PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: 10.6 MW Bundled Small Scale Hydro Power Project in the State of Himachal Pradesh, India

Version 1.0

Date 03/01/2022

First CoU Issuance Period: 8 years, 0 months

Date: 01/01/2014 to 31/12/2021

Project Concept Note (PCN)
CARBON OFFSET UNIT (CoU) PROJECT

BASIC INFORMATION	
Title of the project activity	10.6 MW Bundled Small Scale Hydro Power Project in the State of Himachal Pradesh, India
Scale of the project activity	Small Scale
Completion date of the PCN	03/01/2022
Project participants	Creduce Technologies Private Limited (Representator) Sai Engineering Foundation (Project Proponent)
Host Party	India
Applied methodologies and standardized baselines	Applied Baseline Methodology: AMS-I.D : "Grid connected renewable electricity generation", version 18 Standardized Methodology: Not Applicable.
Sectoral scopes	01 Energy industries (Renewable/Non-Renewable Sources)
Estimated amount of total GHG emission reductions	To be estimated during verification [An ex-ante estimate is 45,752 CoUs per year]

SECTION A. Description of project activity

A.1. Purpose and general description of Carbon offset Unit (CoU) project activity >>

The proposed project tile under UCR is "10.6 MW Bundled Small Scale Hydro Power Project in the State of Himachal Pradesh, India", which is a small bundled Hydro Power project located in three different locations namely Mateni village of Shimla district (named Kareri small hydroelectric project), Simla village of Shimla district (named Simla small hydroelectric project) and Dubling village of Kinnaur district (named Titang small hydroelectric project); all in the state of Himachal Pradesh (India). The project is an operational activity with continuous reduction of GHG, currently being applied under "Universal Carbon Registry" (UCR) for generating Carbon Offset Units.

Purpose of the project activity:

The proposed project activity is promoted by Sai Engineering Foundation (herein after called as project proponent PP). The proposed project activity included installation and operation of hydro turbines in the state of Himachal Pradesh are per details listed below:

Village	District	Name of stream / river	Type of turbine	Number of turbines	Capacity of single turbine	Total Capacity
Mateni	Shimla	Nogli Nallah (tributary of Satluj)	Francis Hydro Turbine	2	2400 kW	4.80 MW
Simla	Shimla	Khanyara Nallah (tributary of Pabbar)	Pelton Hydro Turbine	2	2500 kW	5.00 MW
Dubling	Kinnaur	Titang Nallah (tributary of Satluj)	Turgo Hydro Turbine	1	800 kW	0.80 MW

This bundled project envisages a generation of total 10.6 MW of power from each small hydroelectric project (SHEP) by utilizing the available head and discharge from respective river streams. The project activity aims to harness kinetic energy of water (renewable source) to generate electricity. The project comprises a Trench weir which diverts the water into an intake placed on the bank of the river. The diverted water passes through Desilting basin. Desilted water enters into water conductor system, forebay and the steel pressure shaft. A surface powerhouse is suitably located on a terrace at bank of the river. Tail water from the powerhouse is discharged back into the respective river. Further details of individual project could be verified during project verification by referring to relevant documents on site. The commissioning details of each project activity under this bundled project are provided below:

Name of individual project activity	Total installed capacity	Commissioning date
Kareri SHEP	4.80 MW	21/04/2021
Simla SHEP	5.00 MW	19/08/2015
Titang SHEP	0.80 MW	06/02/2002

As the nature of the hydro project, no fossil fuel is involved for power generation in the project activity. The electricity produced by the project is directly contributing to climate change mitigation by reducing the anthropogenic emissions of greenhouse gases in to the atmosphere by displacing an equivalent amount of power at grid, which would otherwise have been generated from fossil fuel-

based power plants which are connected to the Indian grid system.

The net generated electricity from the bundled project activity is sold to state electricity board i.e., Himachal Pradesh State Electricity Board (HPSEB) under the Power Purchase Agreement (PPA) signed between the project developer and the utility. In pre-project scenario, electricity delivered to the grid by the project activity would have otherwise been generated by the operation of fossil fuel-based grid-connected power plants and by the addition of new generation sources in the grid.

Hence, project activity is displacing the estimated annual net electricity generation i.e., 50,835 MWh from the regional grid, which otherwise would have been generated by the operation of fossil fuel-based grid-connected power plants. The estimated annual total CO2e emission reductions by the project activity are expected to be around 45,752 tCO2e.

The estimated annual average and the total CO_2e emission reductions by the project activity is expected to be 45,752 tCO_2e, whereas actual emission reduction achieved during the first CoU period shall be submitted as a part of first monitoring and verification.

