share purchase agreement, the PP gained all the licenses, permits and the land of project activity in his name. There is no real action towards the construction, equipment supply for the project activity as required by the EB guidance on the project start date (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. 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. EB 41, Meeting Report, para 67). Thus, share purchase agreement does not commit PP for its implementation (specially considering the fact that the earlier owner Tata Power Ltd. also had purchased shares on 03/10/2003 and sold its stake later).
The real action on the project implementation is award of LOI for the construction of diversion tunnel on 26/04/2006 and this is considered as the start date of the project activity.

[44] Project Financing Document executed to this effect with the lenders, dated 03/08/2007

C.2. Expected operational lifetime of project activity

35 years 0 months

As per the CERC Terms and Conditions of Tariff Regulations, 2009.
The PPA is valid for 30 years however on a conservative basis, investment analysis is done for 35 years.

C.3. Crediting period of project activity

C.3.1. Type of crediting period

The project activity chooses a fixed crediting period.

C.3.2. Start date of crediting period

15/03/2012 or actual commercial operation date (COD) whichever is later but not before the registration of project activity

C.3.3. Duration of crediting period

10 Years and 0 months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

The project proponent has conducted a Third Party rapid environmental impact assessment and prepared environmental management plan for the project. The survey is conducted as per guidelines of Ministry of Environment and Forest (MOEF), Government of India (GOI) has delegated power to the State Governments for environmental clearances for some specific categories of plants. The study has concluded that the project will be of great public utility and caters to the needs of the people of region. Compared to Thermal and Nuclear establishments, the hazards of the Hydro power project are nil. This project activity has received environmental clearance and the environmental impacts are not significant.

The various environmental clearances obtained are

1) Environmental Clearance -Ministry of Environment and Forest (MOEF), Government of India, New Delhi
2) Approval for Diversion of Forest Land -Ministry of Environment and Forest (MOEF), Government of India, New Delhi
3) Techno Economic Clearance, Central Electricity Authority, Ministry of Power, Government of India, New Delhi
4) Approval to establish, operate and maintain project from Uttar Pradesh State Government
5) No Objection Letter for Water Use from Uttar Pradesh State Government
6) Approval of EIA and R&R Plan from Uttarakhand State Government
7) Endorsement of Approval to establish, operate and maintain project from Uttarakhand State Government

A summary of impacts is presented below:

a. Land requirement for the submergence area due to the pondage and for other project appurtenances is about 475 ha which lies in 24 villages. Fifteen of the affected villages are in district Tehri Garhwal and remaining i.e. 9 villages are in Pauri Garhwal.
b. About half of the area in villages is culturable waste land. The agricultural land occupies about 33% of the total area and that not available for cultivation is about 18%. The total acquisition of forest land for project activity is 339 ha (66 ha of reserve forest land and 273 ha of civil soyam forest land).
c. Commissioning of Shrinagar hydroelectric project will not have any adverse impact on the existing socio-economic and aesthetic environ aspect such as archaeological, historic and natural unique sites within or near to project boundary.

d. A small section of the Rishikesh-Badrinath highway (about 2 km, maintained by Border Roads Organization) is coming under pondage submergence.
e. The estimated construction material required for the project activity is 2.6 Mm3. It is proposed to obtain the fine aggregate by crushing the rocks. The river flow in the project construction area is also high and therefore the magnitude of impacts due to increase in turbidity and consequent impacts on the biological productivity of the river water are not expected to be significant.
f. The proposed project activity envisages the construction of weir across river Alaknanda. The major commercial fish species found in river Alaknanda are Mahaseer (Tor tor, and Tor putitora). The construction of project activity would marginally obstruct the migratory path of Mahaseers in the project area.
g. The sedimentation and allied problems are not of serious nature, since due to frequent operation of spillway gates, the accumulated silt behind the gates will be flushed out.
h. The catchment area of directly draining river is estimated as 11,419 ha. The catchment area is surrounded by dense forest and snow caps and varies with the altitude (lower area dense forest and upper area is surrounded by the snow caps).
i. There will be no impact on water quality of local water source including the rivers during operational period.
j. There is no greenhouse gas emission during the operation period of Hydel power plant. No significant impact on air quality is envisaged.

An independent third party was hired by the project proponent to carry out detailed study for EIA of the project including rehabilitation and resettlement and Catchment area treatment.

D.2. Environmental impact assessment

a. The proponent has prepared plan for R&R for the people to be migrated from the site location.
b. It is proposed to develop two PHCs, i.e. one near the resettlement site and one at Dhari village and in addition two first aid posts one at weir site and one at power house site.
c. An equivalent amount of non forest land has been afforested as a part of compensatory afforestation plan. The compensation has been paid to the Forest Department for afforestation over 347 ha of land in district Lalitpur, UP in lieu of acquisition of the reserve forest and civil Soyam forest land.
d. The BRO (Border Road Organization) has already conducted the survey to identify the route for realignment.
e. As part of catchment area treatment proposed for this project afforestation will be done in an area of 7594 ha in the forest land. Apart from afforestation pasture development will be done in an area of 3150 ha.
f. Since the fish species Mahaseer found in river is of migratory in nature, it is proposed to compensate by artificial seed production and stocking the pondage in downstream and upstream stretches of the river with the seeds.