Since the project activity will generate electricity through hydro energy, a clean renewable energy source it will not cause any negative impact on the environment and thereby contributes to climate change mitigation efforts.

Project's Contribution to Sustainable Development

Indian economy is highly dependent on "Coal" as fuel to generate energy and for production processes. Thermal power plants are the major consumers of coal in India and yet the basic electricity needs of a large section of population are not being met. This results in excessive demands for electricity and places immense stress on the environment.

Changing coal consumption patterns will require a multi-pronged strategy focusing on demand, reducing wastage of energy and the optimum use of renewable energy (RE) sources. This project is a greenfield activity where grid power is the baseline. The renewable power generation is gradually contributing to the share of clean & green power in the grid; however, grid emission factor is still on higher side which defines grid as distinct baseline.

The Government of India has stipulated following indicators for sustainable development in the interim approval guidelines for such projects which are contributing to GHG mitigations. The Ministry of Environment, Forests & Climate Change, has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. It has been envisaged that the project shall contribute to sustainable development using the following ways:

Social well-being: The project would help in generating direct and indirect employment benefits accruing out of ancillary units for manufacturing of the Hydro Turbine Generator and for maintenance during operation of the project activity. It will lead to development of infrastructure around the project area in terms of improved road network, etc. and will also directly contribute to the development of renewable infrastructure in the region.

Economic well-being: Being a renewable resource, using hydro energy to generate electricity contributes to conservation precious natural resources. The project contributes to the economic sustainability through promotion of decentralization of economic power, leading to diversification of the national energy supply, which is dominated by conventional fuel based generating units. Locally, improvement in infrastructure will provide new opportunities for industries and economic

activities to be setup in the area. Apart from getting better employment opportunities, the local people will get better prices for their land, thereby resulting in overall economic development.

Technological well-being: The bundled project activity leads to the promotion of total 10.6 MW hydro turbine generators into the region and will promote practice for small scale industries to reduce the dependence on carbon intensive grid supply to meet the captive requirement of electrical energy and also increasing energy availability and improving quality of power under the service area. Hence, the project leads to technological well-being.

Environmental well-being: The project utilizes hydro energy for generating electricity which is a clean source of energy. The project activity will not generate any air pollution, water pollution or solid waste to the environment which otherwise would have been generated through fossil fuels. Also, it will contribute to reduction GHG emissions. Thus, the project causes no negative impact on the surrounding environment contributing to environmental well-being.

With regards to ESG credentials:

At present specific ESG credentials have not been evaluated, however, the project essentially contributes to various indicators which can be considered under ESG credentials. Some of the examples are as follows:

Under Environment:

The following environmental benefits are derived from the project activity:

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

For the project proponent, energy sale pattern is now based on renewable energy due to the project and it also contributes to GHG emission reduction and conservation of depleting energy sources associated with the project baseline. Hence, project contributes to ESG credentials.

Under Social:

The social well-being is assessed by contribution to improvement in living standards of the local community. The project activity is located in remote villages of industrially backward state of Himachal Pradesh. The implementation of the project activity would provide job opportunities to the local community; contribute in poverty alleviation of the local community and development of basic amenities to community leading to improvement in living standards of the community.

Under Economics:

Economic well-being refers to additional investment consistent with the needs of the local community. The bundled project activity is associated with a significant investment (nearly INR 705.5 million cumulative). This investment is quite significant in a rural area. These activities would contribute to the economic well-being of the local community. The project activity has also provided direct and indirect job opportunities to the local community during construction and shall provide permanent job opportunities during operation. During operation of the project activity, many persons has been employed directly, apart from indirect employment, which would augur well

for the economic well-being of the community

A.2 Do no harm or Impact test of the project activity>>

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

Rational: as per 'Central Pollution Control Board (Ministry of Environment & Forests, Govt. of India)', final document on revised classification of Industrial Sectors under Red, Orange, Green and White Categories (07/03/2016), it has been declared that hydro project activity falls under the "White category". White Category projects/industries do not require any Environmental Clearance such as 'Consent to Operate' from PCB as such project does not lead to any negative environmental impacts. Additionally, as per Indian Regulation, Environmental and Social Impact Assessment is not required for Small Hydro Projects.

Nevertheless, PP had conveyed about project activity before implementation at respective district of Himachal Pradesh, India to understand, discuss, record all possible concerns related to environment and socio-economic aspects of the project so that as per requirements mitigation measures can be taken. The feedback and inputs received from local stakeholders confirm that no negative impact is foreseen by them.

Additionally, there are social, environmental, economic and technological benefits which contribute to sustainable development. The key details have been discussed in the previous section.

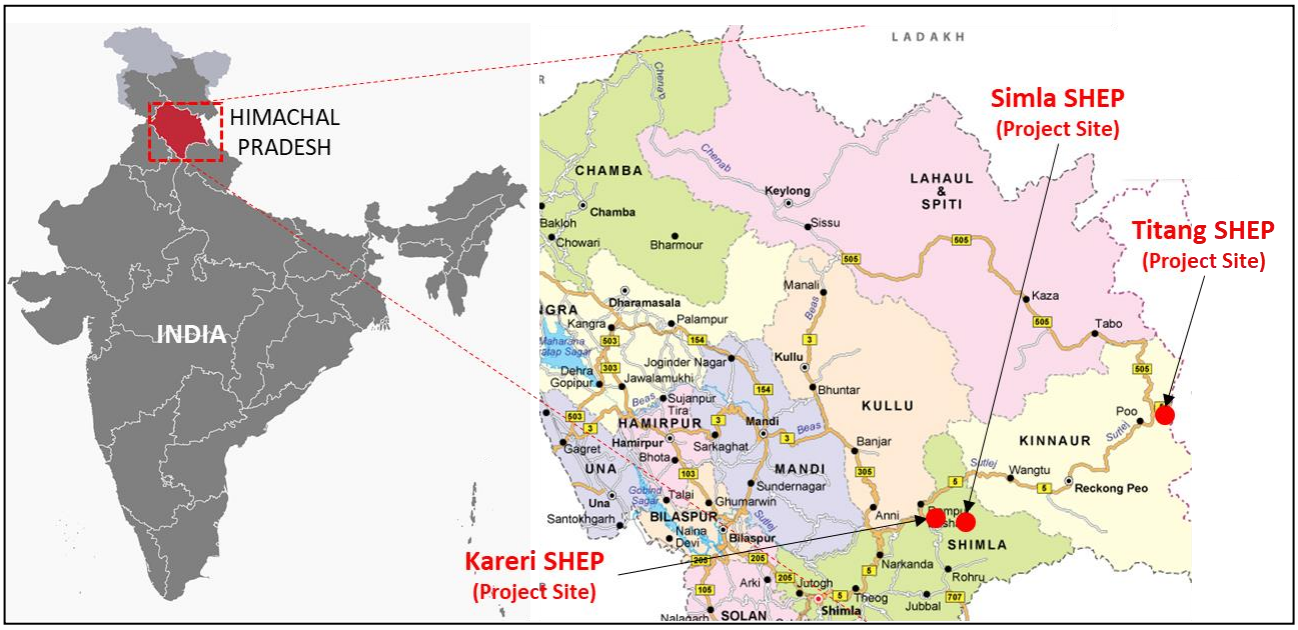
A.3. Location of project activity >>

The location of first project (Kareri SHEP) from this bundled is situated at village Mateni of Shimla district in the state of Himachal Pradesh. The nearest major railway station is Shimla Railway Station which is 139 kms from this site. The nearest airport is at Jubberhatti which is 147 kms from this site. This project site is connected to Shimla by Shimla-Rampur highway (NH-05). The geographic co-ordinate of the project locations is longitude 77°44'35" E and latitude 31°23'33" N.

The location of second project (Simla SHEP) from this bundled is situated at village Simla of Shimla district in the state of Himachal Pradesh. The nearest narrow gauge railway station is Simla Railway Station. The nearest airport is at Jubberhatti which is 185 kms from this site. The geographic co-ordinate of the project locations is longitude 77°58'01" E and latitude 31°20'27" N.

The location of third project (Titang SHEP) from this bundled is situated at village Dubling of Kinnaur district in the state of Himachal Pradesh. The nearest major railway station is Shimla Railway Station which is 280 kms from this site. The nearest airport is at Jubberhatti which is 299 kms from this site. The geographic co-ordinates of the project are located within the geo-coordinates: latitude 31°40' to 31°45' N and longitude 78°35' to 78°43' E.