A well conceived environment management plan has been prepared which will be followed by the company diligently[45]. The rehabilitation and resettlement (R&R) which has significant impact on the project activity, the proponent has prepared plan for R&R. The proponent has proposed to develop two PHCs at R&R site.

The project activity does not have transboundary impacts as river originates and meets in the host country

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

A stakeholders' consultation meeting was organized on 31/07/2007 at Hotel Riverside Resort, Shrinagar, Uttarakhand, India. AHPCL identified local villagers, Block Development Officer of

[45] Environmental Impact Assessment Study, Volume I, Chapter 6. Summary - pg. 112

Shrinagar Taluka, employees of Shrinagar Hydro Electric Power Project, government officials as the most important stakeholders, with an interest in the CDM activities. Accordingly the stakeholders were duly informed of the consultation meeting through written invitation letters 15 days in advance, which was sent individually to the participants.

Comments of stakeholders were recorded during the stakeholder meeting.

The stake holder meeting process was followed in the following sequence

- Welcome Address
- Election of the Chair of the meeting and approval of the proposed Agenda
- Presentation of the CDM-Kyoto Protocol and role of local stake holder
- Discussion and Articulation of concerns
- Chair summarizing the local stake holder concerns
- Vote of Thanks

Mr. Nijawala, Chief of the Block development of Shrinagar, was suggested to chair the proceedings and his appointment was seconded by others.

The summary of the meeting was recorded - copy of which will be made available to Designated Operating Entity during validation process. The list of participants with their signature is kept for record and photographs of the event were also taken.

The meeting started with a good attendance of the local stakeholders with CEO of Alaknanda Hydro Power project, Mr. P. Prasanna Reddy welcomed the gathering with a few opening sentences. This was followed by election of the Chairman of the proceedings.

Thereafter, the CDM consultants were invited to the dais to explain the essence of the meeting to the local stake holders gathered on the occasion. Mr. Ray explained to the local Stakeholders in the local language (Hindi) about the proposed 330 MW Hydro power project. He provided a brief on the CDM project process and the role of the local stakeholders in the CDM project. He briefed about the issues related to the global warming and climate change and elaborated the audience about the sustainable development issues related to the project activity. He also explained that the purpose of the meeting is to internalise the local stakeholders concern for the project activity. It was also explained that how this 330 MW Shrinagar hydro project would displace the electricity generation from carbon intensive fossil fuel based power plant that emit GHGs.

The deliberation also addressed the Rehabilitation issues and other dvelopmental issues which were a part of the plan of the project and those which was already taken up by the Shrinagar Hydro power project Management. On completion of the deliberation, the CEO of Alaknanda Hydro Power project then opened the session for any questions to be put forth by the local Stakeholders.

In summarizing the decision, it was unanimously voiced by the local stakeholder and the Chairman of the proceedings that the project will be a step towards greener and cleaner power which will help in averting the climate changes. The Stakeholders reiterated that the Shrinagar Hydro Electric project will be a boon to the social and economic upliftment in the region and all of them were supportive to the 330 MW Shrinagar Hydro Electric project. The stakeholders were given a time of further 15 days to receive information about the project and convey further concerns/ queries.

Finally, Mr. P. Prasanna Reddy made commitment for better health centre in the region and proposed the vote of thanks. The meeting was concluded with thanks to the chair.

E.2. Summary of comments received

The specific concerns expressed by the participants are summarized below along with clarifications provided on such concerns:

Stakeholder Name and concerns / question /	**Answer / clarifications**

comment	
Mr. Rakesh Singh What is the Run-off-the-river?	In this case, the natural flow of the river and elevation drop of the river is used to generate electricity. This kind of project activity is built up on rivers which are having a consistent and steady flow of water. Run of river hydro projects do not require impoundment of water like large reservoir hydro project. The water from the run of river water is diverted from a river, and sent into a pipe called a penstock. The penstock feeds the water downhill to the power station's turbines. The natural force of gravity creates the energy required to spin the turbines that in turn generate electricity. The water leaves the generating station and is returned to the river without altering the existing flow or water levels. Most run-of-river power plants have a dam across the full width of the river in order to utilize all of the river's water for electricity generation. Such installations will have a reservoir behind the dam. However, in this kind of project activity, flooding is minimal. It was explained that Shrinagar hydro project would have also the same type of process.
Mr. Ravi Rawat What are the gases which will be emitted from the Hydro Power plant?	It was explained that there is no combustion involved emission associated with the hydro project activity. In the reservoir carbon dioxide and methane emission may happen. This is because carbon (which is there in the plants) are released when the reservoir is initially flooded and the same plants decay. Then the same plant matter which settles on the reservoir's bottom decomposes without oxygen, resulting in a build-up of dissolved methane. This is released into the atmosphere when water passes through the dam's turbines. Any other greenhouse gases are not emitted into the atmosphere. This project activity is following ACM0002 methodology which has been approved by the CDM EB (administrative body).
Mr. Vijay Bahuguna What will happen to the dead body which will be come to the dam because of death in the flooding or which will be thrown into the river after death due to the ritual practice? What will happen when it will decay and emit methane?	CEO of Alaknanda Hydro Power Project explained that the bodies would first be devoured by the aquatic creatures and this will be disposed of by the authority in a proper way if it will be noticed by the project proponent. In case where we will not able to notice such cases and which may happen the weight of all those bodies will be too insignificant for emission of methane to the concern of the localites and global communities.
Mr. Amit Sharma What will be the affect on ground water level and water on the river? Whether water will be depleted?	It was explained to the stake holders that the minimum discharge would be about 100 cusecs and a maximum of 1,500 cusecs and that there will be a regular flow of water from the dam for 4 to 5 months in a year. It was also explained to the benefit of all that even in winter there will be a discharge of 90- 120 cusecs and therefore there will be no case of water depletion in the region at any part of the year.

Mr. Mahesh Joshi The stakeholderswanted know about the maximum storage height.	It was explained that after the water level when it reaches a height of 609.80 meters from MSL, the gates will be opened.
Mr. Dinesh Semwal How the noise pollution will be addressed?	The project proponent has selected the electro-mechanical equipment for the hydro power plant to reduce the noise impacts. During the construction activities and after commissioning of the plant it will comply to all pollution control board norms and it will have a benchmarking testing on ambient noise level to demonstrate that compliance with pollution control board guidelines. It will also see that contractors comply with the same PCB guidelines.
Mr. Amar Singh One of the stakeholders referred to a case of a hydro power project where the research report indicates about the methane emission into the atmosphere. He inquired about the same possibility in the current project activity.	It was explained that the referred dam project must be a large reservoir based which impound large quantity of water. This kind of dam project may results in methane emission which is having global warming potential. As described above CDM EB (administrative body under Kyoto Protocol) has already defined methane emission factor in hydro project activity and this will be incorporated in the Project design document. This document has to be prepared as per the CDM process. It will be verified by an auditor which will be accredited by the administrative body.
Mr. Vijayant Singh What is the step towards the biodiversity conservation which will be damaged due to the project activity?	This project activity will disturb little vegetation as a result of project activity. The project proponent will plant more trees for every tree cut down in construction and is doing the same activity on continuation basis. It is reported to the concerned Government department too.

E.3. Consideration of comments received

The stakeholders were given clarification on the issues raised as above to their satisfaction. There was no negative comment from the stakeholders. At the end of meeting, the entire stakeholder appreciated the steps taken by the project proponent by providing relevant evidence of the project claims.

SECTION F. Approval and authorization

The Party involved in the project activity is India and it is involved indirectly. The Letter of Approval from the Designated National Authority for India i.e. National CDM Authority provided with reference of 4/25/2008-CCC dated 06/02/2009

Appendix 1. Contact information of project participants

Organization name	Alaknanda Hydro Power Company Ltd.
Country	India
Address	EKI Energy Services Ltd., EnKing Embassy Office No. 201,Plot 48, Scheme 78, Part 2 ,Vijay Nagar-452010,MP India
Telephone	0731 428 9086
Fax	-
E-mail	naveen@enkingint.org
Website	https://www.enkingint.org/
Contact person	Mr. Naveen Sharma

Appendix 2. Affirmation regarding public funding

Public funding from Annex I and diversion of official development assistance (ODA) is not involved in this project activity. The project cost is met by the project proponent through own sources and in part by the debt financing from banks

Appendix 3. Applicability of methodologies and standardized baselines

Please refer section B of PDD

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

Central Electricity Authority data[46]
For the NEWNE grid,

Net Generation in Operating Margin (GWh) (incl. Imports)			
	2005-06	**2006-07**	**2007-08**
NEWNE	359,270.98	379,470.60	401,641.59

Simple Operating Margin (tCO_2/MWh) (incl. Imports)			
	2005-06	**2006-07**	**2007-08**
NEWNE	1.0195	1.0083	0.9992

Build Margin (tCO_2/MWh) (not adjusted for Imports)			
	2005-06	**2006-07**	**2007-08**
NEWNE	0.6752	0.6313	0.5977

[46] CO2 Baseline Database for the Indian Power Sector, User Guide, Version 4.0. Central Electricity Authority, Ministry of Power, Government of India, New Delhi. http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm

Operating margin - last 3 years Generation Weightage average = 1.0086

Build margin (2007-08) = 0.5977

Combined margin emission factor = 0.5 x 1.0086 + 0.5 x 0.5977
= 0.8032 tCO2/MWh

Variable	Data Source
EG_y – Electricity generated	Records maintained by project proponent – monthly electricity sale to the state electricity board as evident from invoices
Parameter	**Data Source**
$EF_{OM,y}$ - Build Margin Emission Factor (tCO_2/MWh)	CO2 Baseline Database for the Indian Power Sector, User Guide, Version 4.0. Central Electricity Authority, Ministry of Power, Government of India, New Delhi.
$EF_{BM,y}$ = Operating Margin Emission Factor (tCO_2/MWh)	

Appendix 5. Further background information on monitoring plan

Please refer to the Section B.7.1 and B.7.3.

NOTE ON ENERGY METERING

AHPCL has installed 4 nos. hydro power generating units of capacity 82.5 MW each to generate power, utilizing the water flow available. The generating voltage is at 13.8 kV and it will be stepped-up to 400kV by providing 3 nos. single phase transformer on each unit. The power will be generated and stepped-up to 400 kV then fed into common bus in the project outdoor switchyard. From the common bus, the power will be supplied to UPPCL and Uttarakhand through two nos. 400 kV, outgoing feeders. The power generated from the project will be supplied to UPPCL (88%) and 12% free power to Uttarakhand. To measure energy generated, used station auxiliary and energy supplied to UPPCL and Uttarakhand, 3-phase 4-wire electronic metering provided (as shown in the schematic in section B.7.3 of PDD). The tariff energy meters provided on lines are of import / export type with an accuracy of 0.2s. Two nos. tariff meters are provided on each outgoing lines, one as main meter and another as check meter. The meters provided will measure both the import / export energy. The meters provided will be calibrated every year by the third party agency. Every month the energy supplied and imported will be obtained by taking readings by the Project operator and the representatives of the utilities for billing purposes. In case the main energy meter is defective, the check meter readings will be taken for the purpose of billing.