The representative location map is included below:



(Courtesy: google map and images)

A.4. Technologies/measures >>

The project activity involves hydro turbine generators of horizontal Francis, Pelton and Turgo Impulse type (details of each provided in section A.1.) with internal electrical lines connecting the project activity with local evacuation facility. All the generators generate power at 3.3kV, which can further be stepped up to 11 kV. The project activity can operate in the frequency of 50 Hz and in the voltage range of 3.3kV ± 10%. The average life time of the generator is around 35 years as per the equipment supplier specification. The other salient features of the technology are:

Specification	Kareri SHEP (4.80 MW)	Simla SHEP (5.00 MW)	Titang SHEP (0.80 MW)
Gross Head	157 m	546.25 m	226.94 m
Net Head	157 m	516.17 m	213.50 m
Diversion Weir			
Type	Trench weir	Trench weir	Trench weir
Shape	Trapezoindal	Rectangular	Rectangular
Length	25 m	10 m	15 m
Design Discharge	5.10 cumecs	1.22 cumecs	1.03 cumecs
Feeder / Intake Channel			
Length	7.2 m	10 m	5 m
Shape / Material	Rectangular / RCC	Rectangular / RCC	Rectangular / RCC
Size	Width – 5.65 m Depth – 6.50 m	Width – 0.90 m Depth – 0.90 m	Width – 3.00 m Depth – 2.50 m
Slope	-	1 in 200	1 in 10
Design Discharge	5.10 cumecs	0.549 cumecs	1.03 cumecs
Desilting Tank			
Total Length	30.0 m	30.0 m	40.0 m
Width	10.0 m	4.00 m	2.50 m
Full supply depth	3.30 m	3.00 m	3.70 m
Type	Hopper type surface de-silting	Hopper type surface de-silting	Hopper type surface de-silting
Type / Material	R.C.C	R.C.C	R.C.C
Power Channel/ Head Race Pipe			
Length	100 m	1600 m	40 m
Shape / Material	Rectangular / R.C.C	Circular / Steel	Circular / Steel
Size	2.1 m × 2.1 m	Diameter 1.00 m	Diameter 0.750 m
Design Discharge	5.10 cumecs including flushing	0.549 cumecs including flushing	0.70 cumecs including flushing
Forebay Tank			
Total Length	55.0 m	7.50 m	-
Width	10.0 m	1.83 m	-
Full supply depth	2.00 m	1.80 m	-
Free board	-	0.60 m	-
Type / Material	R.C.C	R.C.C	-
Penstock			
Number	One	One	One
Diameter – Main pipe	1500 mm (I.D.)	700 mm (I.D.)	600 mm (I.D.)
After bifurcation	1200 mm (I.D.)	500 mm (I.D.)	400 mm (I.D.)

Specification	Kareri SHEP (4.80 MW)	Simla SHEP (5.00 MW)	Titang SHEP (0.80 MW)
Length	230 m	1530 m	1080 m
Design Discharge	5.10 cumecs including flushing	1.22 cumecs including flushing	1.03 cumecs including flushing
Material	ERW Steel		ERW Steel
Power House			
Type	Surface power house	Surface power house	Surface power house
Size	26.6 m × 17 m × 17.4 m	29.7 m × 15.3 m × 12.6 m	16.0 m × 8 m × 4 m
Capacity	2 × 2400 kW	2 × 2500 kW	1 × 800 kW
Gross head	122.28 m	546.25 m	226.94 m
Net head	118.77 m	516.17 m	213.50 m
Electromechanical Equipment			
Turbine type	Horizontal Francis	Horizontal Pelton	Turgo /525T
Turbine number	02 Nos.	02 Nos.	01 Nos.
Capacity of each turbine	2400 kW	2500 kW	800 kW
Type of generators	Synchronous	Synchronous	Synchronous
Normal Speed	1000 rpm		1000 rpm
Tail Race			
Shape	Rectangular	Rectangular	Circular
Size	1.80 m (width) × 1.80 m (depth)	1.5 m (width) × 1.5 m (depth)	600 mm dia. (first 65m) and 450 mm dia. (remaining)
Length	18 m	30 m	115 m
Switchyard			
Voltage level of transformer	3.3/22 kV	3.3/22 kV	3.3/22 kV
Nos. of bay	2	2	2
Size	Length – 12.0 m Width – 6.0 m	Length – 18.0 m Width – 8.0 m	Length – 18.0 m Width – 8.0 m

The hydro turbines have already been commissioned as described in section A.1.

In the absence of the project activity the equivalent amount of electricity would have otherwise been generated by the operation of fossil fuel-based grid-connected power plants and fed into regional grid which is part of unified Indian Grid system, hence baseline scenario of the project activity is the grid-based electricity system, which is also the pre-project scenario as discussed in the previous section.

A.5. Parties and project participants >>

Party (Host)	Participants
India	**Creduce Technologies Private Limited (Representator)** Contact person: Shailendra Singh Rao Mobile: +91 9016850742, 9601378723 Address: 2-O-13,14 Housing Board Colony, Banswara, Rajasthan - 327001, India **Sai Engineering Foundation (Developer)** Address: Sai Bhawan Building, New Shimla - 171009, Himachal Pradesh, India.