The total units generated in the Power House can be obtained by totalling the energy recorded in the energy meters installed on all generators.

The units supplied to utilities (UPPCL and Uttarakhand) can be obtained by totalling the readings recorded on the tariff energy meters provided on all outgoing lines from project switchyard.

Auxiliary consumption and transformation losses can be calculated by subtracting the total units supplied to utilities from the total units generate

Appendix 6. Summary report of comments received from local stakeholders

Please refer section E of PDD

Appendix 7. Summary of post-registration changes

The following Post Registration Changes are requested and PDD is revised to reflect these changes
Corrections:

1. The status of commissioning of project activity is updated being commissioned in Year 2015
2. The correction in estimated emission reduction values due to change in combined margin emission factor in section B.6.3 and B.6.4 of PDD. The Correction in calculation of grid emission factor by considering 3 years generation weighted average OM emission factor. Thus Combined margin emission factor is changed in section B.6.2, B.6.3 and Appendix 4 of PDD which is part of ex-ante calculation.
3. The contact details of focal point are changed in Appendix 1 of the revised PDD version 06 dated 30/10/2020.
4. Mention of note in section B.6.3 stating that Auxiliary consumption and Transformation losses are assumed just for Net Electricity Generation estimation. In actual net electricity generation is monitored and it covers auxiliary consumption and transformation loss. Thus separate monitoring of Auxiliary consumption and Transformation losses is not required
5. The update in PDD as per new template requirements like section A.5 History of Project, section B.6.2 and B.7.1 Purpose of data, Section F Approval and Authorization

Permanent Changes in monitoring plan:

1. There is difference in electricity mentioned in JMR and electricity mentioned in Invoice, thus transparent note is added to consider the Minimum of Net electricity supplied by the project activity to grid as per JMR (MWh) and Scheduled Energy (invoice Electricity +12% JMR electricity Value) as per Monthly Energy Account issued by UPSLDC (MWh) as a conservative approach.

Annex 1 -

Note on Sustainable Development submitted to NCDMA for obtaining HCA

EIA and R&R Plans are approved by the Government of Uttarakhand and as per the R&R Plan the Socio- Economic developments planned for the area are as follows:

Rehabilitation Plan:
Each family losing land will be preferably given agricultural land to the extent acquired subject to the maximum of 1 standard ha of land. Cash grant for the purchase of seeds and fertilizers are also to be provided. As per the enquiry, no government land suitable for agriculture is available in the nearby areas. Efforts will be made to provide the jobs to Project affected People (PAP) as per the availability of jobs and their qualifications. Apart from the cost of the land to be acquired a rehabilitation grant equivalent to 750 days minimum agricultural wages shall be paid to PAPs.

- This includes compensating those whose land is acquired, as per prevalent circle rates.
- Accommodating the Project Affected People in various jobs on preferential basis as per the project requirement and the qualifications of the persons.
- Cash Compensation paid to the PAPs as per the approved R&R plan

Resettlement Plan:
Each resident family losing homestead will be given homestead land as well as a constructed house. The cost of the house is to be adjusted against the compensation paid to them for land and house. However cash assistance @ ` 12,000/family for the transportation and ` 10,000/family for the construction of cattle sheds will be given to each family. Apart from the compensation to be paid for the rehabilitation and resettlement, infrastructural development and area development activities have also been provided in the R&R Plan.

In addition to the above, Area Development Activities amounting to ` 12.1 million have been planned for the following activities:

- Scholarship to 150 local students will be provided on merit basis.
- Training of local ITIs. 100 seats will be reserved to Project Affected Persons.
- Assist PAPs to form a fishing cooperative society and provide them financial support for the purchase of fishing-nets, boats etc.
- Upgradation of various schools in and around the project area.
- One Public Health Centre each at Shrinagar and Dhari with free medical, immunization, family planning facilities.
- Upgradation of hospital at Shrinagar

In addition to the Resettlement and Rehabilitation plans as above the following socio-economic benefits are envisaged:

1. Compensatory Afforestation:

The total forest acquired for the establishment of the project is 339 ha. The equivalent amount of non-forest land has been afforested as a part of compensatory afforestation plan. The compensation has already been paid to the forest department for afforestation over 347 ha of land in district Lalitpur, U.P.

2. Employment to the Local People:
Jobs will be provided on preferential basis as per the requirement and the qualifications of the persons during construction and operational phases. The peak labour force of skilled and unskilled labourers required during construction is estimated at about 2500. The construction activity will generate jobs throughout the year for at least 5 years. Education will receive attention.. The advantage of education to secure jobs will quickly percolate through all sections of the population and will induce people to get their children educated.

Presently PAPs depend on agriculture for a short period of year. The population in the nearest town (Shrinagar) is dependent on the religious tourism from pilgrims who halt at this town on their way to Badrinath and Kedarnath and the tourism and the related revenue is likely to be enhanced through such a major project in the area.