A.6. Baseline Emissions>>

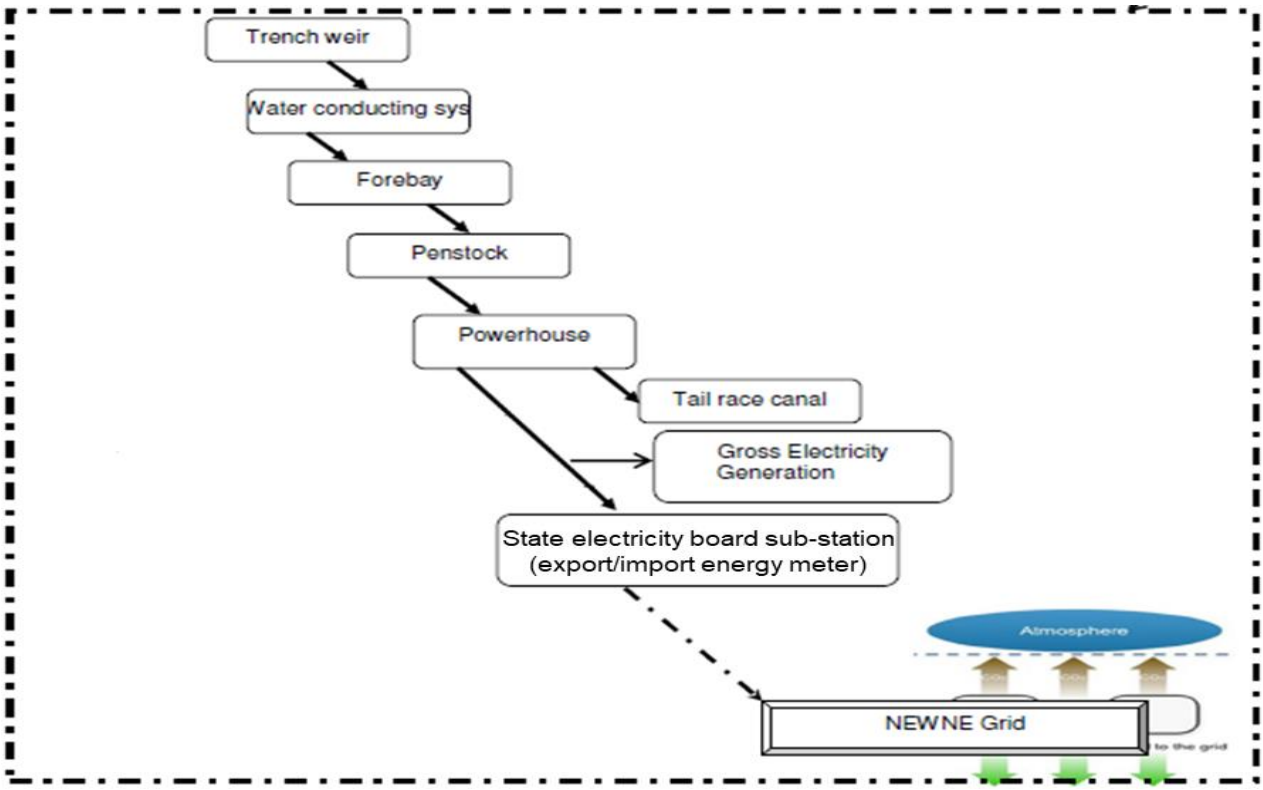
The baseline scenario identified at the PCN stage of the bundled project activity is:

- Grid

In the absence of the bundled project activity, the equivalent amount of electricity would have been generated by the operation of fossil fuel-based grid-connected power plants and fed into Indian grid system, which is carbon intensive due to use of fossil fuels. Hence, baseline scenario of the project activity is the grid-based electricity system, which is also the pre-project scenario.

Schematic diagram showing the baseline scenario:

Project Scenario:



NWENE – North West East and North-East Grid, which was a regional grid and is now recognized as unified Indian Grid system.

Baseline Scenario:

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

"The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid".

The bundled project activity involves setting up of new small HEP plants to harness the green power from Hydrel energy and to supply the produced power to the grid. In the absence of the project activity, the equivalent amount of power would have been supplied by the Indian grid, which is fed mainly by fossil fuel fired plants. Hence, the baseline for the project activity is the equivalent amount of power produced at the Indian grid.

A.7. Debundling>>

This project activity is not a debundled component of a larger project activity.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines >>

SECTORAL SCOPE:
01, Energy industries (Renewable/Non-renewable sources)

TYPE:
I - Renewable Energy Projects

CATEGORY:
AMS. I.D. (Title: "Grid connected renewable electricity generation", version 18)

B.2. Applicability of methodologies and standardized baselines >>

The bundled project activity involves generation of grid connected electricity from the construction and operation of three new hydro power-based power projects. The bundled project activity has total installed capacity of 10.60 MW which will qualify for a small-scale project activity under Type-I of the Small-Scale methodology. The project status is corresponding to the methodology AMS-I.D., version 18 and applicability of methodology is discussed below:

Applicability Criterion	Project Case
1. This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a) Supplying electricity to a national or a regional grid; or **(b)** Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The project activity involves setting up of a renewable energy (hydro) generation plant that exports electricity to the fossil fuel dominated electricity grid (Indian Grid system). Thus, the project activity meets this applicability conditions.
2. Illustration of respective situations under which each of the methodology (i.e. AMS-I.D: Grid connected renewable electricity generation", AMS-I.F: Renewable electricity generation for captive use and mini-grid" and AMS-I.A: Electricity generation by the user) applies is included in Table 2	According to the point 1 of the Table 2 in the methodology – "Project supplies electricity to a national/ regional grid" is applicable under AMS I.D. As the project activity supplies the electricity to Indian Grid system grid which is a regional grid, the methodology AMS-I.D. is applicable.
3. This methodology is applicable to project activities that: (a) Install a Greenfield plant; (b) Involve a capacity addition in (an) existing plant(s); (c) Involve a retrofit of (an) existing plant(s); (d) Involve a rehabilitation of (an) existing plant(s); or	The Project activity involves the installation of new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity. Thus, Project activity is a Greenfield plant and satisfies this applicability condition (a).

Applicability Criterion	Project Case
(e) Involve a replacement of (an) existing plant(s).	
4. Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: (a) The project activity is implemented in existing reservoir, with no change in the volume of the reservoir; or (b) The project activity is implemented in existing reservoir, where the volume of the reservoir(s) is increased and the power density as per definitions given in the project emissions section, is greater than 4 W/m^2. (c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2	As the project activity is a run-off river type hydro power plant, this criterion is not relevant for the project activity.
5. If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The total rated capacity of this bundled project activity is 10.60 MW with no provision of Co-firing fossil fuel. Hence, meeting with this criterion.
6. Combined heat and power (co-generation) systems are not eligible under this category	This is not relevant to the project activity as the project involves only hydro power generating units.
7. In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	There is no other existing renewable energy power generation facility at the project site. Therefore, this criterion is not applicable.
8. In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement power plant/unit shall not exceed the limit of 15 MW.	The project activity is a new installation, it does not involve any retrofit measures nor any replacement and hence is not applicable for the project activity.
9. In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as "AMS I. C.: Thermal energy production with or without	This is not relevant to the project activity as the project involves only hydro power generating units.

Applicability Criterion	Project Case
electricity" shall be explored.	
10. In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	This is not relevant to the project activity as the project involves only hydro power generating units.

B.3. Applicability of double counting emission reductions >>

There is no double accounting of emission reductions in the project activity due to the following reasons:

- Project is uniquely identifiable based on its location coordinates,
- Project has dedicated commissioning certificate and connection point,
- Project is associated with energy meters which are dedicated to the generation point/feeding point with the grid interface.

B.4. Project boundary, sources and greenhouse gases (GHGs)>>

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

Thus, the project boundary includes the Hydro Turbine Generators and the Indian grid system.

Source		Gas	Included?	Justification/Explanation
Baseline	Grid connected electricity generation	**CO_2**	**Yes**	**CO2 emissions from electricity generation in fossil fuel fired power plants**
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
		Other	No	No other GHG emissions were emitted from the project
Project	Greenfield Hydro Power Project Activity	CO_2	No	No CO_2 emissions are emitted from the project
		CH_4	No	Project activity does not emit CH_4
		N_2O	No	Project activity does not emit N_2O
		Other	No	No other emissions are emitted from the project

B.5. Establishment and description of baseline scenario >>

This section provides details of emission displacement rates/coefficients/factors established by the applicable methodology selected for the project.

As per para 19 of the approved consolidated methodology AMS-I.D. Version 18, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

"***The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid***".

The bundled project activity involves setting up of new hydro power plants to harness the green power from hydro energy and to use for sale to national grid through PPA arrangement. In the absence of the project activity, the equivalent amount of power would have been generated by the operation of grid-connected fossil fuel-based power plants and by the addition of new fossil fuel-based generation sources into the. The power produced at grid from the other conventional sources which are predominantly fossil fuel based. Hence, the baseline for the project activity is the equivalent amount of power produced at the Indian grid.