The development of the project will also lead to self employment among the local people. During the course of construction of the project, there will be population increase in the area due to the employees of AHPCL, Government employees and labour force of the contractors. The local people will get opportunity to start their own business for catering to the demands of these employees like vegetables, general store, tailoring, radio-TV, scooter and cycle repairs etc. At present too, about 50 shops have come up in the area in the vicinity of project colonies.

3. Increased power generation

The power generated will be utilized in Uttar Pradesh and Uttarakhand which will go a long way in meeting the domestic and industrial power requirements in Uttarakhand /U.P and will give an impetus to the industrialization in both the states.

4. Infrastructure Development:

The project activity indirectly will help the overall development in the neighboring villages with regard to better roads, telecommunications etc.

The all weather roads that have been built for the project are also being used by the local villagers including the already constructed Steel bridge near Supana village across the river Alaknanda which has drastically improved the communication between Supana and Shrinagar.

5. Provision for houses:

In addition to allotment of homestead land each family will be provided with a house as prescribed under Indira Aawas Yojana with one living room.

- The affected family can retrieve material from their houses coming under acquisition. Free transportation of retrieved material and household belongings will be provided to each displaced family or ` 12,000 to each homestead owners.
- Construction assistance for the construction of cattle sheds or poultry farms will be provided to each family losing homestead.

6. Technical training:

100 seats in the local ITI are to be reserved for the population of the Project Affected Villages. Of the 100 seats, 60% can be reserved for PAPs and the remaining 40% can be reserved for the other families residing in these villages. If the effected persons are not available the seats could be released to general public from the affected villages. The project proponents will provide grant to the local ITI (at Shrinagar) to upgrade their facilities

7. Provision for the Job

The holdings of the cultivators in this area were small. Most of the families are not able to sustain themselves mainly on agricultural income. Their income is supplemented by the earnings of the family members working outside. In view of this, it was considered that the families, whose more than 50 percent land was being acquired, would be affected severely. Therefore, it was proposed to provide job to one member of the family whose more than 50 percent land is being acquired. There were 169 such families whose more than 50 percent land was to be acquired.

8. Community Utilities

The community utilities like Inspection house, bridges, canals, school buildings, temples etc. were proposed to be reconstructed in the area beyond submergence or beyond the alignment of power channel, through the respective government department in case the property belongs to government department, and through the project authorities, in case the property belongs to village panchayats and communities.

9. Employment in Project Related Service Activities

The project was supposed to have a large colony for its employees. The colony needs shops for vegetables, small households goods and services like cycle repairs, TV repairs, etc. It was proposed to give reference in allotment of the shops and in taking up services like vending of food and vegetables, cycle repairs, TV repairs etc. in the project colony to the displaced persons who were not offered stable employment by the Uttar Pradesh Government and State Electricity Board (UPSEB).

10. Self-Employment

During the course of construction of the project, there will be population increase in the area due to the employees of UPSEB, Government employees and labour force of the contractors. The local people will get opportunity to start their own business for catering to the demands of these employees like vegetables, general store, tailoring, radio-TV, scooter and cycle repairs etc. At present too, about 50 shops have come up in the area in the vicinity of project colonies.

11. Other Facilities

The facilities of banking, post office, hospitals, cooking gas, etc. were proposed in the project colonies. These facilities will also be available to the local population.

12. Provision for Civic Amenities

In addition to the resettlement measures, the following civic amenities in the prescribed scale and manner in the new village or in the extended part of any existing village established for the purpose of rehabilitation of affected persons will also be provided.

- piped water supply for drinking purposes;
- school/addition to the existing school with playground;
- Tar topped internal approach roads and link roads to the main road;
- electric supply at least one point at each house as per Jawahar Jyoti Yojana;
- sewer network;
- public latrines, one toilet (Sulabh type) per 5 families or 25 persons;
- land for market and future expansion of the resettlement village.

These facilities will be over and above the land and property compensation as per Land Acquisition Act. The expenditure on all these aspects shall be the part of the project cost.

13. Area Development Activities

The Area Development Activities (ADA) that have been suggested on the project often lead to direct as well as indirect impacts on the socio-economic environment of the region. The acquisition of land or house or both are the direct impacts. The indirect effects include the loss of business opportunities due to acquisition of a village either fully or partly. The objective of the Area Development Activities is to eliminate the suffering to the local population to some extent. The various measures include:

- Priority will be given to accommodate the PAPs in the construction jobs as per their qualification.
- Scholarship to 150 local students on merit basis for persuing studies.
- Training of locals at ITIs. At present, the jobs are limited, but in the post-project phase, the employment scenario is likely to improve;
- 100 seats in the local ITI to be reserved for the population of the Project Affected Villages. Of the 100 seats, 60% can be reserved for PAFs and the remaining 40% can be reserved for the other families residing in these villages. If the effected persons are not available the seats could be released to general public from the affected villages. The project proponents will provide grant to the local ITI (at Shrinagar) to upgrade their facilities;
- Since the construction of dam will result into the creation of a big reservoir with enormous fishing potential, the project proponent will assist PAPs to form a fishing cooperative society and provide them financial support for the purchase of fishing nets, boats and fingerlings
- Upgradation of various schools in and around the project area.
- 1 PHC one each at Shrinagar and Dhari with free medical, immmunization, family planning facilities;
- upgradation of hospital at Shrinagar.