A "grid emission factor" refers to a CO_2 emission factor (tCO_2/MWh) which will be associated with each unit of electricity provided by an electricity system. The UCR recommends an emission factor of 0.9 tCO_2/MWh for the 2014-2020 years as a fairly conservative estimate for Indian projects not previously verified under any GHG program. Also, for the vintage 2021, the combined margin emission factor calculated from CEA database in India results into higher emission than the default value. Hence, the same emission factor has been considered to calculate the emission reduction under conservative approach.

Net GHG Emission Reductions and Removals

Thus, $ER_y = BE_y – PE_y – LE_y$

Where:

ER_y = Emission reductions in year y (tCO_2/y)

BE_y = Baseline Emissions in year y ($t CO_2/y$)

PE_y = Project emissions in year y (tCO_2/y)

LE_y = Leakage emissions in year y (tCO_2/y)

Baseline Emissions

Baseline emissions include only CO_2 emissions from electricity generation in power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants.

The baseline emissions are to be calculated as follows:

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

Where:

BE_y	=	Baseline emissions in year y (t CO_2)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of this project activity in year y (MWh)
$EF_{grid,y}$	=	UCR recommended emission factor of 0.9 tCO_2/MWh has been considered, this is conservative as compared to the combined margin grid emission factor which can be derived from Database of Central Electricity Authority (CEA), India. (Reference: General Project Eligibility Criteria and Guidance, UCR Standard, page 4)

Project Emissions

As per paragraph 39 of AMS-I.D. (version 18, dated 28/11/2014), for most renewable energy project activities emission is zero.

As per applied methodology only emission associated with the fossil fuel combustion, emission from operation of DG Set, would be accounted for the project emission on actuals.

Diesel consumption:

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

$PE_{Diesel} = \Sigma DC_y \times P \times NCV_{Diesel} \times EF_{CO2Diesel}$

Where:

PE_{Diesel} = Project emission due to Diesel consumed during monitoring period in DG set

DC_y = Diesel Consumption in liters (lit)

P = Density of Diesel (0.86 kg/lit)

NCV_{Diesel} = Net Calorific Value of Diesel

$EF_{CO2Diesel}$ = IPCC 2006 Emission factor for Diesel

Hence, PEy = PE_{Diesel}

Leakage

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

Hence, LEy= 0

The actual emission reduction achieved during the first CoU period shall be submitted as a part of first monitoring and verification. However, for the purpose of an ex-ante estimation, following

calculation has been submitted:

Estimated annual baseline emission reductions (BE_y)

= 50,835 MWh/year × 0.9 tCO_2/MWh

= 45,752 tCO_2/year (i.e., 45,752 CoUs/year)

Note:
Above estimation is conducted based on an ex-ante projected value of generation, without any project emissions. However, actual generation shall be considered during the process of verification and any project emissions occurred shall be calculated as per the methodological choice.

The ex-ante assumptions are considered for each individual capacity, as follows:

Number of days	days	365
Annualized avg. PLF	%	60%
5% Outages	MWh	@5% of total generation
1% Auxiliary Consumption	MWh	@1% of total outages
2% Transmission Losses	MWh	@2% of auxiliary consumption

B.6. Prior History>>

The project activity is a bundle of three small-scale hydro projects and projects were never applied under any other GHG mechanism prior to this registration with UCR. Also, the capacities or the total project as a whole has not been applied for any other environmental crediting or certification mechanism. Hence project will not cause double accounting of carbon credits (i.e., COUs).

B.7. Changes to start date of crediting period >>

There is no change in the start date of crediting period.
The start date of crediting under UCR is considered as 01/01/2014 and no GHG emission reduction has been claimed so far.

B.8. Permanent changes from PCN monitoring plan, applied methodology or applied standardized baseline >>

Not applicable.

B.9. Monitoring period number and duration>>

First Monitoring Period:
08 years, 00 month
01/01/2014 to 31/12/2021 (inclusive of both dates)

B.8. Monitoring plan>>

Data and Parameters available at validation (ex-ante values):

Data / Parameter	UCR recommended emission factor
Data unit	tCO_2 /MWh
Description	A "grid emission factor" refers to a CO_2 emission factor (tCO_2/MWh) which will be associated with each unit of electricity provided by an electricity system. The UCR recommends an emission factor of 0.9 tCO_2/MWh for the 2014 - 2020 years as a fairly conservative estimate for Indian projects not previously verified under any GHG program. Hence, the same emission factor has been considered to calculate the emission reduction under conservative approach.
Source of data	https://a23e347601d72166dcd6-16da518ed3035d35cf0439f1cdf449c9.ssl.cf2.rackcdn.com//Documents/UCRStandardNov2021updatedVer2_301121081557551620.pdf
Value applied	0.9
Measurement methods and procedures	-
Monitoring frequency	Ex-ante fixed parameter
Purpose of Data	For the calculation of Emission Factor of the grid
Additional Comment	The combined margin emission factor as per CEA database (current version 16, Year 2021) results into higher emission factor. Hence for 2021 vintage UCR default emission factor remains conservative.