14. Approximate Budgetary Cost for socio-economic development

S. No.	Activity	Cost (million)
1	Infrastructural development	9.20
2	Area development activity	12.140
Total		21.340

15. Various other Social Works being undertaken by the Company are detailed below :

Employment:

350 Project Affected People will be provided employment.

Crematorium Places: Company agreed to build One Electric Control and one Wood Pyre Crematoriums.

Scholarship: Scholarship to 25 students will be provided by the Company, which include 2 pairs of Dresses, ` 250/- per month for food for top 3 students from class 5 to class 12.

Old Age House (Ashram): Company will build an Ashram for widows, old age and helpless people. Land for the same will be provided by the Gram Pradhan.
Compensation for Crops: Company agreed to pay ` 3200/- per Nali towards the compensation for crops which will be affected due to Power Channel.

Pitra Niwas: One Nali Land either at Gram Gugali or at Madhi will be provided by the company for Pitra Niwas.

Social Works:

Build one Community Centre, two Hospital and Schools.Land for the above shall be provided from State Govt. or from Gram Sabha in cordination with Gram Pradhan. Hospital will have a facility of 10 beds. One Hospital will be built in Pansaur near Gram Margaon and other one in Madhi. English Primary School will be built in Gandasu and Higher Secondary English Medium School in Madhi , Thapli. Land for the above will provided by the Gram Pradhan.

Stadium: Stadium will be constructed in village Naithana. Land for the same will be provided by Gram Pradhan. Company shall pay ` 20 lac for the Stadium.

Street Light: Company will provide Street Lights in all the dam affected villages.

River Development Plan: River development work will be done by the company after the completion of Dam.

Donation to Industrial Training Institute: Company agreed to pay ` 5 Lac per year for maximum five years to the local ITI.

1. Village Naur :
Plantation: All the Van Panchayat Samities will prepare a DPR and from Gorsali to Naithana and, plantation will be done and the cost of the same will be incurred by the Company.

Ghat : One 30 x 6 m Ladder-shape Ghat is being constructed by the Company along with two small Bridges (if required).

Renovation of Kilkileshwar Temple: It was agreed by the Company that White Wash work of the Kilkileshwat Shiv Mandir will be carried out by the Company 15 days before Shivaratri for a term of 4 years.

Coffer Dam Road (Power House): At present, temporary CC Road is being constructed.

Social Work:

Medical Camp: One Medical Camp has already been conducted by the Company for the Chauras area. Free medicines were distributed and other expenses like fees for doctors, fooding, etc. were incurred by the Company.

Bus Stop near Sanjoo School: Bus Stop near Sanjoo School is being repaired by the Company.

Water Tank: One Water Tank of 60,000 ltrs capacity is being constructed by the Company. Pipe lines are also provided by the Company.

Fodder for Animals: Fodder for animals will be provided by the Company according to the list submitted by the villagers.

Road Near Sanjo School to Alaknanda River (Nala): NOC required. Estimates are being prepared. After all the clearances, the road will be constructed by the company.

2. Village Naigyana and Bairangana :
Water Tanker: water Tanker is handed over to the villagers for sprinkling of water.

Medical Camp: A Medicat Camp wil be conducted in the area with the help of local personnel.

Construction of 1.5 to 2.0 m High Wall: To minimize the dust pollution, a wall of 1.5 m height will be constructed after the proper inspection by company's Engineer.

3. Village Sankro :
Widow/Handicap package: ` 10,000/- will be given as per norms to the widows and handicaps.

Water Tank: A 50,000 Ltrs. Tank will be constructed in the village by the company and pipe lines will be provided by the company.

Walk Ways, Roads:Walkways and roads will be improved by the company.

Solar Lights: 5 Solar Lights will be provided for Sankro Village by the company.

Water Tanker: 1 water Tanker will be handed over to the villagers for sprinkling of water.

4. Village Gugali :
Widow/Handicap package: ` 10,000/- will be given as per norms to the widows and handicaps.

Crop Compensation: ` 3200/- per Nali will be given towards crop compensation

Fodder for Animals: As per other villages fodder for animals will be provided by the Company according to the list submitted by the villagers

Employment/Petty Contracts: As per the requirement of the Company, Employment and Petty Contracts will be given.

Water Pipe Lines: Pipe lines will be provided by the company. Temporarily these will be used for Gugali and later stage, the same will be used for Nagrajasain.

Sewing Centre: 2 Machines for Sewing Centre will be provided by the company. Salary for 1 instructor @ ` 3000/- per month for 1 year will be given by the company.

5. Village Madhi :
Widow/Handicap package: ` 10,000/- will be given as per norms to the widows and handicaps.

Water Pipe Lines: 800 m pipe Length is being given for Madhi Gram Sabha.
Roads & C.C. Road: ` 5.00 lakhs for the purpose of development of Roads & CC Roads is being given to the Madhi Gram Sabha.

Fodder for Animals: Fodder for Animals is being given.

Medical Camp: A Medical Camp will be conducted in the area with the help of local personnel after every 3rd month.

Culvert Box for Rain Water Harvesting: Culvert Box will be constructed by the company for Rain Water Harvesting.

Sewing Centre and Computer Centre: 1 Sewing Centre will be constructed by the company for which the land will be provided by the Gram Sabha. The same will be used as Computer Centre also. 5 Machines and 3 Computers will be given by the company. Instructor will be paid ` 3000/- per month and ` 4500/- per month respectively. Furniture will also be provided by the Company.
Renovation & Beautification of Temples: After proper inspection, estimation and evaluation of the estimates, company is ready to help for the renovation/beautifications of the temples.

Solar Lights: 5 Solar Lights will be provided for Sankro Village by the company.

300 m CC Road and One Room in Bittaa Toak: For Pooja purpose one room and 300 m CC Road is being constructed by the company in Bitta Toak.

School Bus: School Bus for the School Children of Madhi is being provided.

Library: One Library will be constructed by the company in the Gram Sabha for which place will be provided by the Gram Sabha only. Librarian/Care Taker will be paid by the company for 1 year.

6. Village Supana :
Road From Bhagwati Crusher to Dam Site: Road will be constructed by the Company. Contract will be awarded to local experienced and registered contractor. Work is under progress.

Scholarship: Scholarship for eligible student and Handicap student will be given by the company.

Compensation for Widows/Marriage: Financial help to the Widows and to the girls getting marriage will be provided by the company.

Temporary Roads: Temporary road from Quarry to Ghat will be renovated by the Company. Work will be allotted to local villagers.

English Medium High School: English Medium High School will be constructed in the village and the land for the same will be provided by the villagers.

Medical Camp: A Medical Camp will be conducted for the check-up and distribution of medicine will be done by the company.

Water Tank: 1 Storage Tank will be constructed for which the land will be provided by the villagers. Meanwhile Water Tankers are being deployed to cater the requirement of water.

Solar Lights: Five Solar Lights along the road side and 1 Solar Light at Naga Temple will be provided by the Company.

School Bus & Jeep: One Bus from Village Supana to Kilkileshwar and One Jeep from Supana to Srinagar is being deployed to carry the school children of Supana and nearby villages.

7. Village Swit :
Compensation to Injured/Widows: It was agreed that ` 10,000/- and ` 15,000/- to the injured and widows (next to the kin) respectively will be given to the Road Accident persons.

Water Supply: Water Pumping (Lift) scheme will be constructed by the villagers and the company and two times in a day, water will be supplied to the village.

Road to Sweet Village: Financial help will be given by the company to develop the road for Sweet village. Contract will be given to local experienced and registered contractor only.

Renovation/Development of Temples: Companywill finance assist in the renovation/development of 4-5 temples which are being affected, after the estimate is submitted.

Compensation to SC/ST people: ` 10,000/- will be given to SC/ST people of Sweet village after submission of approved documents.

Sewing Centre: 1 Sewing Centre will be constructed at the Panchayat Bhavan building by the company. 5 Machines and 1 yr. salary for the trainer will be given by the company.

Meeting Hall, Play Ground at Primary School: Financial help for leveling the school ground and construction of Meeting Hall in the primary school will be given by the company only after the approval is being taken from the Govt.

Solar Lights: 10 nos of solar lights will be given to sweet village by the company.

Children Park: Leveling for Children park and 5 nos. cement seats for children will be provided by the company in Sweet village.

Renovation of Temples at Chopra Sweet Lagga: It was agreed that financial help for the renovation of affected temples of Sweet Lagga will be given by the company.

8. Village Koteshwar :
Medical Assistance: ` 10,000/- towards Medical assistance will be given to Mr. Satish Bhatt and Mr. Kushlanand

Water Pipe Line for Koteshwar Village: It was agreed that water pipe line for Koteshwar village will be connected by the company and the tnk for the same will be constructed by the villagers.

Solar Lights: 5 nos. solar lights will be given to village Koteshwar by the company.

Barat Ghar/Sewing Centre: One Barat Ghar along with Sewing Centre with 5 machines will be constructed by the company. Land for the same will be provided by the villagers.

9. Village Khakra (Kaliyasaur) :
Compensation to Injured/Widows: ` 10,000/- to the injured and widows is being given.

Ghat & Mortuary Ghats: A 30 x 6 m step ghat will be constructed for which the land will be provided by the villagers or Gram Sabha.

Community Centre: One Community Centre will be constructed by the Company for which the land will be provided by the Gram Sabha.

10. Village Dungripant :
Compensation for Land: ` 2.00 Lac per Nali will be paid to the Dam affected people..

House for SC/ST People: Separate houses for SC/ST people near Dungirpant will be constructed by the Company.
Compensation for House for General Category: General Category will be paid compensation for their houses as per PWD evaluation.

Rehabilitation: Company will pay ` 1.00 lac towards employment and ` 0.50 lac towards transportation to the people shifting from the area.

Shri Ram Janki Temple: Company agreed to build the Shri Ram Janki Temple– Land for the same will be provided by the Gram Sabha.

Other Miscellaneous Works such as : Construction of Channel, Water & Electricity, Bridge/Road from Pant Lagga to Dungripant village, Renovation of Cremation Ghat, Bus Stop at Dungripant

Village, 4 Rooms, 1 Principal Room, 4 Toilets and Play Ground in Dungripant High School Building, Community Hall will be constructed by the Company.

11. Village Dhamak (Kaliyasaund) :

Ram Janki Mandir: Renovation/Expansion of Ram Janki Temple will be done by the Company on the Govt. land at Jogidhar Tok and the land will be chosen along with the villagers. Other Civil land will be purchased and utlised for the rehabilitation of other villagers.