Data / Parameter	P
Data unit	kg/lit
Description	Density of diesel
Source of data	http://www.fast-tek.com/TM104.pdf http://www.iocl.com/Products/DieselSpecifications.pdf
Value applied	0.860
Measurement methods and procedures	Fixed Value has been taken from the publicly available data source.
Purpose of Data	Calculation of project emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$NCV_{diesel,y}$
Data unit	GJ/Ton
Description	Net calorific value of the Diesel in year y
Source of data	As options a, b & c are not available, the project proponent chooses option d i.e. IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories

	and is fixed Ex-ante. This is in accordance to the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", latest version applied.
Value applied	43.30
Measurement methods and procedures	IPCC Default Value is considered.
Purpose of Data	Calculation of project emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{CO2,diesel,y}$
Data unit	tCO_2e/TJ
Description	CO2 emission factor of diesel in year y
Source of data	IPCC default value
Value applied	74.8
Measurement methods and procedures	As options a, b & c are not available, the project proponent chooses option d i.e. IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories and is fixed Ex-ante. This is in accordance to the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" latest version applied.
Purpose of Data	Calculation of project emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data and Parameters to be monitored (ex-post monitoring values):

Data / Parameter	$EG_{PJ, y}$
Data unit	MWh / year
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the project activity in year y (MWh)
Source of data	Monthly Joint Meter Readings (JMRs)
Measurement procedures (if any):	Data Type: Measured Monitoring equipment: Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: 5 years (as per CEA provision) Generally, the calculation is done by the Authority/Discom and the PP has no control over the authority for the calculation. Therefore, based on the joint meter reading (JMR) certificates/credit notes, the PP shall raise the invoice for monthly payments. In case the monthly JMR provides net export quantity, the same will be directly considered for calculation. However, if the JMR does not directly provide "net electricity" units, then quantity of net electricity supplied to the grid shall be calculated using the parameters reflected in

	the JMR. For example, the difference between the measured quantities of the grid export and the import will be considered as net export: $EG_{PJ,y} = EG_{Export} - EG_{Import}$ Thus, $EG_{PJ,y}$ is the net export which will be either directly sourced from the monthly generation statements (such as JMR) or to be calculated from export and import values reported. Provision: The project is a bundle of 3 small hydro projects, as described under the section A.1 of the PCN. Therefore, for each individual project capacity this parameter "$EG_{PJ,y}$" shall be separately monitored, measured and recorded. Hence, the project will have the provision to calculate ERs for each capacity separately, however for the purpose presentation of ERs for the entire project the cumulative value and results shall be presented in the Monitoring Report.
Measurement Frequency:	Monthly
Value applied:	To be applied as per actual data (50,835 is an annualized average value has been considered here for an ex-ante estimation only, whereas this is an ex-post parameter hence actual value shall be applied during monitoring and verification)
QA/QC procedures applied:	Calibration of the Main meters will be carried out once in five (5) years as per National Standards (as per the provision of CEA, India) and faulty meters will be duly replaced immediately as per the provision of power purchase agreement. Cross Checking: Quantity of net electricity supplied to the grid will be cross checked from the invoices raised by the project participant to the grid.
Purpose of data:	The Data/Parameter is required to calculate the baseline emission.
Any comment:	All the data will be archived till a period of two years from the end of the crediting period.

Data / Parameter	DC_y
Data unit	Liters
Description	Diesel consumption by the standby DG set in year y
Source of data	Plant Records (individually recorded at each plant level)
Measurement procedures (if any):	The diesel quantity available in the diesel storage tanks is recorded daily by PP in the plant log book. The diesel consumption has been recorded in the logbook in liters. However, based on the density of diesel of about 0.86 kg/lit, the diesel consumption in tons is calculated.
Frequency of monitoring/recording	Continuously and recorded monthly basis.
Value monitored	To be monitored as per actuals
Monitoring equipment	Calculated

QA/QC procedures to be applied	The measured data will be cross checked with total diesel procurement using payment receipts.
Purpose of the data	Calculation of project emissions.
Calculation method	Data Type: Measured & Calculated Data Archiving: Paper/ Electronic.
Any comment:	The data would be archived upto two years after the end of crediting period.