Road from Dhang Tok to Dhari Devi Temple: Road will be constructed by the Company and preference will be given to local Contractors, duly registered with PWD.

Cremation Ghats: Renovation/Expansion of Ghats will be done by the Company as per other villages.

Renovation of Gaura Devi Temple: Financial help will be given by the Company for the renovation/Expansion of Gaura Devi Temple at Gram Dhamak.

12. Srinagar City :

Medical Camp: On 13th July, 2008 a Medical Camp at St. Thresas School, Srinagar is conducted for various type of health problems. An expense of ` 3.50 Lacs was incurred towards the Medical Camp, medicines, food etc.

Retention Wall: Retention Wall from Ganga Mandir to SSB area will be constructed by the company.

13. As a responsible corporate, AHPCL is committed to the welfare and development of the area and

the people near the Project area. AHPCL will make a detailed program for developmental activities in consultation with the local and project affected people. Towards this, AHPCL volunteers to utilise up to 2.0% of the net revenues out of Carbon Credits for the following local Sustainable Development Activities:

1. Scholarships to students.
2. Maintenance and upgradation of schools and ITIs in the area.
3. Conducting medical camps.
4. Support in operation of the public health centres.
5. Maintenance of bathing ghats.
6. Conducting sport events.
7. Any other activities as requested by the villagers.

AHPCL may carryout the above activities either spending by itself or through GVK Foundation. Brief back ground of GVK Foundation is furnished below :

GVK Foundation : GVK foundation is a public charitable trust registered in March, 2001. The trust is involved in promotion of education, arts, healthcare, sports and various activities to bring about overall development in the morale, intellectual, social, economic and cultural spheres of the society.

ANNEX 2: LIST OF ABBREVIATIONS USED IN THE PDD

Sr. No.	Abbreviation	Full form
1	AHPCL	Alaknanda Hydro Power Company Ltd
2	NEWNE	Northern, Eastern, Western and North Eastern
3	HRT	Head Race Tunnels
4	UPPCL	Uttar Pradesh Power Corporation Ltd
5	PPA	Power Purchase Agreement
6	SHA	Synergics Hydro Asia
7	DNHPCL	Duncans North Hydro Power Company Ltd
8	TPC	The Tata Power Company Ltd.
9	FRL	Full Reservoir Level
10	MDDL	Minimum Draw Down Level
11	BHEL	Bharat Heavy Electricals Ltd
12	LILO	Line in line out
13	CWC	Central Water Commission
14	GHG	Greenhouse gas
15	CO	Carbon Monoxide
16	SOx	Sulfur Oxide
17	NOx	Nitrogen Oxide
18	SPM	Suspended Particulate Matter
19	W	Watt
20	MW	Mega Watt
21	MWh	Mega Watt hour
22	kV	kilovolt
23	GWh	Giga Watt hour
24	GJ	Giga Joules
25	kWh	kilowatt hour
26	MVA	Megavolt Ampere
27	PLF	Plant Load Factor
28	PF	Power Factor
29	rpm	Revolutions per minute
30	GCV	Gross Calorific Value
31	NCV	Net Calorific Value
32	ODA	Official Development Assistance
33	OM	Operating Margin
34	BM	Build Margin
35	CM	Combined Margin
36	CO2	Carbon Dioxide
37	CH4	Methane
38	N2O	Nitrous Oxide
39	tCO2	tonnes of CO2
40	CEA	Central Electricity Authority
41	UPERC	Uttar Pradesh Electricity Regulatory Commission
42	UPSEB	Uttar Pradesh State Electricity Board
43	PSU	Power Supply Unit

44	SEB	State Electricity Board
45	DOE	Designated Operational Entity
46	UNFCCC	United Nations Framework Convention on Climate Change
47	IPCC	Intergovernmental Panel on Climate Change
48	IRR	Internal Rate of Return
49	WACC	Weighted Average Cost of Capital
50	CAPM	Capital Asset Pricing Method
51	CoE	Cost of Equity
52	CoD	Cost of Debt
53	CER	Certified Emission Reduction
54	EB	Executive Board
55	O&M	Operation & Maintenance
56	CERC	Central Electricity Regulatory Commission
57	PP	Project Participant
58	VCU	Voluntary Carbon Units
59	LOI	Letter of Intent
60	DNV	Det Norske Veritas
61	EPC	Engineering Procurement and Construction
62	NCDMA	National CDM Authority
63	HCA	Host Country Approval
64	PDD	Project Design Document
65	RLDC	Regional Load Dispatch Centre
66	RPC	Regional Power Committees
67	NTPC	National Thermal Power Corporation
68	NHPC	National Hydroelectric Power Corporation
69	COD	Commercial Operation Date
70	MOEF	Ministry of Environment and Forest
71	GOI	Government of India
72	EIA	Environnemental Impact Assessment
73	PAP	Project Affected People
74	ADA	Area Development Activities
75	PWD	Public Works Department
76	NOC	No Objection Certificate
77	MSL	Mean Sea Level

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Document information

Version	*Date*	*Description*
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
10.1	28 June 2017	Revision to make editorial improvement.

Version	*Date*	*Description*
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • 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-PDD to CDM-PDD-FORM; • Make editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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